

BS 6222-2:2009



# BSI British Standards

## Domestic kitchen equipment

Part 2: Fitted kitchen units, peninsular units, island units and breakfast bars –  
Performance requirements and test methods

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## Contents

Foreword *iii*

1	Scope	1
2	Normative references	1
3	Terms and definitions	1
4	Requirements	2
5	Testing	3
6	Test report	7

### Annexes

Annex A (normative) Units and components to be tested to assess conformity of a range of units 8

Annex B (normative) Test methods 9

Bibliography 16

### List of figures

Figure B.1 – Horizontal impact device 11

Figure B.2 – Horizontal fatigue test – Positions for application of force 12

Figure B.3 – Oven housing jig 14

### List of tables

Table 1 – Tests 5

Table 2 – Loads in storage components during testing, and on shelves for strength of shelf supports test 7

Table 3 – Steel impact plates 7

### Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 16, an inside back cover and a back cover.

BSI Standards Body

## Foreword

### Publishing information

This part of BS 6222 is published by BSI and came into effect on 31 January 2009. It was prepared by Subcommittee FW/0/2, *Domestic and contract furniture*, under the authority of Technical Committee FW/0, *Furniture*. A list of organizations represented on these committees can be obtained on request to their secretary.

### Supersession

This part of BS 6222 supersedes BS 6222-2:1997 and BS 6222-5:1995, which are withdrawn.

### Information about this document

This revision of BS 6222-2 has been prompted, in part, by the publication of ISO 7170:2005, which contains some of the test methods previously included in BS 6222-2:1997.

In order to simplify the standards, this revision of BS 6222-2 has been extended to include requirements for peninsular units, island units and breakfast bars, which were previously specified in BS 6222-5:1995.

This revision of BS 6222-2 does not include safety requirements for kitchen units. These are specified in BS EN 14749:2005, which has replaced BS EN 1153:1996. This revision of BS 6222-2 was also prompted, in part, by the need to remove material covered by BS EN 14749:2005.

The performance requirements are verified by tests which reproduce normal use and foreseeable misuse to which domestic and residential kitchen units can be subjected, together with the loads that are likely to be encountered when assembling and installing the units. They apply to a wide range of fitted kitchen units, peninsular units, island units and breakfast bars. Two test levels are given, for two grades of units, corresponding to the variations in severity of end-use to be expected for various types of units. Whilst the tests reproduce normal use and foreseeable misuse, they do not reproduce any abuse to which the article might be subjected.

The requirements apply only to the durability of the structure. The tests are designed to be applied to an article that is fully assembled and ready for use. The tests do not reproduce the effects of degradation of structural materials by sunlight or chemical attack.

### Hazard warnings

**WARNING.** This British Standard calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

### Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

**Presentational conventions**

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "shall".

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

**Contractual and legal considerations**

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

## 1 Scope

This part of BS 6222 specifies performance requirements and test methods for the strength and durability of the structure of domestic and residential fitted kitchen units, peninsular units, island units and breakfast bars.

This part of BS 6222 is not applicable to the safety of kitchen storage units and worktops.

*NOTE Safety requirements and test methods for kitchen storage units and worktops are specified in BS EN 14749:2005.*

This standard is not applicable to free-standing kitchen units, domestic and contract storage furniture, office storage furniture or storage furniture intended for educational use.

## 2 Normative references

The following referenced documents are 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 7170:2005, *Furniture – Storage units – Determination of strength and durability*

## 3 Terms and definitions

For the purposes of this part of BS 6222 the following terms and definitions apply.

