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Kitchen equipment — Safety requirements and test methods for kitchen cabinets and work tops

Mobilier de cuisine — Exigences de sécurité et méthodes d'essai pour meubles de cuisine et plans de travail

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Contents

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

This International Standard ISO 15717 was prepared by Technical Committee ISO/TC 59, *Building construction,* Subcommittee SC 11, *Kitchen equipment.*

This International Standard is identical to European Standard EN 1153 with the exception of a few minor clarifying amendments.

Annex B forms a normative part of this International Standard. Annex A is for information only.

Kitchen equipment — Safety requirements and test methods for kitchen cabinets and work tops

1 Scope

This International Standard specifies safety requirements on the structure of built-in and free-standing kitchen units, work tops, and breakfast bars including those with glass in their construction.

This International Standard is applicable to units after installation. It is not applicable to catering equipment. However, safety depending on the structure of the building is not included; e.g. the strength of wall-hanging cabinets includes only the cabinet and its parts, the wall and the wall attachment are not included.

This International Standard specifies requirements to prevent serious injury through normal functional use, as well as misuse that might reasonably be expected to occur.

It should be understood that the tests do not ensure that structural failure will not eventually occur as a result of habitual misuse or after an excessively long period of service.

Assessment of ageing, degradation and the heating effect of appliances are not included, nor are the ergonomic aspects of safety and the resistance to fire.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD).*

3 Terms and definitions

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

3.1
free-standing unit
unit not attached to the structure of the building

3.2
built-in unit
unit attached to the structure of the building, directly or via other units

3.3
wall-mounted unit
unit supported entirely by one or more walls of the building

3.4
top-mounted unit
unit supported by the ceiling

4 General test conditions

4.1 Preliminary preparation

Before any of the tests are commenced, the item shall have developed its full strength. At least 4 weeks under normal indoor conditions shall have elapsed between manufacturing (or assembly) and testing in the case of glued joints in timber and the like.

The furniture shall be tested as delivered. If of the self-assembly type, it shall be assembled in accordance with instructions supplied with the furniture. If the furniture can be assembled or combined in different ways, the most adverse combination shall be used for each test. The same is valid for units that can be combined with other units or components.

Units shall be attached at the fixing points specified by the manufacturer, using fixings which will not fail during the tests.

Any assembly fittings shall be tightened before testing.

The tests refer to furniture parts with conventional function. A combination of tests may be necessary to cover the properties of multi-function components; e.g. a shelf that can be pulled out on runners shall be tested for the strength of the shelf supports and tested for the strength of the runners.

4.2 Test equipment

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

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

4.3 Tolerances

Unless otherwise stated, the following tolerances are applicable:

forces	± 5 %
velocities	± 5 %
masses	± 0,5 %
dimensions	± 1,0 mm

4.4 Sequence of testing

The tests shall be carried out in the sequence laid down in this International Standard.

All tests specified for a particular part and/or unit shall be carried out on the same sample.

5 Test apparatus

5.1 Floor surface, which is rigid, horizontal and flat.

5.2 Wall surface, which is rigid, vertical and flat.

5.3 Stops, to prevent the sample from sliding but not tilting.

These shall be not higher than 12 mm, except in cases where the design of the sample necessitates the use of higher stops in which case the lowest stops that will prevent the item from sliding shall be used.

5.4 Loading pad, comprising a rigid cylindrical object, 50 mm in diameter, having a flat face with 12 mm radius on the edge.

5.5 Apparatus for slam-open test for drawers

An example of a suitable apparatus as well as calibration instructions are shown in annex A.

5.6 Deadloads, comprising masses which do not reinforce the structure.

If bags with lead shot or the like are used, the bags shall be divided into small compartments to prevent the contents from moving during the test.

5.7 Glass marbles, between 10 mm and 15 mm in diameter.

These are required for the test described in 8.5 (slam-open test for drawers). They shall be in a flexible bag large enough to allow them to move during the test.

5.8 Impact plate, comprising a 1,7 kg steel plate of dimensions 200 mm × 109 mm x 10 mm, faced on one side with a 3 mm thick layer of rubber with a hardness of 85 IRHD in accordance with ISO 48.

