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Office furniture — Office work chairs — Test methods for the determination of stability, strength and durability

Mobilier de bureau — Sièges de travail de bureau — Méthodes d'essai pour la détermination de la stabilité, de la résistance et de la durabilité

Reference number
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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.

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The main task of technical committees is to prepare International Standards. 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.

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.

ISO 21015 was prepared by Technical Committee ISO/TC 136, *Furniture*.

Office furniture — Office work chairs — Test methods for the determination of stability, strength and durability

1 Scope

This International Standard specifies test methods for determining the stability, strength and durability of office work chairs. Guidance is given on the choice of forces, cycles, etc., for these tests.

The tests are designed to be applied to an article of furniture that is fully assembled and ready for use.

The dimensions in the tests are applicable to office work chairs intended for adult persons.

The tests consist 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 test results are valid only for the article tested. When the test results are intended to be applied to other similar articles, it is important that the test specimen be representative of the production model.

Tests carried out according to this International Standard are intended to demonstrate the ability of the item to give satisfactory service in its intended environment. The tests have been developed for units/components that have not been in use. However, when properly justified, they can be used for fault investigation.

Data are given for the design of seat-loading pads (Annex B) and for the design of stability-loading pad (Annex C).

This International Standard does not give any product requirements. These can be specified in a requirements document. If this is not available, possible forces and cycles are suggested in Annex A (informative). These forces and cycles can be used for adults regardless of their weight and number of working hours.

This International Standard does not specify type approval tests for chair components.

Assessment of ageing and degradation is not included. The tests are not intended to assess the durability of upholstery, i.e. filling materials and covers.

2 Normative references

The following referenced document is indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 22880:2004, *Castors and wheels — Requirements for castors for swivel chairs*

3 Terms and definitions

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

3.1
office work chair
piece of seating furniture for one person, with a back rest, with or without arm rests, whose upper part, which includes the seat, can rotate in the horizontal plane and can be adjusted in height

NOTE Other adjustments may be included.

3.2
column
⟨office work chair⟩ component that connects the base and the seat structure

NOTE A column normally incorporates a seat-height adjustment and swivel mechanism.

3.3
locking device
device that inhibits the movement of the seat action and/or the back rest

3.4
arm-rest length
distance between vertical lines through its front and rear edges

NOTE In the case of an arm rest that is not horizontal or that is curved, the length is measured in a horizontal plane 20 mm below the highest point of the arm rest.

3.5
supporting point
castor or glide

NOTE There are two castor types as defined in ISO 22880:2004.

a) Type H: Castors with plain wheels defined as type H, hard tread. The wheel is one colour over the entire surface. These castors are suitable for carpeted floors.

b) Type W: Castors with resilient tyred wheels defined as type W, soft tread. This is of clearly different colour to the wheel centre. These castors are suitable for hard stone, wooden or tiled floors or those featuring non-textiled covering.

4 General test conditions

4.1 Preliminary preparation

The unit shall be assembled and/or configured according to the instructions supplied with it. The most adverse configuration shall be used for each test (see Table 1). For testing a range of related chair models, it is necessary to test only the worst case(s). If mounting or assembly instructions are not supplied, the mounting or assembly method shall be recorded in the test report. Fittings shall not be re-tightened unless specifically required by the manufacturer. If it is necessary to change the configuration to produce the worst case conditions, any re-tightening of the fittings shall be recorded in the test report.

Unless otherwise stated, all tests shall be carried out on the same sample.

The tests shall be carried out in indoor ambient conditions. If during a test the temperature is outside of the range of 15 °C to 25 °C, the maximum and/or minimum temperature shall be recorded in the test report.

In the case of designs not addressed in the test procedures, the test shall be carried out as far as possible as described, and deviations from the test procedure recorded in the test report.

Before beginning the testing, visually inspect the unit thoroughly. Record any defects so that they are not assumed to have been caused by the tests. Carry out measurements if specified.

4.2 Test equipment

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

The equipment shall not inhibit deformation nor cause unnatural deformation of the unit/component, i.e. it shall be able to move so that it can follow the deformation of the unit/component during testing.

All loading pads shall be capable of pivoting in relation to the direction of the applied force. The pivot point shall be as close as practically possible to the load surface.

4.3 Application of forces

The forces in the static-load tests shall be applied sufficiently slowly to ensure that negligible dynamic force is applied. Each force shall be maintained for not less than 10 s and not more than 15 s.

The forces in durability tests shall be applied at a rate to ensure that excessive heating does not occur. Each force shall be maintained for (2 ± 1) s.

The forces may be applied using masses.

4.4 Tolerances

Unless otherwise stated, the following tolerances are applicable:

a) Forces: ± 5 % of the nominal force;

b) Masses: ± 1 % of the nominal mass;

c) Dimensions: ± 5 mm of the nominal dimension on soft surfaces;
± 1 mm of the nominal dimension on all other surfaces;

d) Angles: ± 2° of the nominal angle.

The accuracy for the positioning of loading pads shall be ± 5 mm.

4.5 Sequence of testing

All applicable tests shall be carried out on the same sample and in the sequence that the clauses are numbered in this International Standard.

4.6 Inspection and assessment of results

After completion of each test, inspect the unit again. Record any changes including the following:

a) fracture of any component or joint;

b) loosening, which can be demonstrated by hand pressure, of any joint intended to be rigid;

c) deformation or wear of any part or component such that its function is impaired;

d) loosening of any means of fixing components to the unit;

e) changes that can affect stability.

Table 1 — Positioning of chair components

Clause	Test	Seat height	Seat	Back rest in height	Back rest in depth	Tilt stiffness adjustment	Castors and base	Arm rest	Foot rest
7.1.1	Front edge overturning	highest position	foremost position	highest position	foremost position	maximum tension	most likely to cause overturning	most likely to cause overturning	—
7.1.2	Forwards overturning	highest position	foremost position	highest position	foremost position	maximum tension	most likely to cause overturning	most likely to cause overturning	—
7.1.3	Forwards overturning for chairs with foot rest	highest position	foremost position	lowest position	foremost position	maximum tension	most likely to cause overturning	most likely to cause overturning	most likely to cause overturning
7.1.4	Sideways overturning for chairs without arm rests	highest position	foremost position	highest position	foremost position	maximum tension	most likely to cause overturning	—	—
7.1.5	Sideways overturning for chairs with arm rests	highest position	foremost position	highest position	foremost position	maximum tension	most likely to cause overturning	most likely to cause overturning	—
7.1.6	Rearwards overturning of chairs without back-rest inclination	highest position	rearmost position	highest position	rearmost position	minimum tension	most likely to cause overturning	most likely to cause overturning	—
7.1.7	Rearwards overturning of chairs with back-rest inclination	highest position	rearmost position	highest position	rearmost position	minimum tension	most likely to cause overturning	most likely to cause overturning	—
7.2.1	Seat front-edge static-load test	highest position	foremost position	—	—	—	—	—	—
7.2.2	Combined seat and back static-load test	highest position	most adverse position	highest position	rearmost position	mid range	least likely to cause overturning	—	—
7.2.3	Arm-rest downward static-load test – central	lowest position	horizontal	—	—	—	—	most likely to cause failure	—
7.2.4	Arm-rest downward static-load test – front	lowest position	horizontal	—	—	—	—	highest, foremost position	—
7.2.5	Arm-rest sideways static-load test	lowest position	horizontal	—	—	—	—	highest, widest position	—
7.2.6	Foot-rest static-load test	—	—	—	—	—	least likely to cause overturning	—	highest position
7.3.1	Seat and back durability	highest position	horizontal and foremost	highest position	most likely to cause failure	mid range	90° to the base arm	—	—
7.3.2	Arm-rest durability	lowest position	horizontal	—	—	maximum tension	—	highest, widest position	—
7.3.3	Swivel test	highest position	horizontal, foremost position	highest position	rearmost position	—	—	—	—
7.3.4	Foot-rest durability	—	—	—	—	—	least likely to cause overturning	—	lowest position
7.3.5	Castor and chair-base durability	lowest position	horizontal	—	—	—	—	—	—