- 3.1 unit**  
complete cabinet, including drawers, doors, loose shelves and fixtures
- 3.2 base unit**  
unit fitted with, or able to support, a worktop  
*NOTE Base units are normally floor standing.*
- 3.3 fitted kitchen unit**  
kitchen unit intended to be fixed to a wall
- 3.4 wall unit**  
unit intended to be wholly suspended by attachment to a wall
- 3.5 tall unit**  
floor standing unit, the top of which is higher than the surrounding worktops
- 3.6 appliance housing**  
unit designed to house a specific appliance, e.g. an oven or refrigerator
- 3.7 pull-out larder unit**  
unit to which access is gained by pulling the interior fitments out of the cabinet, instead of opening a door
- 3.8 carcass**  
unit excluding drawers, doors, loose shelves and fixtures
- 3.9 shelf**  
continuous horizontal surface intended for storage

- 3.10 extension element**  
item supported on runners which can be drawn out from a cabinet  
*NOTE Examples of extension elements are drawers and trays.*
- 3.11 door**  
panel hinged in a vertical plane or sliding in a vertical plane
- 3.12 flap**  
panel hinged in a horizontal plane
- 3.13 worktop**  
continuous horizontal surface intended for working on
- 3.14 cantilevered worktop**  
projecting moveable or fixed worktop, only part of which is supported
- 3.15 breakfast bar**  
horizontal surface that is at a height convenient for use by a seated person
- 3.16 island unit**  
assembly of units attached to the structure of the building only at the floor
- 3.17 peninsular unit**  
assembly of units in which not more than one base unit and one wall unit are attached to the structure of the building
- 3.18 range of units**  
group of units that share the same basic design and construction details

## 4 Requirements

### COMMENTARY ON CLAUSE 4.

*Conformity to the requirements specified in Clause 4 for the strength and durability of the structure of an article of furniture is verified by applying to various parts, loads or forces simulating normal functional use, as well as foreseeable misuse, at one of two levels of severity. Test level G is for grade G (general domestic) units which are suitable for general domestic situations where users can be expected to exercise care. Test level H is for grade H (heavy duty) units which are for use in residential locations where heavy use can be expected or where users are unlikely to exercise care.*

*The test sequence as a whole determines the following:*

- a) *ability to withstand handling prior to fixing;*
- b) *static strength and initial damage;*
- c) *fatigue strength and damage propagation;*
- d) *ability to withstand foreseeable misuse.*

*The magnitude of the loads or forces applied or the number of applications varies according to the test level to which conformity is tested.*

*The following types of tests are specified.*

- 1) *Handling tests. Handling tests assess the ability of the article to withstand the load or forces that are likely to be encountered when assembling and installing the units.*
- 2) *Static load tests. Static load tests assess the static strength of the article under the highest levels of loading that can reasonably be expected to occur.*



- 3) *Fatigue tests. The strength of the component parts of the article are tested by simulating the repeated application of forces and movement of components that occur during long-term use.*
- 4) *Impact tests. Impact tests assess the impact strength of the article under the rapid rates of force application that occur only occasionally.*

#### 4.1 Individual items

After the item has been tested in accordance with Clause 5, at the relevant test level, none of the following shall have occurred:

- a) any fracture of any member, joint or component;
- b) any loosening, shown to be permanent by hand pressure applied to suitable members, of joints intended to be rigid;
- c) any deformation or wear of any component that will affect its function;
- d) any loosening of any means of fixing components to the article;
- e) any changes that prevent movable parts opening or closing freely or that prevent catches operating smoothly;
- f) any deflection of shelves or tops or worktops greater than span/200 for particle board, span/150 for wood or span/100 for other materials;
- g) any force required to move drawers or other extension elements in excess of 70 N and any force required to maintain movement in excess of 45 N.

#### 4.2 Ranges of units

When the items specified in Annex A are tested in accordance with Clause 5, every item shall conform to 4.1 in order for the range of units to be deemed to conform to this part of BS 6222.

If any item does not conform to 4.1, the range of units shall be deemed not to conform to this part of BS 6222.

## 5 Testing

### 5.1 Samples

#### 5.1.1 General

Samples shall each comprise a complete unit, or range of units, as supplied by the manufacturer, either fully assembled and ready for use, or flat packed and ready for assembly. Each of the samples shall be assembled and/or configured in accordance with the instructions supplied with it. The most adverse configuration shall be used for each test. If mounting or assembly instructions are not supplied with the sample, the mounting or assembly method used shall be recorded in the test report. If the configuration has to be changed from that given in the instructions supplied with the sample in order to produce the most adverse configuration, this shall be recorded in the test report.

