INTERNATIONAL STANDARD

ISO 9221-2

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Furniture — Children's high chairs —

Part 2:
Test methods

Ameublement — Chaises hautes pour enfants —

Partie 2: Méthodes d'essai

Reference number
ISO 9221-2:1992(E)

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9221-2 was prepared by Technical Committee ISO/TC 136, *Furniture*, Sub-Committee SC 1, *Test methods*.

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

— *Part 1: Safety requirements*

— *Part 2: Test methods*

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Furniture — Children's high chairs —

Part 2:
Test methods

1 Scope

This part of ISO 9221 specifies test methods that assess the safety requirements given in ISO 9221-1 of children's high chairs and multi-purpose chairs for domestic use.

Such chairs may be convertible to low chairs, low chairs and tables and for such uses as baby walking frames, pushchairs, swings, car chairs or reclining low chairs. These additional functions are not covered by ISO 9221.

This part of ISO 9221 describes a number of tests consisting of the application, to various parts of the item, of forces simulating normal functional use, as well as misuse, that can reasonably be expected to occur.

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

The tests are designed to be applied to a high chair that is fully assembled and ready for use.

The test results are only valid for the article tested. When the test results are intended to be applied to other similar articles, the test specimen should be representative of the production model.

In the case of designs not catered for in the test procedures, the test should be carried out as far as possible as described, and a list made of the deviations from the test procedure.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9221. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9221 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications.*

ISO 1521:1973, *Paints and varnishes — Determination of resistance to water — Water immersion method.*

ISO 4628-3:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 3: Designation of degree of rusting.*

ISO 9221-1:1992, *Furniture - Children's high chairs — Part 1: Safety requirements.*

3 General test requirements

Unless otherwise stated, measurements of all forces shall have an accuracy of $\pm$ 5 %, all masses an accuracy of $\pm$ 0,5 % and all dimensions an accuracy of $\pm$ 0,5 mm.

Before any of the tests described in this part of ISO 9221 are commenced, the item shall be old enough to ensure that it has developed its full strength. At least four weeks in normal indoor conditions shall have elapsed between manufacture and testing in the case of glued joints in timber and the like.

Immediately before testing, the chair shall be stored for at least one week in a standardized atmosphere with a temperature of 23 °C $\pm$ 2 °C and a relative humidity of (50 $\pm$ 5) % according to ISO 554.

The high chair shall be tested as delivered. If of the knock-down type, it shall be assembled according to instructions supplied with the chair. If it can be assembled or combined in different ways as a high chair, the most adverse combination shall be used for each test.

Knock-down fittings shall be tightened before testing.

If the high chair is constructed with an adjustable angle backrest, the strength and stability tests shall be carried out with the backrest in its most adverse position for each test: this is normally fully reclined.

4 Test equipment

4.1 Test dummy, a solid 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 edges shall have a minimum radius of 5 mm. Two safety harness anchorage points shall be provided. These shall be positioned 150 mm from the base and 180° to each other around the circumference.

4.2 Strength impact hammer, a striker in the form of a cylindrical object having a mass of 6,5 kg ± 0,07 kg (including the head), supported from a pivot by a steel tube of 38 mm in diameter and with a wall thickness of 1,6 mm. The hammer head has a rubber and hardwood end. The distance between the pivot and the centre of gravity of the striker is 1 m. The pendulum arm is pivoted by a low friction bearing.

The essential details of an apparatus meeting these requirements are specified in figure 1.

4.3 Loading pad, a rigid cylindrical object 100 mm in diameter having a smooth hard surface and rounded edges.

4.4 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 that will prevent the item from moving shall be used.

4.5 Floor surface, horizontal, flat, rigid, e.g. concrete.

4.6 Beam, 900 mm long with a mass of 450 g ± 10 g.

4.7 G-clamp, with a mass of 0,25 kg ± 0,05 kg.

4.8 Hook, with a mass of 1,00 kg ± 0,05 kg.

5 Test procedures

5.1 Assembly and inspection before test

Assemble the high chair in accordance with the manufacturer's instructions. Prior to the test, inspect the high chair visually for defects.

5.2 Corrosion resistance test

Expose metal parts that would be within the reach of the child to an atmosphere as specified in ISO 1521 for a period of 48 h. After this, determine the degree of corrosion on the basis of ISO 4628-3.

5.3 Inspection of workmanship

Inspect the specimen to determine whether exposed edges, screws, bolts, zips and other fittings are rounded or chamfered, and free of burr and sharp edges.

5.4 Strength of harness attachments

Apply a force of 150 N for 1 min in the direction most likely to cause failure to each of the harness attachment points, with the seat of the high chair held rigidly so that the chair is in an upright position.

5.5 Strength of crotch strap

Apply a force of 150 N with negligible dynamic load for 1 min in the direction most likely to cause failure.