5 Test apparatus

5.1 Test surface

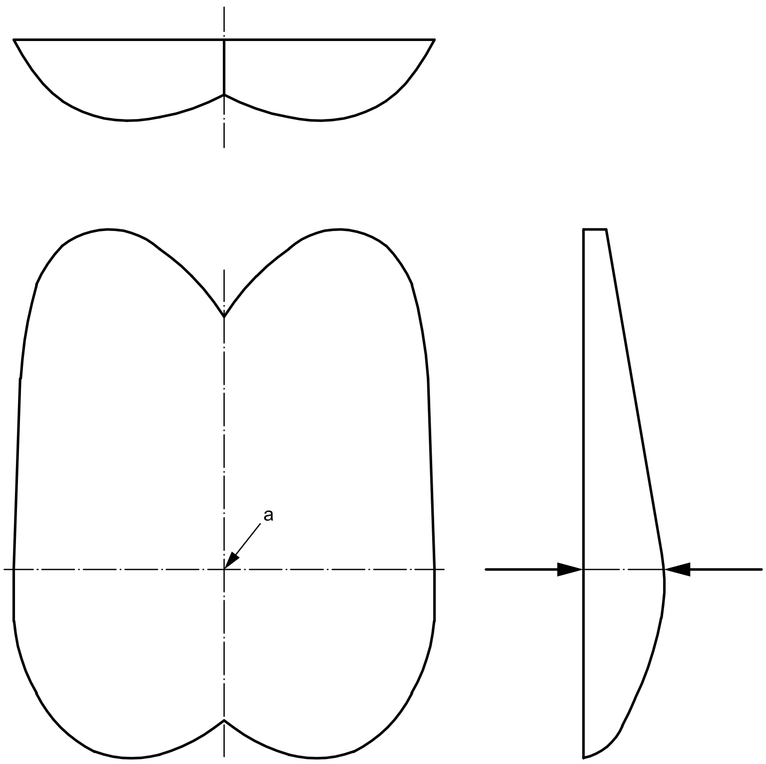
The test surface shall be rigid, horizontal and flat.

5.2 Stops

Stops are devices to prevent the chair from sliding or rolling but not overturning, They shall be 3 mm high for stability tests and 12 mm high for all other tests, except in cases where the design of the chair or the test method necessitates the use of higher stops, in which case the lowest that prevents the chair from sliding or rolling shall be used.

5.3 Seat-loading pad

The seat-loading pad is a naturalistically shaped rigid indenter with a hard, smooth surface (see Figure 1). In principle, this loading pad is for use in loading points A (6.1) and C (6.3). See Figure 7. For details of the design, see Annex B.



a Loading point.

Figure 1 — Seat-loading pad

5.4 Smaller seat-loading pad

The smaller seat-loading pad is a rigid, circular object 200 mm in diameter, the face of which has a convex spherical curvature of 300 mm radius with a 12 mm blend radius between the face and the side. (See Figure 2). In principle, this loading pad shall be used in loading points D (6.4), G (6.7), F (6.6) and J (6.9). See Figure 7.

Dimensions in millimetres

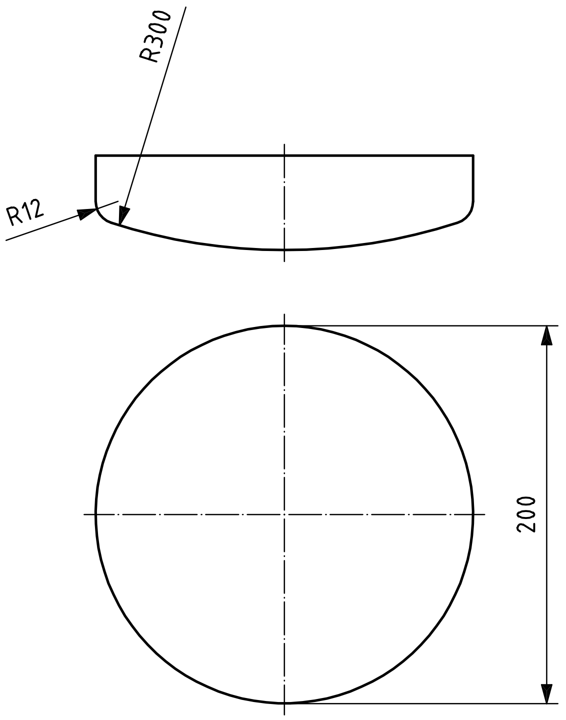


Figure 2 — Smaller seat-loading pad

5.5 Local loading pad

The local loading pad is a rigid, circular object 100 mm in diameter, with a flat face and a 12 mm blend radius between the face and the side.

5.6 Back-loading pad

The back-loading pad is a rigid rectangular object 200 mm high and 250 mm wide, the face of which is curved across the width of the pad with a convex cylindrical curvature of 450 mm radius and with a 12 mm blend radius between the face and the sides. (See Figure 3).

Dimensions in millimetres

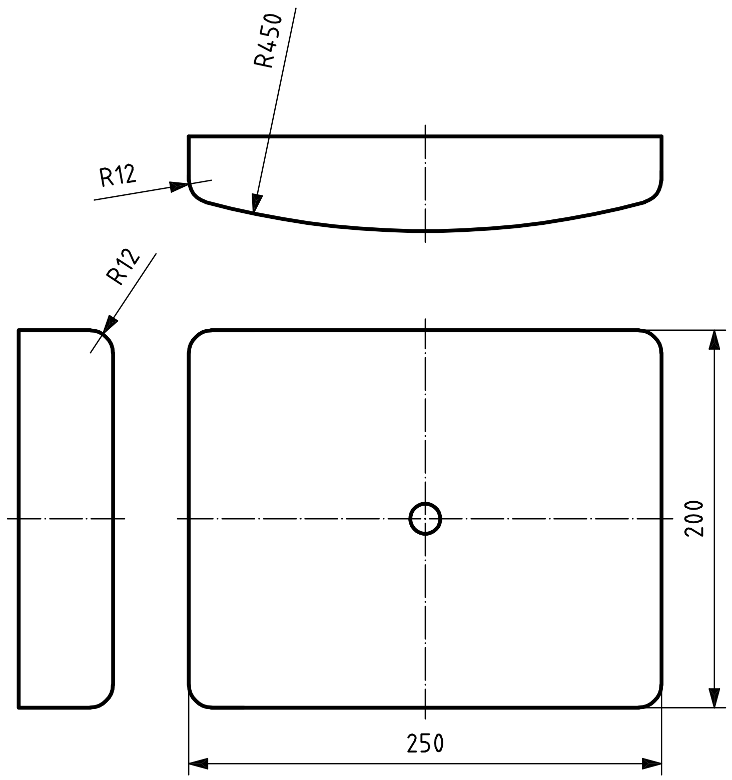
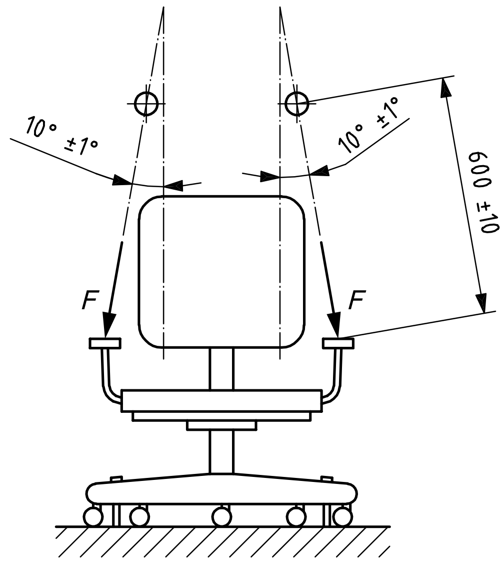


Figure 3 — Back-loading pad

5.7 Arm-rest durability test apparatus

An apparatus capable of applying a cyclic force simultaneously to both arm rests. The forces shall be applied through an arm-rest loading device, which functions in principle as shown in Figure 4.