5.9 Impact hammer, comprising a cylindrical object of mass of 6,5 kg, supported from a pivot by a steel tube of 38 mm in diameter and having a wall thickness of 2 mm.

The distance between the pivot and the centre of gravity of the striker shall be 1 m. The pendulum arm shall be pivoted by a low-friction bearing (see Figure 1).

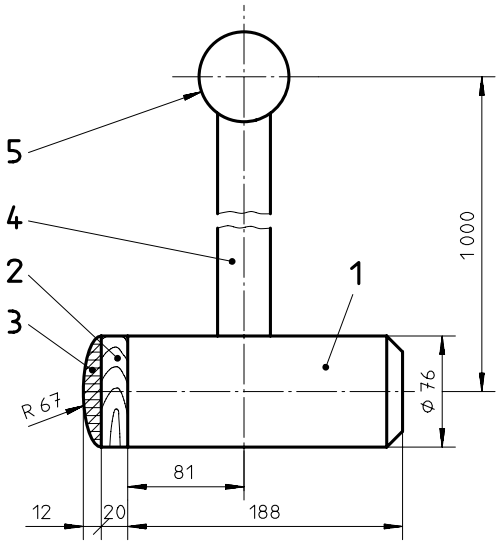
5.10 Test hammer for fragmentation test, comprising a hammer with a head of mass 0,075 kg and a conical tungsten carbide tip with an angle of 60° (see Figure 2).

6 Safety requirements

6.1 Principles of safety requirements

The following safety requirements are based upon the knowledge that kitchen units or components are likely to cause serious injury only when they are heavy and fall through a significant distance.

Dimensions in millimetres



Key
1 Pendulum head, steel, of mass 6,4 kg
2 Hard wood
3 Rubber, 50 IRHD
4 Pendulum arm, length 950: high-tensile steel tube, Ø 38 mm × 2 mm; mass 2 kg ± 0,2 kg
5 Pivot
Mass of assembly (items 1, 2 and 3): 6,5 kg ± 0,07 kg

Figure 1 — Impact hammer

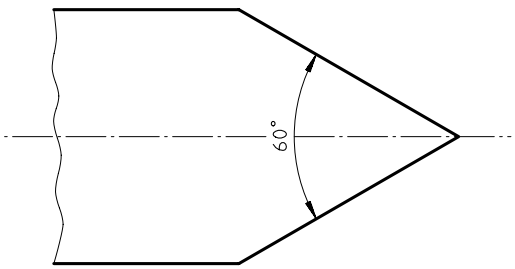


Figure 2 — Head of hammer for fragmentation test

As a consequence, the test methods specified are applicable to all units and components whose centre of gravity is at or above 900 mm from the floor and whose total mass (in accordance with 7.2) exceeds 10 kg. The test methods also apply to components whose centre of gravity is between 350 mm and 900 mm from the floor and whose total mass exceeds 35 kg (see annex B).

Any external vertical glass components $\geqslant$ 0,1 m^2 in area, any part of which is less than 900 mm above the floor, shall fulfil the requirements according to 8.9 or 8.10.

6.2 Constructional safety requirements

Components or parts of the kitchen units and worktops with which the user may come into contact during normal use shall have no burrs or sharp edges, nor shall there be open-ended tubes.

All movable parts accessible during normal use shall have safety distances in any position during movement of $\leqslant$ 8 mm or $\geqslant$ 25 mm. This applies to any two elements moving relative to each other, with the exception of doors (including hinges), flaps (including hinges) and extension elements (including runners), but including handles.

In order to avoid pinching points for feet, the safety distance shall be $\geqslant$ 100 mm.

All roll-front doors which slide vertically shall not move by themselves from any position higher than 50 mm, measured from the closed position, if this can cause any injury.

Units intended for storage of hazardous items or substances shall, when locked, not be capable of being opened by a force of $\leqslant$ 200 N applied directly to the handle.

All drawers whose total mass (in accordance with 7.2) exceeds 10 kg but where safety tests are not carried out (see clause 7) should have effective open stops; i.e. they shall resist being pulled out of the carcass once by a force of 200 N applied to the handle of the loaded drawer, or they shall be supplied with product information to the effect that drawers can easily be pulled out.

Additional requirements are specified for the strength of work tops and the stability of free-standing units (see 8.7 and clause 9).