5.6 General strength test

5.6.1 Apply a force of 90 N to any part or attachment of the high chair, except in the case of fastenings where the force is not applied in the direction of normal operation of the fastening.

5.6.2 Place the high chair in an upright position with all its legs on the floor. Place a mass of 40 kg, distributed over an area of 150 mm in diameter, in the centre of the seat. Maintain the load for 1 min. Lift the high chair by its arms for 1 min. Remove the load.

5.6.3 Place 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.

5.6.4 When the chair is furnished with a tray, place a mass of 20 kg, distributed over an area of 75 mm × 150 mm, on the centre of the tray. Maintain the load for 1 min. Remove the load.

5.6.5 Securely affix the legs of the high chair to the floor so that it cannot move in the direction of the force being applied. If there is a tray, it shall be either removed or left on according to which is most likely to cause failure. Allow the impacter specified in 4.2 to strike the centre of the top of the inside chair back with a velocity of 1,5 m/s. Repeat the test but striking the centre of the top of the outside chair back (see figure 2). Carry out the test 10 times in each direction.

NOTE 1 A velocity of 1,5 m/s is obtained by allowing the striker to fall from a height of drop (h in figure 2) of 116 mm through an angle (α in figure 2) of 28°.

5.6.6 Remove the tray from the high chair. Drop the tray through a height of 1 m onto the floor, on each of the following; one long edge, one short edge, the flat bottom, adjacent to the fastening points and any other point judged likely to be damaged by the test.

5.6.7 With the tray on the high chair, securely affix the seat of the high chair so that it cannot move in the direction of the force being applied. Apply in turn a horizontal force of 200 N to the tray in the following positions:

a) at the centre of the front edge fore and aft at its uppermost surface;

b) outwards at the centre of each side at its uppermost surface.

The test force is applied gradually over a period of 1 s and then maintained for 30 s.

Carry out this test 10 times.

5.7 Test for folding high chairs

With the tray in position, place the test dummy (4.1) on the seat. Apply a force of 200 N to the outer end of the tray or to the nearest appropriate structure, if the tray is not fitted, in the direction most likely to fold the chair.

Carry out this test 10 times (see figure 3).

Repeat the test with the load in any other position or direction likely to fold the chair.

5.8 Strength of adjustable back mechanism

With the base of the reclining chair secured to the floor, apply a vertical force of 100 N to the top edge of the backrest for 1 h in the middle and the two extreme positions.

5.9 Measuring of angle of backrest

5.9.1 To determine the angle of the seat backrest, place the device shown in figure 4 on the seat of the high chair and centrally locate the test dummy on the base board as indicated in figure 5.

5.9.2 Ensure that the 20 mm × 12 mm block is located against the front edge of the seat and that the reclining board is resting firmly against the backrest. Measure the angle between the reclining board and the horizontal as shown in figure 5.

5.10 Stability test

5.10.1 Place the high chair in an upright position with all its legs on a horizontal floor surface (4.5).

If there is a tendency of the high chair to slide during the tests, place stops (4.4) on the floor against the appropriate leg or legs in a manner that will prevent the chair from sliding on the floor but will not prevent it from overturning.

If failure occurs during the other tests which affects the stability of the high chair, it shall be considered not to have been tested and another article shall be submitted for this test.

5.10.2 With the chair assembled and positioned as specified in 5.10.1, apply a vertical force of 150 N at a distance (a in figure 6) horizontally outward from the inside edge of the top of one arm of the high chair by means of a beam (4.6). Fasten this beam to the chair.

One means of attaching the beam is to clamp it to the upper side of the arm furthest away from the point of loading with a G-clamp (4.7) of low mass. In this way the beam can rest on the arm nearest to the direction of the point of loading (see figure 6).

Increase the distance (a) until the chair starts to tip and record the distance when this occurs.

5.10.3 With the chair assembled and positioned as in 5.10.1, apply a force of 150 N at a distance (b in figure 7) horizontally outwards from the centre of the inside edge of the top of the back by means of a beam (4.6), firmly fastened to the chair.

One means of fastening the beam is with a string and hook arrangement (see 4.8) as shown in figure 7, so that the beam is hooked to the tray to prevent upward movement.

Increase the distance (b) until the chair starts to tip and record the distance when this occurs.

5.10.4 Assemble and position the chair as in 5.10.1 with the footrest attached according to the manufacturer's instructions. Remove the tray if any.

With the chair unloaded, apply a downward vertical force to the footrest at a position not to exceed 25 mm from the front edge of the footrest, by a loading pad (4.3) (see figure 8).

If the chair has no footrest, apply the force downwards on the forwardmost horizontal frame member.

Increase the force until the chair starts to tip and record the force when this occurs.

5.10.5 If the chair has a tray, assemble the chair and position it as in 5.10.1 with the tray attached according to the manufacturer's instructions.