Dimensions in millimetres



Key

F loading point

Figure 4 — Arm-rest test principle

The apparatus shall be capable of applying the forces at varying angles to the vertical. It shall be adjustable both vertically and horizontally and set as specified in 7.3.2. The apparatus shall be capable of freely following the deformation of the arm rests during testing (see Figure 5). The length of the loading pad shall be 100 mm with the force acting through the centre of its length.

Dimensions in millimetres

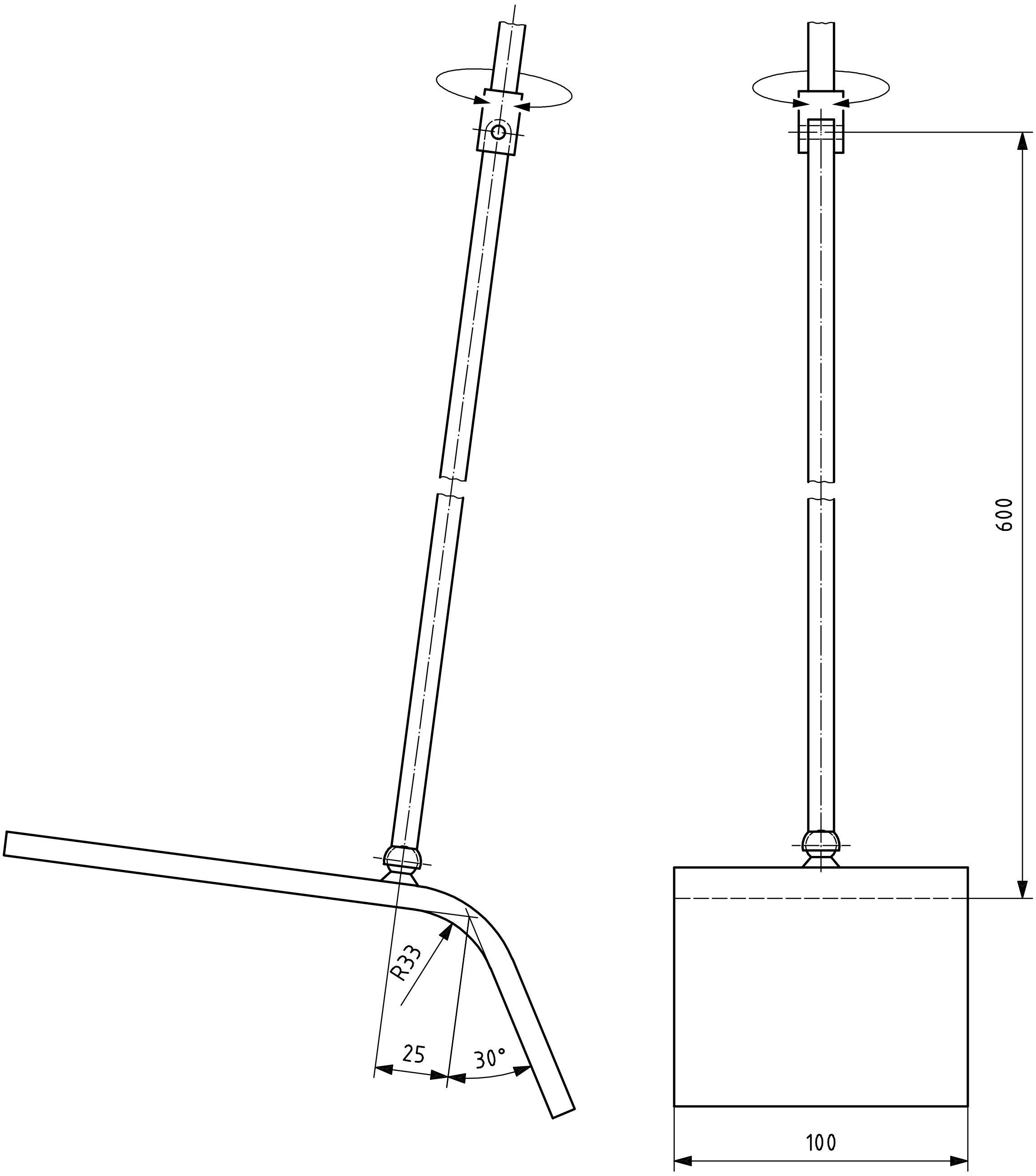


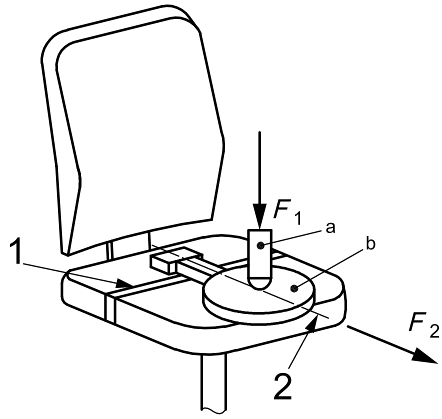
Figure 5 — Example of arm-rest loading pad

5.8 Strap

A 50 mm wide strap capable of bearing a mass as specified in 7.1.1 and Annex A.

5.9 Stability-loading device

A loading device in principle functioning as shown in Figure 6. For details of the design, see Annex C.



Key

1 hold down strap
2 centreline of seat
F_1 vertical force
F_2 horizontal force

a For details, see Figure C.1.
b For details, see Figure C.2.

Figure 6 — Stability-loading device — Principle

5.10 Loading discs

Loading discs each with a mass of 10 kg, a diameter of 350 mm and a thickness of 48 mm. The centre of gravity shall be in the centre of the disc.

5.11 Test surface for castor durability

This shall be a horizontal smooth steel surface.

6 Loading points

6.1 Loading point A

This shall be the point in which the chair’s axis of rotation intersects with the seat surface with the seat in a position as close as possible to the horizontal.

6.2 Loading point B

This shall be the point on the centreline of the back rest, 300 mm above loading point A (6.1), measured when the seat is loaded with 640 N through the seat-loading pad.

6.3 Loading point C

This shall be a point in front of loading point A (6.1) along the centreline of the seat, 100 mm from the structure of the seat edge.

6.4 Loading point D

This shall be the point 150 mm to the right of loading point A (6.1).

6.5 Loading point E

This shall be the point 50 mm to the right of loading point B (6.2).

6.6 Loading point F

This shall be a point in front of loading point D (6.4) on a line parallel to the centreline, 100 mm from the structure of the seat edge.

6.7 Loading point G

This shall be the point 150 mm to the left of loading point A (6.1).