### 5.1.2 Individual units

For testing of individual units, all the tests applicable to the particular unit shall be carried out on the same sample. If any failure occurs during the sequence of tests, all the tests shall be repeated on a new sample. If the new sample fails in any of the tests the unit shall be deemed to have failed.

### 5.1.3 Ranges of units

For testing of a range of units tests shall be carried out on each of the units and components listed in Annex A that are present in the sample. Each unit and component shall be subjected to all the tests applicable to that type of unit or component. If any unit or component fails in any of the tests then all the applicable tests shall be carried out on an identical new unit. If the new unit fails in any of the tests the entire range of units shall be deemed to have failed.

## 5.2 Moisture content of timber components

Before testing, parts made of timber products shall be checked with an electric moisture meter to determine whether the moisture content is between 8% and 12%. If the moisture content is outside this range, the sample shall be placed in a suitable environment until the moisture content is between 8% and 12%.

## 5.3 Inspection before testing

Immediately before testing, the sample shall be thoroughly inspected. Any defects in the members, joints or attachments of components such as flaps and extensions shall be noted so that they are not attributed to the tests. A complete dimensional check shall be carried out on all articles likely to suffer permanent deformation as a result of testing. The dimensions shall be recorded.

Any minor defects detected as a result of this inspection shall be recorded in the test report. If the sample is found to have a major defect as detailed in 4.1 the sample shall be rejected.

## 5.4 Procedure

The sample shall be tested in accordance with ISO 7170:2005 and in accordance with Annex B of this part of BS 6222, as specified in Table 1. All tests on the sample shall be carried out at the same test level (see Table 1) and in the sequence given in Table 1. Unless otherwise specified for a particular test, the loads in the storage components undergoing testing shall be as specified in Table 2. All other storage components in the unit shall be loaded as specified in ISO 7170:2005, 4.7.

## 5.5 Inspection after testing

Immediately after completion of the tests, the sample shall again be thoroughly inspected. Any defects as detailed in 4.1 shall be recorded, together with any other changes that have taken place since the initial inspection.

Table 1 Tests

Test	Test description	Test parameter	Test level	
			G	H
Clause in ISO 7170:2005 unless otherwise stated				
6.1.2	Shelf retention test	Force, N	Equivalent to 50% of the mass of the unloaded shelf	
6.1.3	Deflection of shelves	Mass, kg/dm <sup>2</sup>	1.5	1.75
6.1.4 but with shelf loading as specified in Table 2	Strength of shelf supports	See Table 3		
6.2.1	Sustained load test for tops and bottoms	Mass, kg/dm <sup>2</sup>	1.5	1.75
6.2.2	Static load test for tops and bottoms Tops Bottoms	Force, N; 10 times	1 000 750	1 000 1 000
B.1 in this part of BS 6222	Carcase handling test	Force, N; 10 times	300	450
B.2 in this part of BS 6222	Sudden lifting by rails test	Mass, kg	See B.2	See B.2
6.4.2	Drop test	Nominal drop height, mm	50	50
7.1.2.1	Vertical load on pivoted doors	Mass, kg; 10 cycles	30	37.5
7.1.2.2	Horizontal load on pivoted doors	Force, N; 10 times	60	70
7.1.3	Slam-shut test of pivoted doors	Mass $m_2$ , kg; 10 times	1.5	2
7.1.4	Durability of pivoted doors	Cycles	30 000	60 000
7.2.2	Slam shut/open of sliding doors and horizontal roll-fronts	Mass $m_2$ , kg; 10 times	3	4
7.2.3	Durability of sliding doors and horizontal roll-fronts	Cycles	40 000	80 000
7.3.1	Strength of bottom-hinged flaps	Force, N; 10 times	200	300
7.3.2	Durability of flaps and hinged cantilevered worktops	Cycles	20 000	40 000
7.3.3	Drop test for top-hinged flaps	Cycles	150	200
7.4.1	Slam shut/open of vertical roll-fronts	Mass $m_2$ , kg; 10 times	3	4
7.4.2	Durability of vertical roll-fronts	Cycles	10 000	10 000

Table 1 Tests (continued)