With the chair unloaded, apply a downward vertical force at the centre of the tray (see figure 9).

Increase the force until the chair starts to tip and record the force when this occurs.

6 Test report

The test report shall include at least the following information:

a) a reference to this part of ISO 9221;

b) the unit tested (relevant data);

c) description of the delivery condition of the unit;

d) test results according to 5.2 to 5.10;

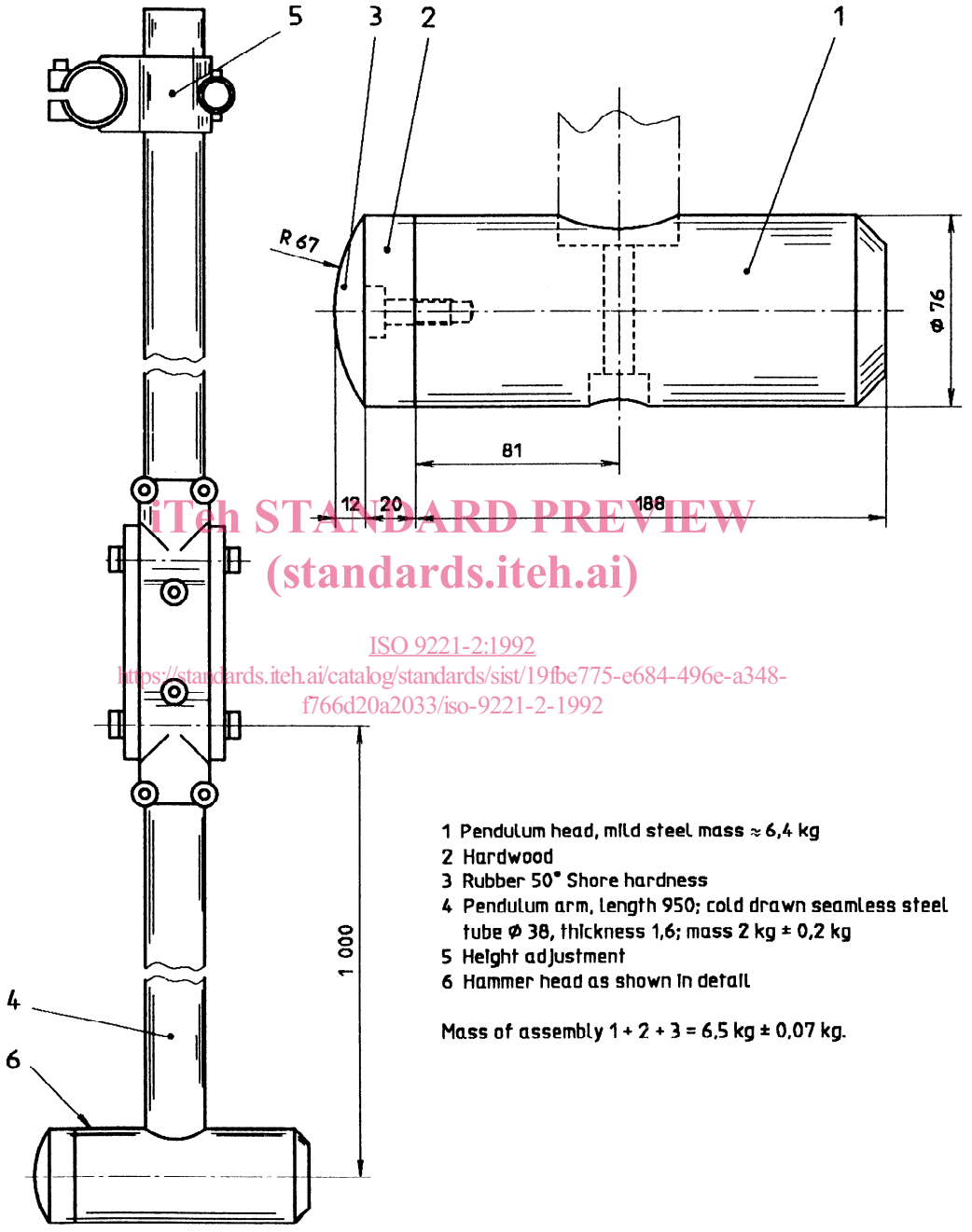
e) compliance with requirements specified in ISO 9221-1;

f) details of any deviation from this part of ISO 9221;

g) the name and address of the test facility;

h) the date of test.

Dimensions in millimetres



1 Pendulum head, mild steel mass ≈ 6,4 kg
2 Hardwood
3 Rubber 50° Shore hardness
4 Pendulum arm, length 950; cold drawn seamless steel tube ø 38, thickness 1,6; mass 2 kg ± 0,2 kg
5 Height adjustment
6 Hammer head as shown in detail

Mass of assembly 1 + 2 + 3 = 6,5 kg ± 0,07 kg.