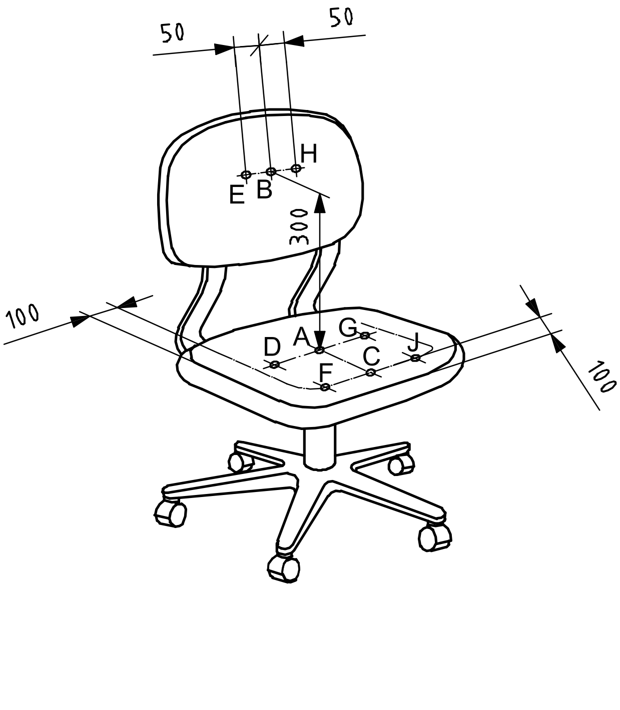
6.8 Loading point H

This shall be the point 50 mm to the left of loading point B (6.2).

6.9 Loading point J

This shall be a point in front of loading point G (6.7) on a line parallel to the centreline, 100 mm from the structure of the seat edge.

Dimensions in millimetres



Key

A to H, J loading points

Figure 7 — Loading points

7 Test methods

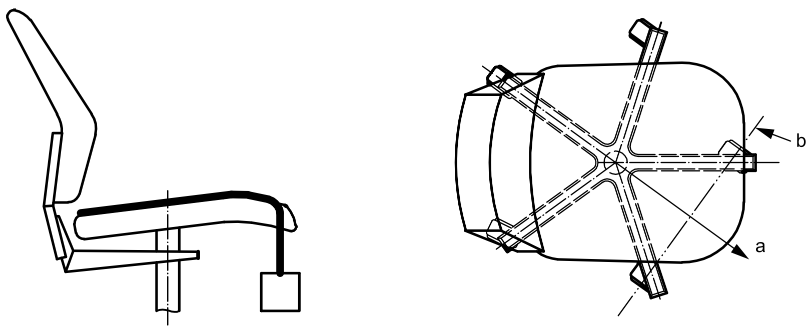
7.1 Stability

Position the chair on the test surface (see 5.1) with its components as specified in 4.1 and Table 1.

Record whether the chair overturns during the tests in 7.1.1 to 7.1.7.

7.1.1 Front edge overturning

Do not position the chair with the stops against the supporting points (3.5). Fix the strap (5.8) to the chair as shown in Figure 8, i.e. the force is applied at the point on the front edge that is furthest from the axis of rotation, and allow the mass to hang freely.



a Position of the strap on the seat surface.

b Tilting axis, castors in the most adverse position.

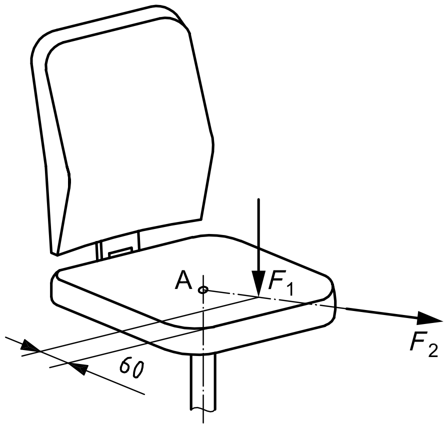
Figure 8 — Front edge overturning

7.1.2 Forwards overturning

Position the chair with two adjacent supporting points (3.5) on the front against the stops (5.2).

Apply by means of the stability-loading device (5.9) a vertical force, F_1, acting 60 mm from the front edge of the load bearing structure of the seat at those points most likely to result in overturning. Apply for at least 5 s a horizontal outwards force F_2 from the point on the seat surface where the vertical force is applied (see Figure 9).

Dimensions in millimetres



Key

A seat-loading point

F_1 vertical force

F_2 horizontal outwards force

Figure 9 — Forwards overturning

7.1.3 Forwards overturning for chairs with foot rest

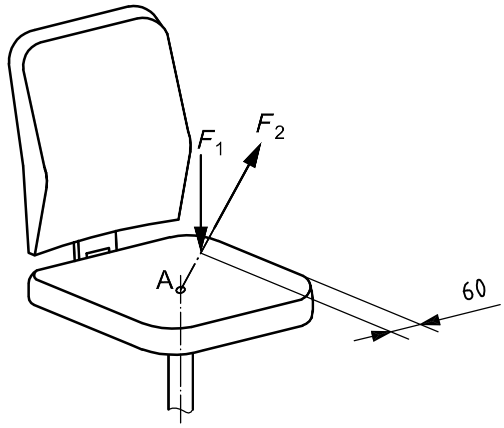
For chairs with foot rests repeat the procedure of 7.1.2 on the foot rest. For round cross-section ring-shaped foot rests, the force shall be applied through the centre of the ring cross section.

7.1.4 Sideways overturning for chairs without arm rests

Position the chair with two adjacent supporting points (3.5) on one side against the stops (5.2).

Apply by means of the stability-loading device (5.9) a vertical force, F_1, acting 60 mm from the edge of the load bearing structure of the side nearest the stopped supporting points at those points most likely to result in overturning. Apply for at least 5 s a horizontal sideways force, F_2, outwards from the point on the seat surface where the vertical force is applied (see Figure 10).

Dimensions in millimetres



Key

A seat-loading point

F_1 vertical force

F_2 horizontal sideways force

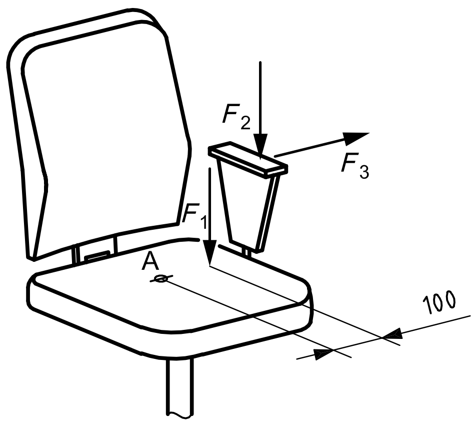
Figure 10 — Sideways overturning for chairs without arm rests

7.1.5 Sideways overturning for chairs with arm rests

Position the chair with two adjacent supporting points (3.5) on one side against the stops (5.2).

Apply by means of the stability-loading device (5.9) a vertical force, F_1, acting at a point 100 mm from the fore and aft centreline of the seat at the side where the supporting points (3.5) are restrained (see Figure 11) and between 175 mm and 250 mm forward of the rear edge of the seat. Apply a vertical downward force, F_2, acting at points on the arm rest that is on the same side as the restrained supporting points (3.5) up to a maximum 40 mm inwards from the outer edge of the upper surface of the arm rest, but not beyond the centre of the arm rest, and at the most adverse position along its length. Apply a horizontal sideways force, F_3, outwards from the same point for at least 5 s (see Figure 11).