Test Clause in ISO 7170:2005 unless otherwise stated	Test description	Test parameter	Test level	
			G	H
7.5.2	Strength of extension elements	Force, N; 10 times	250	300
7.5.3	Durability of extension elements Cutlery drawer General drawer Pan drawer Basket on runners Sliding cantilevered worktop	Cycles	80 000 40 000 20 000 20 000 20 000	100 000 50 000 25 000 25 000 40 000
7.5.4	Slam open/shut test of extension elements	Velocity, m/s, at calibration points Slam open load 5 kg Slam shut load 35 kg	1.65 1.10	1.85 1.25
7.5.5	Displacement of extension element bottoms	Force, N; 10 times	60	70
8.1.3	Sustained load (overload) test	Mass, kg/m <sup>2</sup>	250	250
B.3 in this part of BS 6222	Handle strength test	Force, N	100	100
B.4 in this part of BS 6222	Horizontal impact test for peninsular units, island units and breakfast bars	Drop height, mm	40	40
B.5 in this part of BS 6222	Horizontal fatigue test for peninsular units, island units and breakfast bars	Cycles	15 000	30 000
B.6 in this part of BS 6222	Vertical fatigue test on worktops and breakfast bars	Cycles	15 000	30 000
B.7 in this part of BS 6222	Appliance housing sustained load test	Mass, kg	250	250
B.8 in this part of BS 6222	Strength test for carousel units	Force, N	200	300
B.9 in this part of BS 6222	Durability test for carousel units	Cycles	10 000	15 000

Table 2 Loads in storage components during testing, and on shelves for strength of shelf supports test

Component	Load	Test level	
		G	H
Door baskets	kg/dm <sup>2</sup>	1.0	1.25
Extension elements <sup>A)</sup>	kg/dm <sup>3</sup>		
Cutlery drawer		0.25	0.40
General drawer		0.25	0.33
Pan drawer		0.25	0.33
Basket on runners		0.25	0.33
Shelf <sup>B)</sup>	kg/dm <sup>2</sup>	0.5	0.66

<sup>A)</sup> The volume of extension elements is calculated from the internal depth × internal width × internal clear height.

<sup>B)</sup> For strength of shelf supports test.

Table 3 Steel impact plates

Test level	Mass	Approximate width	Approximate thickness	Length	Impact energy
	kg	mm	mm	mm	J
G	1.1	70	10	200	1.08
H	1.7	109	10	200	1.66

## 6 Test report

The test report shall contain the following:

- the number and date of this British Standard, i.e. BS 6222-2:2009;
- details of the article tested, e.g. specification and photographs;
- the test level at which the article has been tested;
- details of any defects observed before the tests;
- details of any defects and damage observed after the tests;
- the test result;
- details of any deviation from the test procedures.

## Annex A (normative) Units and components to be tested to assess conformity of a range of units

To determine whether a range of units conforms to this standard (see 4.2) the following items from the range shall be tested:

- a) the largest base unit;
- b) the largest wall unit;
- c) the largest tall unit;
- d) the largest appliance housing;
- e) the largest "built under" appliance housing;
- f) the largest pull-out larder unit;
- g) the shelf with the longest span;

*NOTE 1 This may be the bottom of the unit.*

- h) the work top with the greatest span fully supported by a base unit;
- i) a bridging unit supported at both ends and also one side with the longest span (the length of the span being that recommended by the manufacturer);
- j) the cantilevered worktop with the largest projection (the length of the span being that recommended by the manufacturer);
- k) the door that produces the greatest load on its hinge;

*NOTE 2 If different types of hinge are used, the door producing the greatest load on each type of hinge should be submitted for test.*

- l) the largest sliding door;
- m) the largest hinged flap;
- n) the largest drawer;

*NOTE 3 If different types of runner are used, the largest drawer with each type of runner should be submitted for test.*

- o) a cutlery drawer, or drawer not more than 150 mm deep which could be used for storing cutlery;
- p) the fixtures included in the range of units;
- q) the longest peninsular unit;
- r) the breakfast bar with the longest span;
- s) the breakfast bar with the greatest cantilevered projection;
- t) the longest peninsular unit that is attached only to a wall;
- u) the overhead unit door whose geometry creates the greatest bending moment on the hinges;
- v) the most adverse island unit configuration.