NOTE — Pendulum head is drawn turned 90° from working position.

Figure 1 — Impact hammer

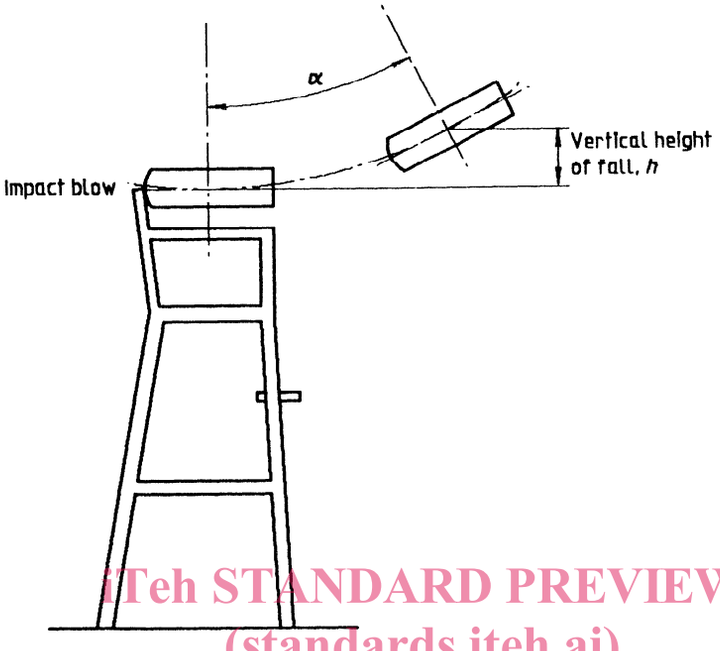


Figure 2 — Back impact strength test

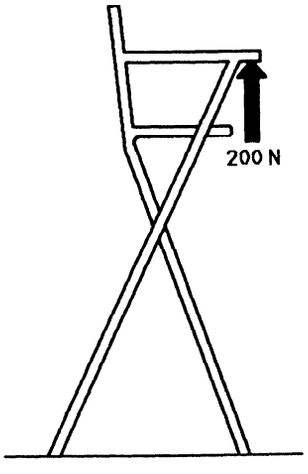
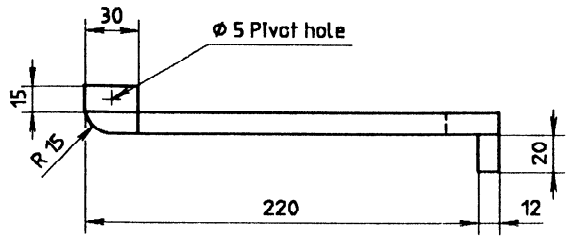
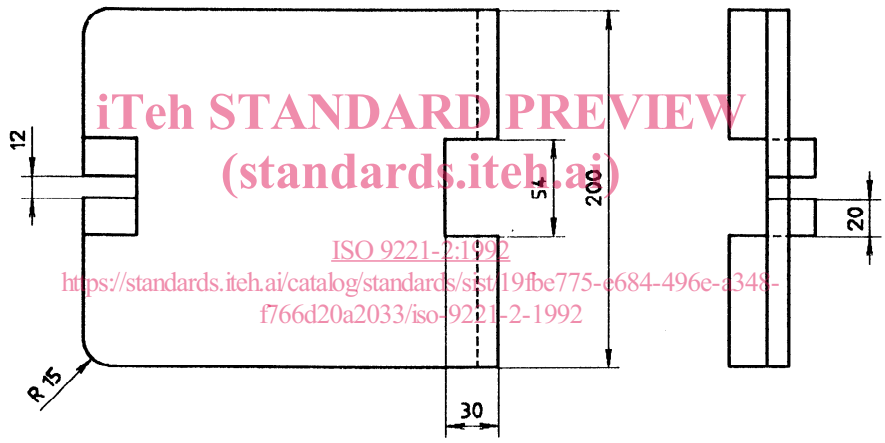


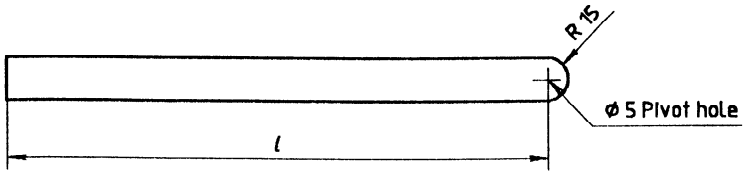
Figure 3 — Test for folding high chairs

Dimensions in millimetres



Base board, 9 mm plywood





Reclining board, 30 x 12 hardwood
l = length of backrest = 300
Pivot pin, ø 5 x 52

Figure 4 — Devices for measuring backrest angle