7 Test parameters

7.1 Determination of centre of gravity

The centre of gravity of a component or unit shall be taken as the geometric centre of the usable volume of drawers and cupboards and as the geometric centre of doors, flaps and shelves.

The height of the centre of gravity above the floor shall be measured for floor units or their components when installed in accordance with the manufacturer´s instructions. Adjustable feet shall be set at their middle position.

Height-adjustable components of floor units shall be placed in their highest position.

All work tops and wall-mounted or top-mounted units, or components thereof, are considered to have their centre of gravity more than 900 mm above the floor, unless restrictions are stated by the manufacturer.

7.2 Determination of total mass

The total mass shall be the mass of the component or unit plus the mass which is supported by it.

Unless conspicuously and durably marked by the manufacturer stating a maximum allowable load, the mass supported shall be determined according to Table 1, which specifies the load per unit area for shelves, flaps and bottoms, and the load per unit volume for drawers and baskets.

The volume of baskets shall be taken as the volume contained below the top edge.

The volume of drawers shall be taken as the area of the drawer bottom multiplied by the clear height.

NOTE The clear height is the maximum clear distance over the drawer bottom. This is often the distance from the top of the drawer bottom to the lower edge of the drawer front of the drawer above, or the structure of the unit.

Table 1 — Required loads

Elements	Required loads kg/dm^2
Shelves/flaps/bottoms	0,65
Baskets with internal height ⩽ 100 mm All other baskets	0,65 0,20
Drawers with ⩽ 110 mm clear height All other drawers	0,35 0,20

8 Test procedures and requirements

8.1 Shelves

Shelves more than 900 mm above the floor shall be secured against their falling out.

If the shelf is not restrained by a physical stop, this requirement is fulfilled when the horizontal force applied to the middle of the front edge required to initiate movement of the unloaded shelf is more than 50 % of the weight of the unloaded shelf.

Any unloaded shelf shall not tip when a downward vertical force of 100 N is applied at any point 25 mm in from the front edge.

8.2 Shelf supports

All supports of the tested shelf shall be tested.

For units with an indeterminate number of shelves, unless otherwise specified, divide the internal height of the unit in millimetres by 300 and take the nearer integer. This number minus 1 shall then be the number of shelves to be fitted.

Load all components intended for storage purposes uniformly in accordance with Table 1.

For the shelf being tested, distribute the load uniformly, except at approximately 220 mm from one support, where the impact plate (5.8) shall be tipped over 10 times at a point as close to the support as possible (see Figure 3). The striking surface shall be that faced with rubber.

After the test shelf supports and/or the shelf/carcase shall show no fracture or other damage that could affect the safety.

Dimensions in millimetres

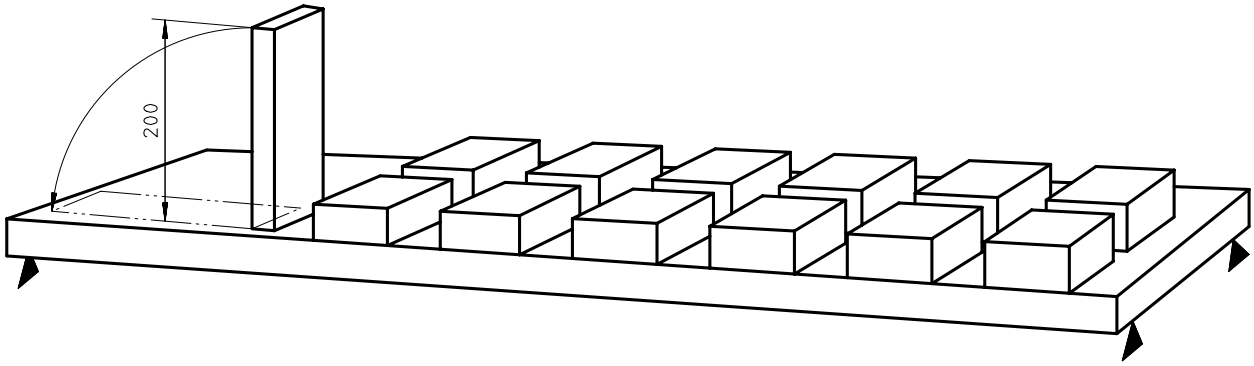


Figure 3 — Strength test for shelf supports

8.3 Pivoted doors

This test applies to all doors hinged to the carcase on one vertical side (including folding doors).