## Annex B (normative) Test methods

### B.1 Carcase handling test

Test the unit in accordance with the test method given in ISO 7170:2005, 6.4.1, but with storage areas of the unit under test not loaded. In the case of units supplied ready assembled, perform the test with the doors open at an angle of 90°. In the case of units supplied flat packed, remove the doors before performing this test and replace them afterwards.

### B.2 Sudden lifting by rails test

#### B.2.1 Apparatus

**B.2.1.1** *Two slings*, each with a 100 mm bearing length and each fitted with a means of attachment to the rope (B.2.1.3).

**B.2.1.2** *Counterweight*, with a mass equal to that of the unit under test.

**B.2.1.3** *Rope*.

**B.2.1.4** *Pulley*, attached to a rigid structure of sufficient strength to support the mass of the unit under test plus the mass of the counterweight.

#### B.2.2 Procedure

Perform the test with all storage areas of the unit under test unloaded. In the case of units supplied ready assembled, close all doors, drawers, trays and flaps, ensuring that any catches are engaged correctly. Do not apply adhesive tape or other means of restraint to hold doors etc. shut. In the case of units supplied flat packed, remove the doors, drawers, trays and flaps before performing this test and replace them afterwards.

Test each front rail and each back rail of the unit in turn.

Place the slings (B.2.1.1) around the rail to be tested. Where the rail is interrupted by a post or other member, place one sling on either side. Position each of the slings at a distance away from each end of the unit corresponding to one quarter of the length of the unit.

Attach the two slings to the rope (B.2.1.3), run the rope over the pulley (B.2.1.4) and fasten the other end to the counterweight (B.2.1.2). Adjust the length of the rope so that the counterweight is suspended 300 mm above the floor with the unit standing on the floor. Lift the counterweight to a height of 600 mm above the floor and allow it to drop freely so that the unit is lifted off the floor.

### B.3 Handle strength test

#### B.3.1 Apparatus

**B.3.1.1** *Claw mechanism*, with a suitably shaped claw able to apply a force of 100 N to a handle in the direction in which forces would be applied to the handle in normal use, i.e. perpendicular to drawer fronts and pivoted doors and parallel to sliding doors and sliding flaps.

**B.3.1.2** *Clamping system*, which can hold a door, drawer or flap rigidly in position.

### B.3.2 Procedure

Hold the drawer, door or flap to which the handle under test is attached, rigidly in position by means of the clamping system (B.3.1.2).

Attach the claw mechanism (B.3.1.1) to the handle and apply the force ten times at a rate of 6 cycles/min.

*NOTE* When testing strip handles attach the claw mechanism to one end of the handle.

## B.4 Horizontal impact test

### B.4.1 Apparatus

**B.4.1.1** *Horizontal impact device*, as shown in Figure B.1, consisting of a basketball inflated to a pressure of  $(73.5 \pm 5)$  kPa and attached by a network of elastic cords to a mounting ring. The mounting ring shall consist of a ring of plywood, as illustrated in detail in Figure B.1a), having an inside diameter of  $(90 \pm 5)$  mm and an outside diameter of  $(150 \pm 5)$  mm. The rear face of this ring shall be attached to the main body of the impact device and its front face shall be shaped to fit the ball.

The main body of the impact device shall consist of a set of disc weights supported by cords or flexible wires  $(850 \pm 50)$  mm long arranged so that the longitudinal axis of the impact device remains horizontal when the supporting cords or wires are displaced from the vertical.