Dimensions in millimetres



Key

A seat-loading point

F_1 vertical force

F_2 vertical downward force

F_3 horizontal sideways force

Figure 11 — Sideways overturning for chairs with arm rests

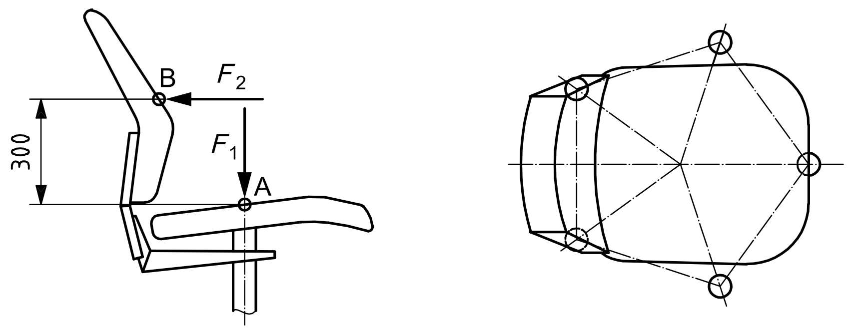
7.1.6 Rearwards overturning for chairs without back-rest inclination

Position the chair with two adjacent supporting points (3.5) on the back against the stops (5.2). When an independent lumbar adjustment is fitted, it shall be set in the most adverse configuration.

A vertical force, F_1, shall be applied at point A (6.1) and a horizontal force, F_2, shall be applied at point B (6.2). See Figure 12.

If the back-rest pad is pivoting around a horizontal axis above the height of the seat and is free to move, the horizontal force shall be applied on the axis. If the back rest is height-adjustable, the axis shall be set as close as possible to 300 mm above point A (6.1).

Dimensions in millimetres



Key

A seat-loading point

B back-loading point

F_1 vertical force

F_2 horizontal force

Figure 12 — Rearwards overturning for chairs without back-rest inclination

7.1.7 Rearwards overturning for chairs with back-rest inclination

Do not position the chair with the supporting points (3.5) against the stops (5.2). When an independent lumbar adjustment is fitted, it shall be set in the most adverse configuration.

Load the chair with discs (5.10) so that the discs are firmly settled against the back rest as shown in Figure 13. If the height of the stack of discs exceeds the height of the back rest, prevent the upper discs from sliding off by the use of a light support.

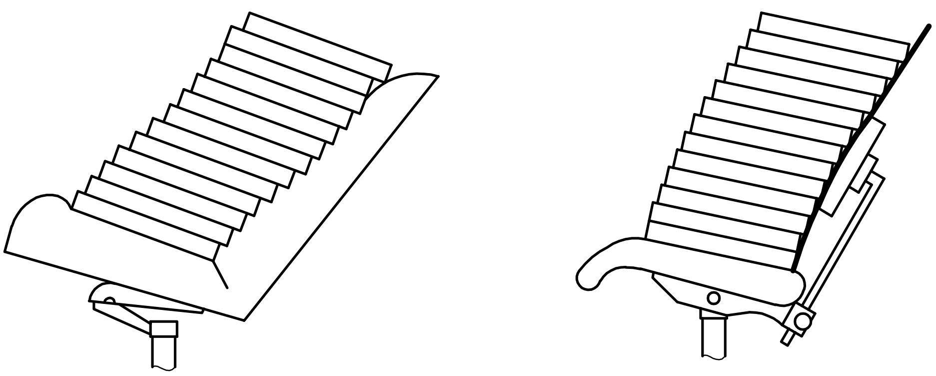


Figure 13 — Rearwards overturning for chairs with back-rest inclination

7.2 Static-load tests

Position the chair and its components as specified in 4.1 and Table 1 on the test surface (5.1).

7.2.1 Seat front-edge static-load test

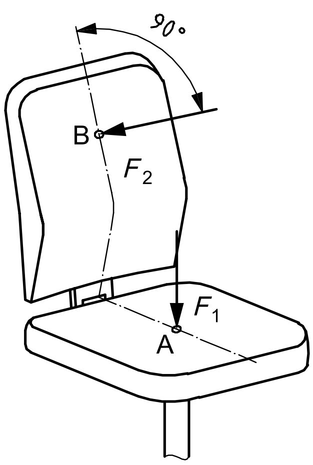
Position the smaller seat-loading pad (5.4) at loading point F (6.6) or J (6.9). Apply a vertical downward force, F_1, through the centre of the loading pad.

7.2.2 Combined seat and back static-load test

Prevent the chair from moving rearwards by placing stops (5.2) behind two adjacent supporting points (3.5) at the rear of the chair.

Chairs with a locking device(s) for seat and/or back-rest angle movements shall be tested first with the device(s) locked for half of the cycles and then with the device(s) unlocked for the other half of the cycles. For the first half of the cycles, the back rest shall be in the upright position.

Apply a vertical force, F_1, through the seat-loading pad (5.3) at point A (6.1). Keep the seat loaded and apply a force, F_2, through the centre of the back-loading pad (5.6) at point B (6.2). When fully loaded, the force shall act at 90° ± 10° to the back-rest plane (see Figure 14). If the chair tends to overturn, reduce the back-rest force and report the actual force. Remove the back force and then the seat force.



Key

A seat-loading point

B back-loading point

F_1 vertical force

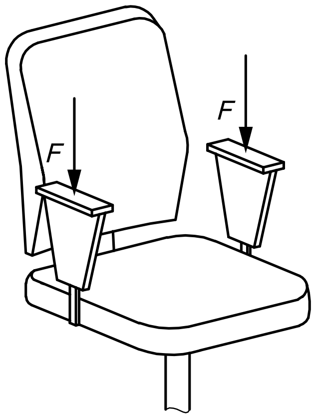
F_2 horizontal force

Figure 14 — Combined seat and back static-load test

7.2.3 Arm-rest downward static-load test — Central

The arm rests shall be loaded vertically by means of the local loading pads (5.5). The loading points shall be at the mid point of the arm-rest length (3.4). The loading pads shall be centred side to side.

Apply the force to both arm rests simultaneously (see Figure 15).



Key

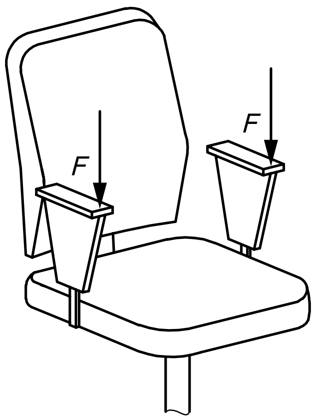
F vertical force

Figure 15 — Arm-rest downward static-load test – Central

7.2.4 Arm-rest downward static-load test — Front

The arm rests shall be loaded vertically by means of the local loading pads (5.5). The loading points shall be on the centreline of the arm-rest length (3.4) and 75 mm from the front edge. The force shall be 50 % of the force for the central static-load test (7.2.3).

Apply the force to both arm rests simultaneously (see Figure 16).



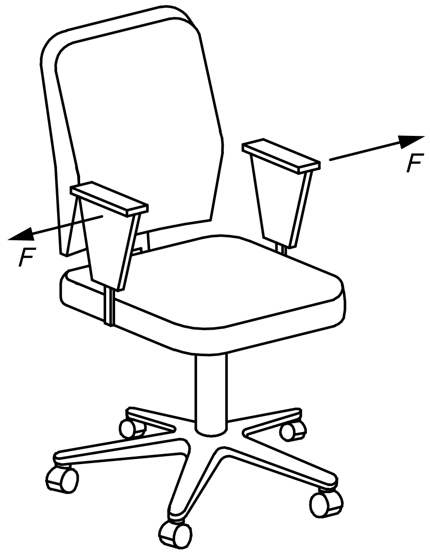
Key

F vertical force

Figure 16 — Arm-rest downward static-load test — Front

7.2.5 Arm-rest sideways static-load test

Apply an outward horizontal force to both arm rests simultaneously. Apply the forces to the edge of the arm rests at the point along the arm rests most likely to cause failure but not less than 75 mm from the front or rear edge (see Figure 17).