Load all components intended for storage purposes uniformly in accordance with Table 1.

Load the door as shown in Figure 4 with a load of 30 kg, acting vertically 100 mm in from the edge of the door.

Swing the door 10 full cycles (back and forth) from a position $45^{\circ} \pm 2^{\circ}$ from fully closed to a position $10^{\circ} \pm 2^{\circ}$ from fully opened, but to a maximum of 135°.

Opening and closing can be done by hand using 3 s to 5 s for opening and 3 s to 5 s for closing.

After the test the door shall remain attached to the cabinet.

Dimensions in millimetres

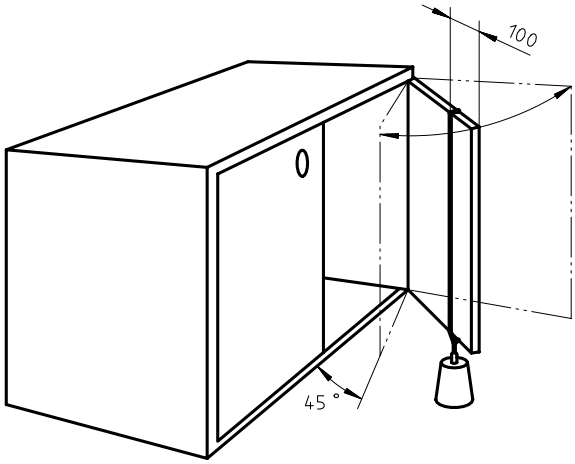


Figure 4 — Load test for pivoted doors

8.4 Sliding doors and horizontal roll-fronts (slam shut and open)

This test applies to all doors sliding horizontally, including those constructed from hinged elements.

Load all components intended for storage purposes uniformly in accordance with Table 1.

The door shall be closed/opened by means of a string or cord attached to the centre of the handle. If the handle has a length greater than 200 mm, the string shall be attached 100 mm below the top of the handle up to a maximum height from the floor of 1 200 mm (see Figure 5) and 100 mm above the bottom of the handle if the height is more than 1200 m from the floor.

Determine the mass, m, required to just move the door. The test mass shall be 4 kg plus the mass, m, in kilograms.

Close/open the door or roll-front 10 times towards the fully closed/opened positions using the test mass (m + 4 kg).

Start the movement 300 mm from the closed/opened positions respectively.

The test mass shall be removed 10 mm before the door or roll-front is fully closed/opened.

After the test the door and/or carcase shall show no fracture or damage that could affect the safety.

Dimensions in millimetres

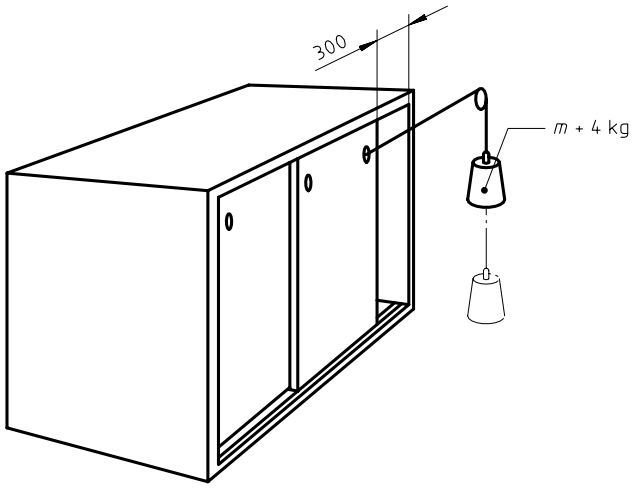


Figure 5 — Slam shut/open test for sliding doors

8.5 Slam-open test for drawers

Load all components intended for storage purposes uniformly in accordance with Table 1.

Load the drawer under test according to Table 1 with glass marbles (5.7) and place it on its runners. Close the drawer to a position 300 mm from the fully open position (or fully close the drawer if the travel is less than 300 mm).

Slam the drawer open 10 times using the apparatus shown in annex A or using an apparatus with similar function.

The apparatus shall be calibrated so that the slam open velocities of the calibration drawers are

1,3 m/s for a 5 kg drawer, and

1,0 m/s for a 35 kg drawer.

NOTE A linear relationship is assumed for drawers of mass from 5 kg to 35 kg.

The slamming force shall be applied until 10 mm before the drawer reaches the end of its travel.

Apply the force to the centre of the handle.

Throughout the test the drawer shall not fall out of the cabinet.

8.6 Strength of bottom-hinged flaps

Load all components intended for storage purposes uniformly according to Table 1.

Load the flap vertically 10 times with 200 N as shown in Figure 6 using the loading pad (5.4).

During each application maintain the load for 10 s.

After the test the flap shall remain attached to the cabinet.

Dimensions in millimetres

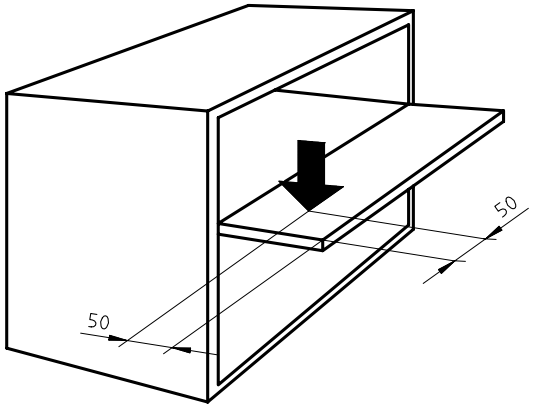


Figure 6 — Strength test for flaps

8.7 Static load on work tops

Load all components intended for storage purposes uniformly in accordance with Table 1.

Load the work top vertically 10 times with 1 000 N at the position most likely to cause failure using the loading pad (5.4).

During each application maintain the load for 10 s.

After the test the work top and/or carcase shall show no fracture or damage that could affect the safety.

8.8 Wall- and top-mounted cabinets

8.8.1 General

The unit shall be mounted according to the manufacturer´s installation instructions. Where the manner of mounting is not unambiguously defined, the manner of mounting shall be recorded.

Adjustable wall-attachment devices shall be set in the position most likely to cause failure.

NOTE This position will normally be when adjusted to the maximum depth (as far from the wall as possible) and to the height adjustment range and when devices used for levelling adjustments are placed as low and as far apart as possible.

After being tested in accordance with 8.8.2 and 8.8.3, the unit shall remain attached as mounted and shall support the test load in accordance with 8.8.3.

8.8.2 Test on movable parts and shelf supports

As soon as possible after the loading, carry out the following tests, if applicable:

– shelf supports (8.2);

– pivoted doors (8.3);

– sliding doors and horizontal roll-fronts (slam, shut and open) (8.4);

– slam-open test for drawers (8.5);

– strength of bottom-hinged flaps (8.6).

The tests shall always be carried out on that part most likely to cause failure to the wall attachment.

8.8.3 Overload

After carrying out the tests on the movable parts, increase the load on all the storage areas according to the following principle.

If the number of shelves is not determined by the structure of the unit, divide the internal height of the unit in millimetres by 200 and take the lower integer. This number shall then be the number of shelves to be used during testing. The loads shall be as follows:

– on the bottom 250 kg/m^2,

– on the first shelf 150 kg/m^2,

– on the second shelf 100 kg/m^2, and

– on the third and subsequent shelves 65 kg/m^2.

If the volume of the unit, calculated by the inner width, depth and height, is greater than 0,225 m^3, the loads shall be multiplied by the factor

$$\frac{1{,}2}{(0{,}645 - 2\,V)^2}$$

where V, in cubic metres, is the volume of the unit.

When reduction of the load is necessary, the appropriate amount shall be removed from the bottom.

The load shall be maintained for one week.

8.9 Impact test for vertical glass components

Assemble the unit in accordance with the manufacturer's instructions.

Load all the storage areas with the loads specified in Table 1. Carry out the test with the impact hammer (5.9) (see Figure 1).

Face the striking surface of the glass with a 10 mm thick rubber pad with a hardness of 30 IRHD according to ISO 48 and a minimum size of 100 mm x 100 mm.

Position the impact hammer so that when hanging freely the front surface of the hammer just touches the front surface of the glass. Swing the hammer away from the glass so that the head is raised through 150 mm. Allow the hammer to fall freely and to impact the glass through the rubber pad.