Key

F outward horizontal force

Figure 17 — Arm-rest sideways static-load test

7.2.6 Foot-rest static-load test

Apply a vertical force acting 80 mm from front edge of the load bearing structure of the foot rest at those points most likely to cause failure. For round cross-section ring-shaped foot rests, the force shall be applied through the centre of the ring cross section. If the chair tends to overturn, load the seat to prevent overturning and report this test.

7.3 Durability tests

Position the chair and its components as specified in 4.1 and Table 1 on the test surface (5.1), except for the castor and chair-base durability test (7.3.5).

7.3.1 Seat and back durability

The upper part of the chair shall be positioned so that the centre of the back rest is midway between two adjacent supporting points (3.5) of the base with stops (5.2) against these supporting points.

The seat load shall be applied vertically using the seat-loading pad (5.3). The back-rest force shall be applied at an angle of 90° ± 10° to the back rest when fully loaded using the back-loading pad (5.6).

All chairs shall be tested according to steps 1 to 5. See Table 2.

Chairs with a locking device(s) for seat and/or back-rest angle movements shall be tested according to step 2, first with the device(s) locked for half of the cycles and then with the device(s) unlocked for the other half of the cycles. For the first half of the cycles, the back rest shall be in the upright position. In steps 3, 4 and 5, the mechanism shall be set free to move.

One cycle shall consist of the application and removal of the force(s) at the respective loading point(s).

Each step shall be completed before going to the next.

The seat force shall be applied first and maintained while the back-rest force is applied.

If the back-rest pad is pivoting around a horizontal axis above the height of the seat and is free to move, the horizontal force shall be applied on the axis. If height adjustable, the axis shall be set as close as possible to 300 mm above point "A" (6.1). If the axis cannot be adjusted to 300 mm, adjust the force to produce the same bending moment.

Table 2 — Seat and back durability test

Testing sequence	
Step	**Loading point** [a]
1	A
2	C - B
3	J - E
4	F - H
5	D - G

[a] See Figure 7.

7.3.2 Arm-rest durability

Apply simultaneously and cyclically the force on each arm rest at points 100 mm behind the foremost point of the arm-rest length (3.4). Using the apparatus shown in principle in Figure 4, apply a force of (10 ± 5) N through the loading device, an example of which is shown in Figure 5. With this force applied, adjust the apparatus so that each "arm" of the test apparatus has an angle of 10° ± 1° to the vertical. The length of the "arm" of the test apparatus shall be 600 mm ± 10 mm. The arm rests shall be allowed to deform freely.

7.3.3 Swivel test

The base of the chair shall be secured on a rotating table with a test surface according to 5.1 so that the rotating axis of the chair coincides with the rotating axis of the table. The upper part of the chair shall be loosely fixed in such a way as not to hinder the rotation of the base. Load the seat at loading point A (6.1) with a mass, M_1, and at loading point C (6.3) with a mass, M_2, or any equivalent loading that results in the same downwards force and bending moment on the chair. The angle of rotation shall be 360° at a rate of 10 ± 5 cycles/minute. Change direction after each rotation.

7.3.4 Foot-rest durability

Using the local loading pad (5.5), apply a vertical downward force to the foot rest at the point most likely to cause failure but not less than 80 mm from the front edge. For round cross-section ring-shaped foot rests, the force shall be applied through the centre of the ring cross section.

7.3.5 Castor and chair-base durability

This test does not apply to chairs with castors that are braked when the chair is loaded.

The chair shall be placed on a rotating table with a test surface according to 5.11 so that the rotating axis of the chair coincides with the rotating axis of the table. Load the seat at point A (6.1) with a force, F_1. The base shall be loosely fixed in such a way that there is no rotation of the base but that the natural movements of the castors during testing are not prevented. The castors shall be left free to swivel, the table shall be rotated with a rate of (6 ± 1) cycles per minute. The angle of rotation shall be from 0° to 180° and back. One rotation forward and one rotation backward constitutes one cycle.

Alternatively, attach the chair to a device that provides a linear movement of 1 000 ± 250 mm and a test surface according to 5.11. Load the seat at point A (6.1) with a force, F_1. The base shall be loosely fixed in such a way that there is no rotation of the base but that the natural movements of the castors during testing are not prevented. One movement forward and one movement backward constitutes one cycle.

8 Test report

The test report shall include at least the following information:

a) reference to this International Standard;

b) details of the chair tested;

c) any defects observed before testing;

d) test results according to Clause 7;

e) details of any deviations from this International Standard;

f) name and address of the test facility;

g) dates of tests.

Annex A
(informative)

Guidance for the choice of forces, cycles, etc., for stability, strength and durability tests — General principles

A range of forces, cycles, etc., is suggested in this annex to ensure that this International Standard is useful either where no national-requirements document is available or to assist in the development of one. If no such suggestions were included, then this International Standard would only be usable in countries that possessed a well-developed test and research institute to specify the required forces, etc.

The suggested forces, cycles, etc., (see Tables A.1 and A.2) are intended to ensure that countries can gain experience in the use of strength and durability standards, in a manner which makes it possible to compare the test results with those of other countries. For example, without any guidance, one country might choose to use a 900 N strength test and a durability test of 100 000 cycles with a force of 400 N to test a pair of arm rests. These results are not comparable with those from tests in another country that had chosen to use a 750 N strength test and a durability test of 50 000 cycles with a force of 600 N.

It should be emphasized that test methods for activities affecting the safety of office work chairs have not been pre-selected from the range of stability, strength and durability tests. If required, they should be determined by the specifying authority, but it should be noted that the requirements for safety can be different from the requirements for serviceability.

The suggested range of forces, cycles, etc., is not intended in any way to inhibit the freedom of participating countries to carry out the tests in the manner they consider preferable.

It is the appropriate authority who must specify the requirements. The requirements used in other furniture standards include the following:

— no damage, as listed in 4.6;

— no damage affecting the safe use of the product;

— no damage affecting function or appearance;

— no damage according to 4.6 up to a specified limit, after that no failure affecting safety.

It is emphasized that the application of this International Standard is useful only if the requirements truly represent the service environment for which the furniture is intended. Requirements that are too severe or insufficiently severe render the results of the testing valueless.

Table A.1 — Proposed forces and numbers of cycles for stability tests

Reference	Test	Mass/Force				Number of cycles
		Type	Symbol	Force N	Other units	
7.1.1	Front edge overturning	Mass	—	—	27 kg	1
7.1.2	Forwards overturning	Downwards force	F_1	600	—	1
		Horizontal force	F_2	20	—	
7.1.3	Forwards overturning for chairs with foot rest	Downwards force	F_1	1 100	—	1
		Horizontal force	F_2	20	—	
7.1.4	Sideways overturning for chairs without arm rests	Downwards force	F_1	600	—	1
		Horizontal force	F_2	20	—	
7.1.5	Sideways overturning for chairs with arm rests	Downwards force	F_1	250	—	1
		Downwards force	F_2	350	—	
		Horizontal force	F_3	20	—	
7.1.6	Rearwards overturning for chairs without back-rest inclination	Downwards force	F_1	600	—	1
		Horizontal force	F_2	192	—	
7.1.7	Rearwards overturning for chairs with back-rest inclination	Number of discs	—	—	13 discs	1

Table A.2 — Proposed forces and numbers of cycles for strength and durability tests

Clause	Test	Force/Mass					Cycles
		Type	Location	Symbol	Magnitude		
					Force N	Mass kg	
7.2.1	Seat front-edge static-load test	Force	—	—	1 600	—	10
7.2.2	Combined seat and back static-load test	—	Seat	F_1	1 600	—	10
		—	Back	F_2	560	—	
7.2.3	Arm-rest downward static-load test – central	Force	—	—	900	—	5
7.2.4	Arm-rest downward static-load test – front	Force	—	—	450	—	5
7.2.5	Arm-rest sideways static-load test	Force	—	—	400	—	10
7.2.6	Foot-rest static-load test	Force	—	—	1 300	—	10

Table A.2 (*continued*)

Clause	Test	Force/Mass					Cycles
		Type	Location	Symbol	Magnitude		
					Force N	Mass kg	
7.3.1	Seat and back durability: Step 2: C – B Step 3: J – E Step 4: F – H Step 5: D – G (alternating)		Point A	—	1 500	—	120 000
			Point B	—	320	—	80 000
			Point C	—	1 200	—	80 000
			Point D	—	1 100	—	20 000
			Point E	—	320	—	20 000
			Point F	—	1 200	—	20 000
			Point G	—	1 100	—	20 000
			Point H	—	320	—	20 000
			Point J	—	1 200	—	20 000
7.3.2	Arm-rest durability	Force	—	—	400	—	60 000
7.3.3	Swivel test	—	Seat	M_1	—	60	120 000
				M_2	—	35	
7.3.4	Foot-rest durability	Force	—	—	900		50 000
7.3.5	Castor and chair-base durability	Seat	—	—	—	110	100 000

The forces and cycles in Table A.2 are based upon use for 40 hours per week, by persons weighing up to 110 kg. For chairs used by heavier people and/or for more hours per week, the following principles apply.

a) Heavier people: Multiply the forces by the actual weight divided by 110, e.g. a chair for a 165 kg person, multiply the forces by 1,5.

b) More hours per week: Multiply the number of cycles by the actual hours divided by 40, e.g. a chair for 120 h use per week, multiply the cycles by 3.

For continuous use throughout the week, multiply the cycles by 4,2.

NOTE Item b) applies only to durability tests.

For chairs for use both by heavier people and for more hours per week, carry out the multiplication of both forces and cycles.

Annex B
(normative)

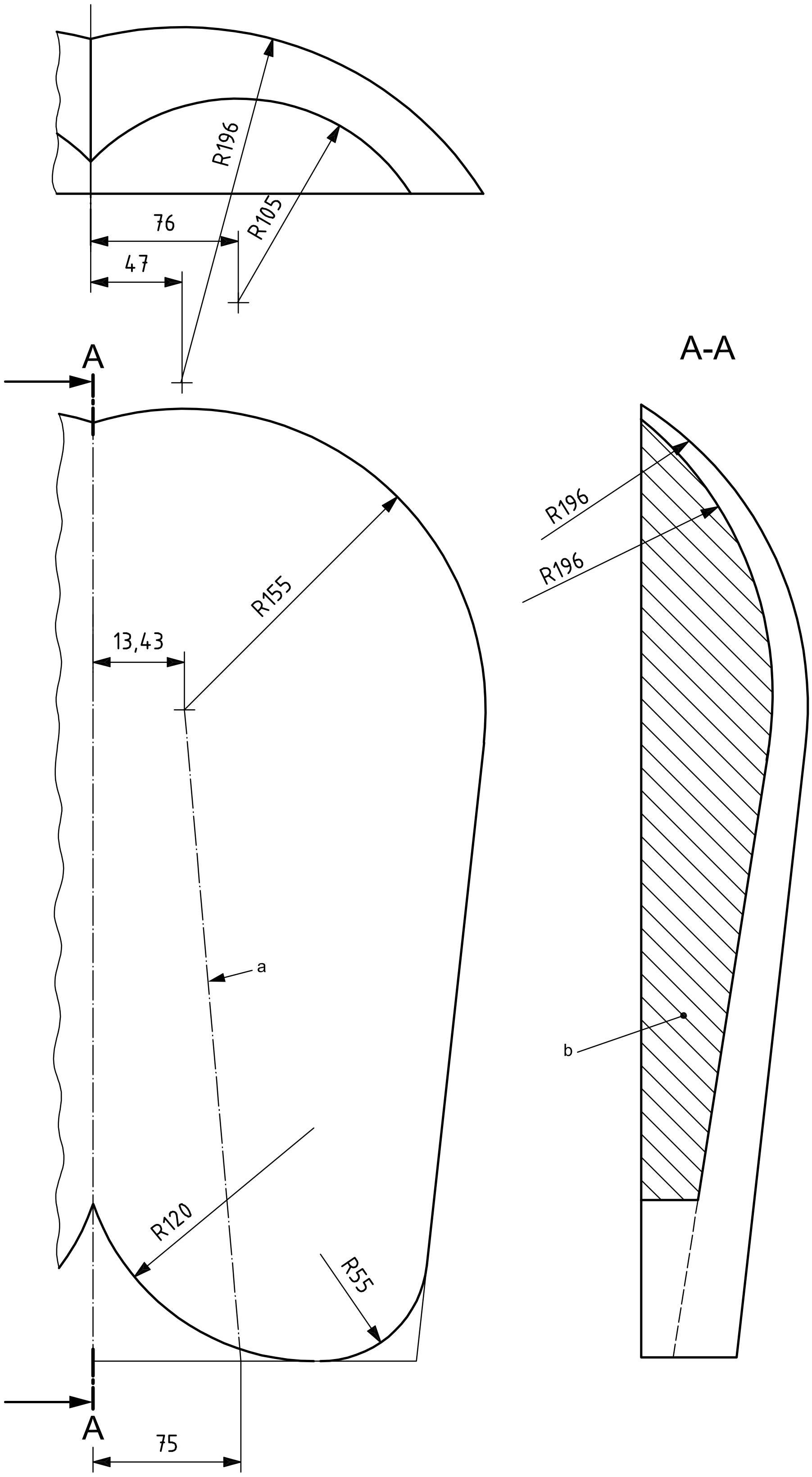
Seat-loading pad data

The seat-loading pad specified in 5.3 of this International Standard currently exists in the following two versions:

a) machined in hardwood, as shown in Figure B.1,

b) moulded from fibre glass, as shown in Figure B.2.