The impact shall be applied to the following positions.

a) At the geometric centre of the glass surface.

b) If the unit is fitted with shelves immediately behind the glass component, impact the glass surface at the following points instead of as in a):

– at the central position between shelves, or
– between a shelf and the top, or
– between a shelf and the bottom,

whichever is more likely to cause failure.

c) On the corner considered most likely to fail, 100 mm from each visible edge of the glass.

After the test the glass shall neither become entirely dislodged nor break, or it shall break safely in one of the following ways:

– numerous cracks or fissures appear but no opening within the glass component through which a probe with 75 mm diameter can pass freely;

– disintegration occurs but 3 min after impact the 10 largest crackfree pieces shall weigh no more than the mass equivalent to 6 500 mm^2 of the original glass component.

NOTE It is still necessary to gather experience with this test method.

8.10 Fragmentation test of the glass

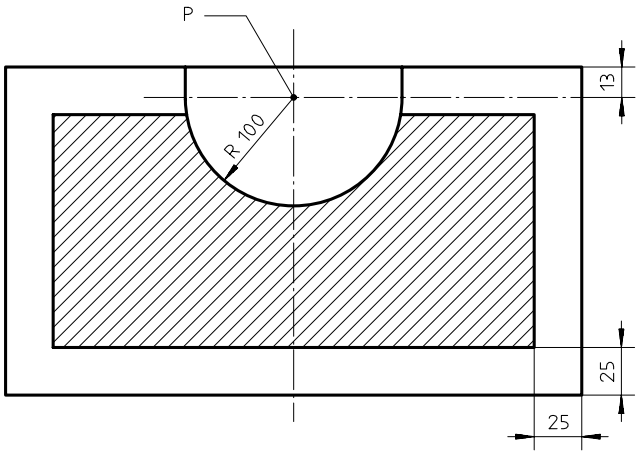
The test shall be carried out on the glass component itself. Frames and/or other parts attached to the glass shall be removed.

Two samples shall be subjected to the test and both samples shall fulfil the requirements.

Place the glass on the floor surface (5.1). In order to prevent the broken pieces from scattering, contain the edges of the sample with a frame, adhesive tape or the like, in such a manner that the broken pieces remain in place after breakage but without hindering expansion of the sample.

Break the sample by means of the test hammer for fragmentation test (5.10). The blow shall be applied approximately 13 mm in from the longest edge of the glass at the midpoint of that edge (see Figure 7).

The assessment is made on the glass except within a peripheral margin of 25 mm from the edge of the sample and an area having 100 mm radius from the point of impact (see hatched area in Figure 7).



P = point of impact

Figure 7 — Point of impact and areas of assessment

Place a frame of dimensions 50 mm x 50 mm on the fractured glass and count the number of crackfree pieces wholly within the frame. This assessment shall be undertaken on at least two areas of the sample. The areas chosen shall contain the largest particles.

After the test there shall be a minimum of 40 pieces in any 50 mm x 50 mm area.

NOTE It is still necessary to gather experience with this test method.

9 Stability

Free-standing units and combinations of units shall, when unloaded, not overbalance when an overturning moment of 200 Nm is applied. During testing, all doors, flaps and drawers shall be closed and extension elements shall be pushed in.

10 Installation instructions

Each wall- and top-mounted cabinet shall be supplied with installation instructions. The instructions shall contain at least the following information in the language of the country, where the furniture is sold:

a) a warning of danger if incorrectly installed;

b) a statement that installation is only to be carried out by a competent person;

c) a statement that it is necessary to check the suitability of the wall/ceiling and to check that the fastening devices will withstand the forces generated.

For self-assembly furniture the following additional information is required:

d) list of parts supplied;

e) list of tools required; and

f) a diagram of the bolts and other fastenings required.

11 Test report

The test report shall include the following items:

a) reference to this International Standard;

b) details of the furniture tested;

c) any defects observed before testing;

d) the test results according to the applicable clauses;

e) details of any deviations from this International Standard;

f) the name and address of the test facility;

g) the date of test.

Annex A
(informative)

Apparatus for slam-open test for drawers

A.1 Principle

Lightweight (empty) drawers are slammed at consistently higher speeds than heavy (full) drawers. Friction does not greatly affect the slamming speed.

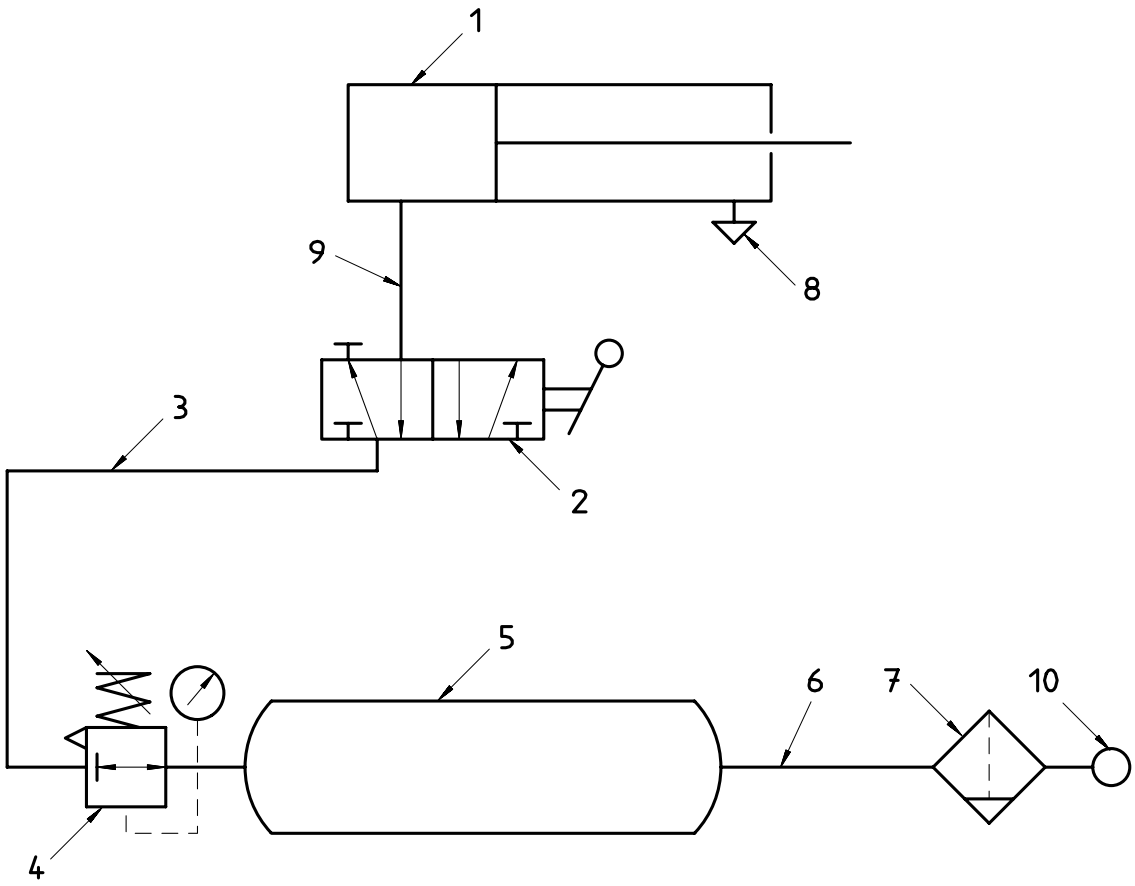
Standard empty "(5 kg)" and "full" (35 kg) drawers with minimal friction are used to simulate these conditions. Using these drawers the speed of the drawer slamming apparatus is adjusted to the slamming speeds specified.

A.2 Apparatus

A suitable apparatus for slam-open tests of drawers consists of a pneumatically actuated low-friction piston/cylinder with a means of regulating the pressure of air supplied from a reservoir. The air-flow between the piston/cylinder and the reservoir is controlled by an air-operated valve which allows the air stored in the reservoir to be connected to the piston/cylinder rapidly when the control valve is operated. The rate of flow is controlled by the incorporation of connecting tubing of specified bores and lengths. The pneumatic circuit is shown in Figure A.1.

A.3 Calibration

Using two standard drawers, having masses of 5 kg and 35 kg respectively, and exhibiting a total frictional force in the runners of not greater than 10 N, calibrate the apparatus to produce the closing and opening velocities specified in 8.5.