Dimensions in millimetres

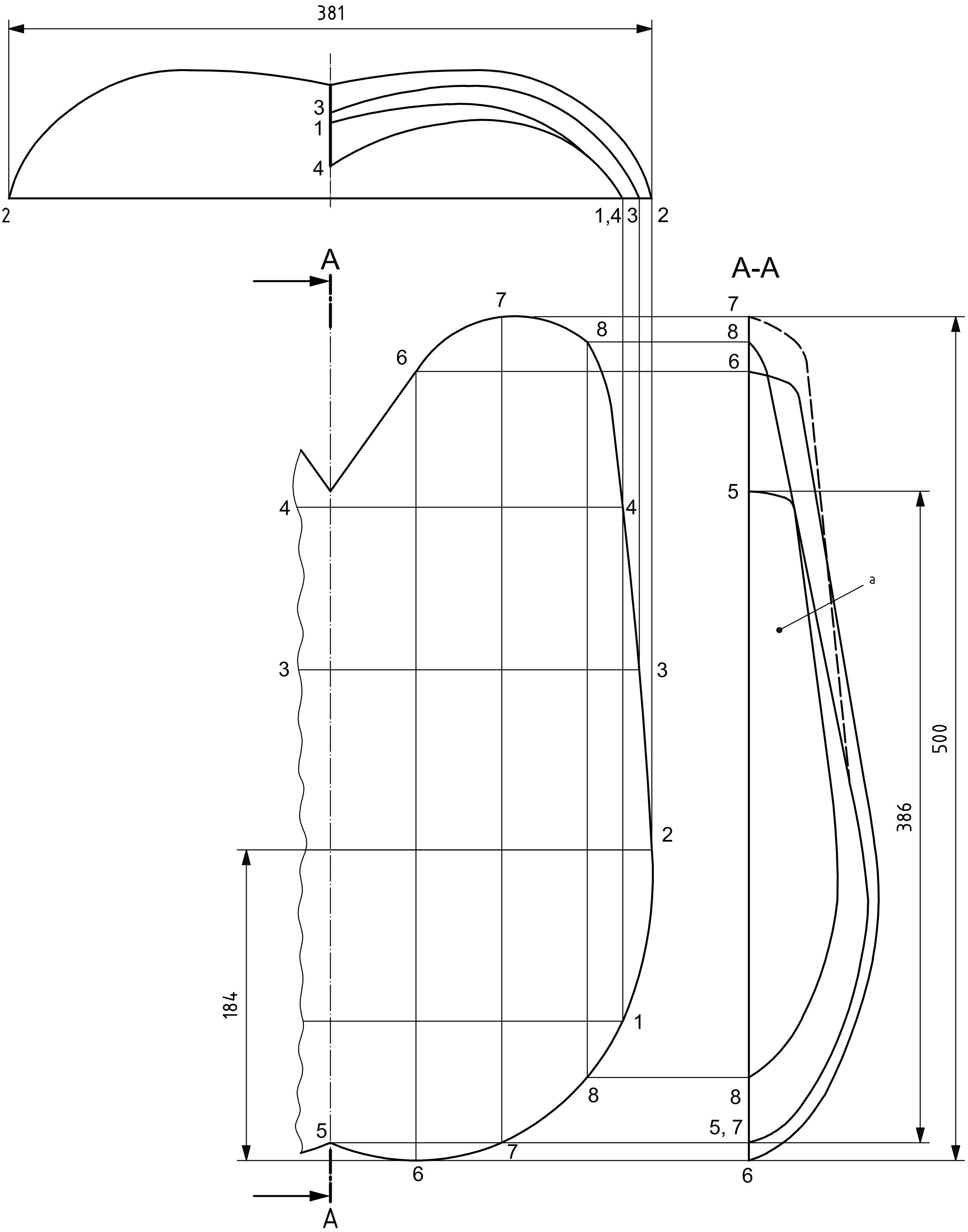


a Axis of the cone.

b Centre section cross-hatched.

Figure B.1 — Seat-loading pad geometry — Hardwood construction

Dimensions in millimetres



Key

1 to 8 lines to help mould the dummy

a Centre section cross-hatched.

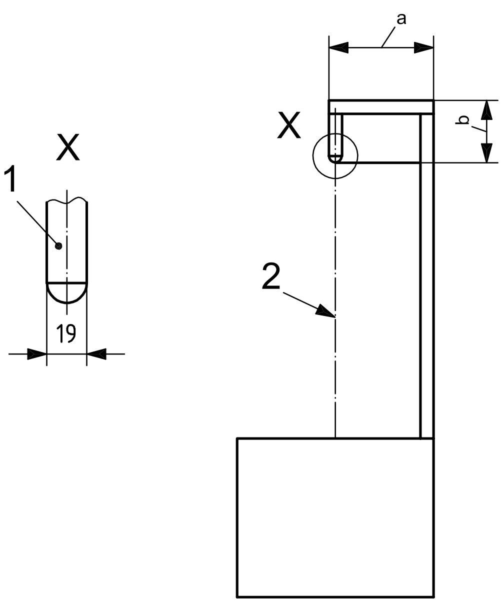
Figure B.2 — Seat-loading pad geometry — Moulded fibre glass construction

Annex C
(normative)

Stability-loading device data

Figures C.1 and C.2 show the details of the stability-loading device.

Dimensions in millimetres



Key

1 rod with spherical tip

2 centreline to point and centre of gravity of mass

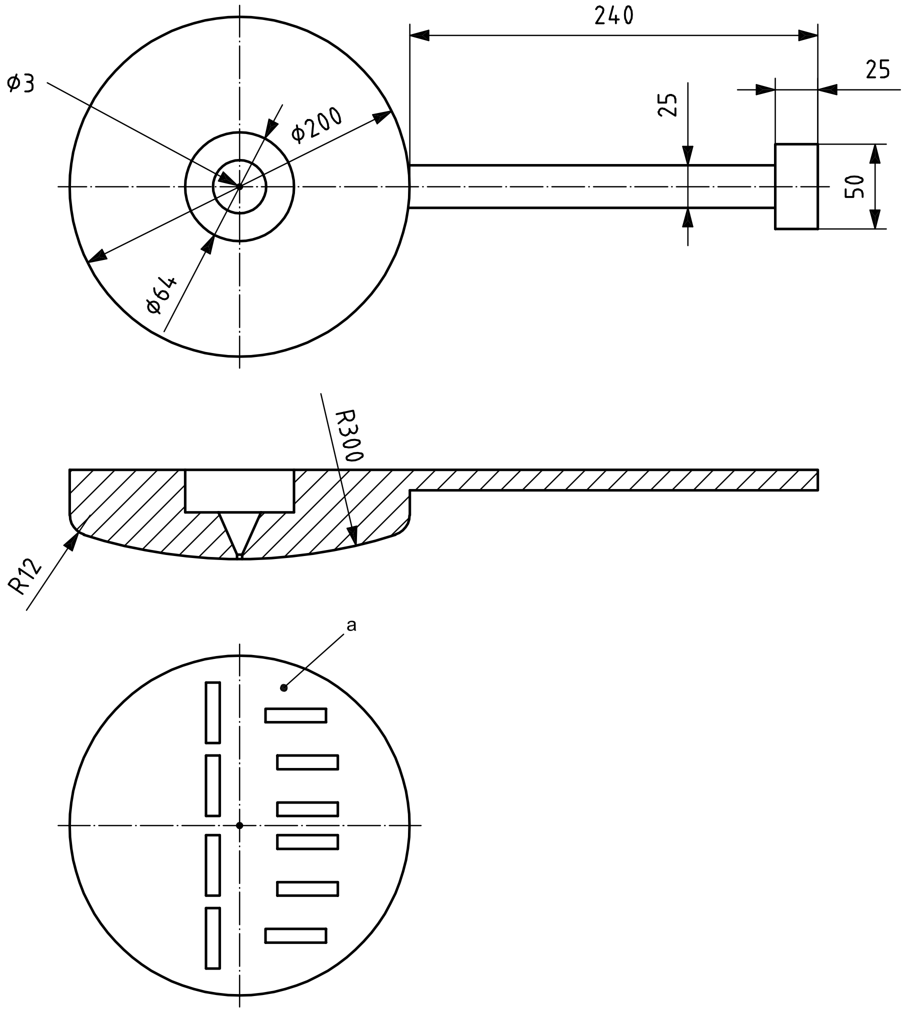
Total weight is 600 N.

[a] Sufficient to clear all foam and fabric and allow for set back.

[b] Sufficient to clear all foam and fabric.

Figure C.1 — Front stability-loading fixture

Dimensions in millimetres



a Carpet stretcher grip material on R 300 surface. It is recessed into an approximately 2 mm deep groove so that only the gripper teeth protrude. The carpet gripper placement shown is one example, other configurations are acceptable.

Figure C.2 — Front stability-loading disk

ICS 97.140

Price based on 27 pages