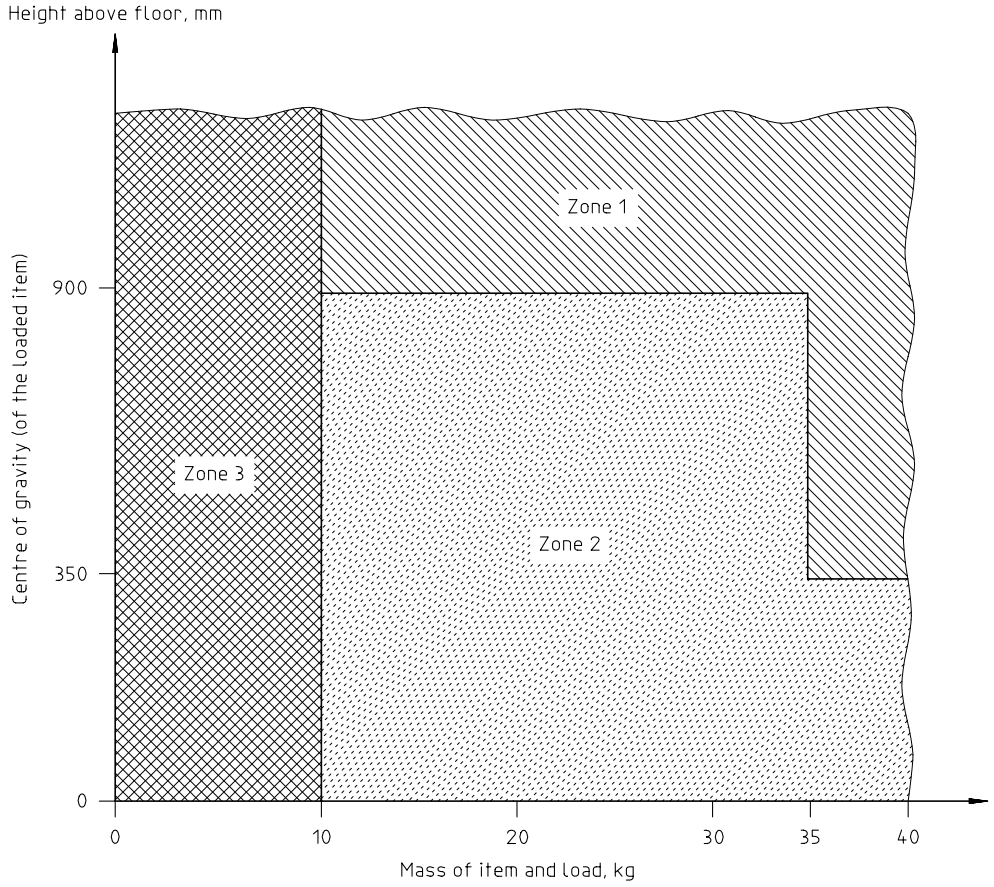
Key

1 Cylinder (diameter 40 mm, stroke 300 mm)
2 Valve (nominal air flow > 900 l/min)
3 Tube (bore 6 mm, length 720 mm)
4 Pressure regulator (nominal air flow > 900 l/min)
5 Air reservoir (radius 37,5 mm; length 350 mm; volume 1 545,6 cm^3)
6 Tube (bore 3 mm, length 1 040 mm)
7 Air cleaner
8 Free outlet
9 Valve to be mounted directly on cylinder
10 Primary pressure 6 bar

Figure A.1 — Circuit diagram for pneumatic drawer-slamming apparatus

Annex B
(normative)

Safety requirements and test methods



Key

Zone 1: Safety requirements and test methods are applicable for all items (e.g. drawers shall fulfil the requirements in accordance with 8.5).

Zone 2: Safety requirements and test methods are applicable for drawers (open stops shall be tested with a force of 200 N).

Zone 3: No safety requirements or test methods are necessary.

Figure B.1 — Safety requirements and test methods

ICS 97.040.10

Descriptors: furniture, kitchen furniture, accident prevention, fixing, layout, working plans, installation, specifications, safety requirements, mechanical properties, mechanical strength, shock resistance, stability, tests, testing conditions.

Price based on 15 pages