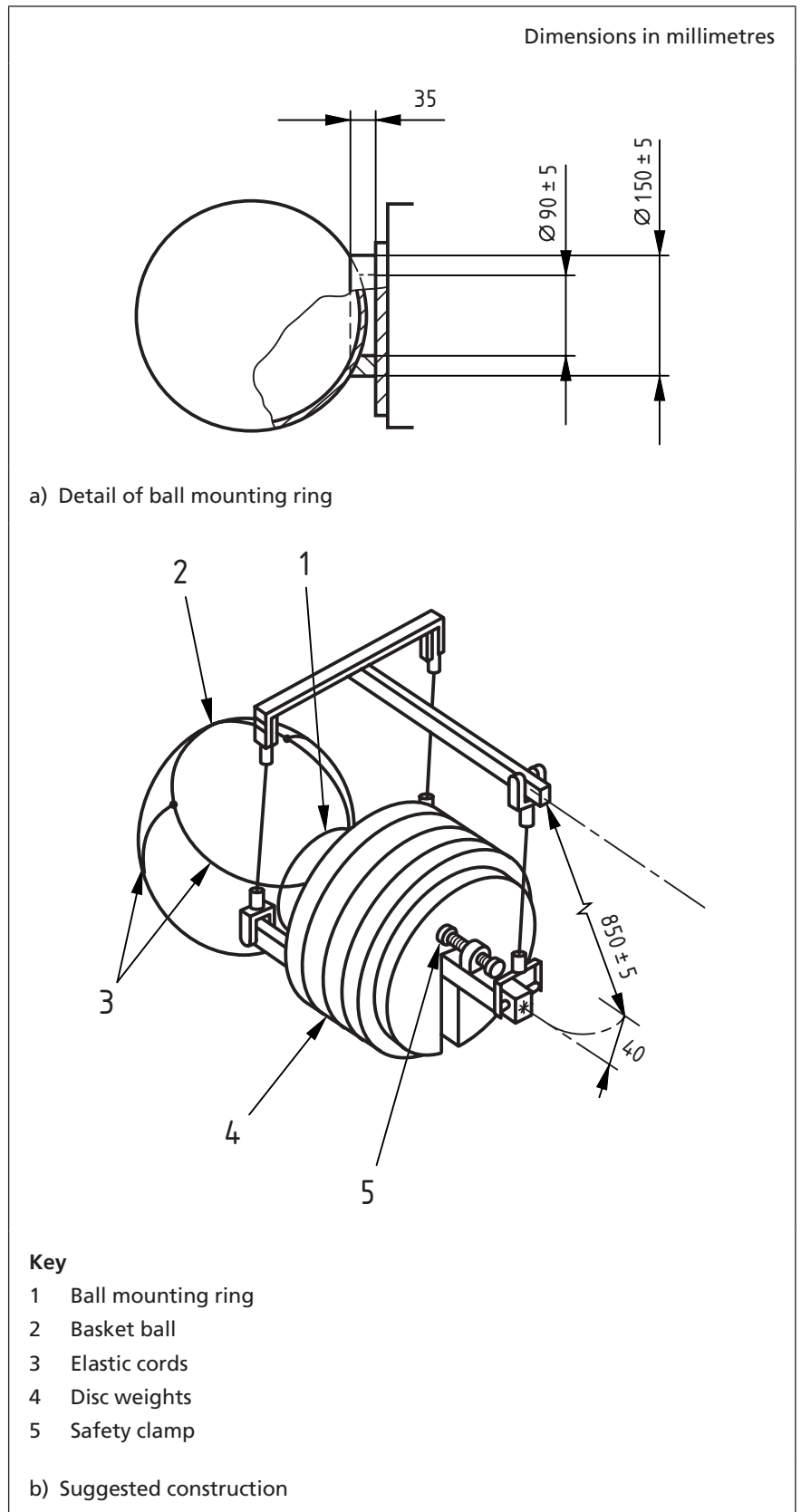
The total mass of all moving parts of the impact device, excluding the supporting cords or wires, shall be 40 kg.

### B.4.2 Procedure

Install the unit, including any wall or floor attachments, in accordance with the manufacturer's instructions. Arrange the horizontal impact device (B.4.1.1) so that when raised through a vertical height of 40 mm and released the ball will impact the unit under test in the position likely to have the most adverse affect, for example the top edge furthest from the wall fixing. Raise the horizontal impact device through a vertical height of 40 mm and release it. Subject the unit under test to a total of 10 impacts in the same position.



Figure B.1 Horizontal impact device



## B.5 Horizontal fatigue test

### B.5.1 Apparatus

B.5.1.1 *Loading pad*, as specified in ISO 7170:2005, 5.4.

### B.5.2 Procedure

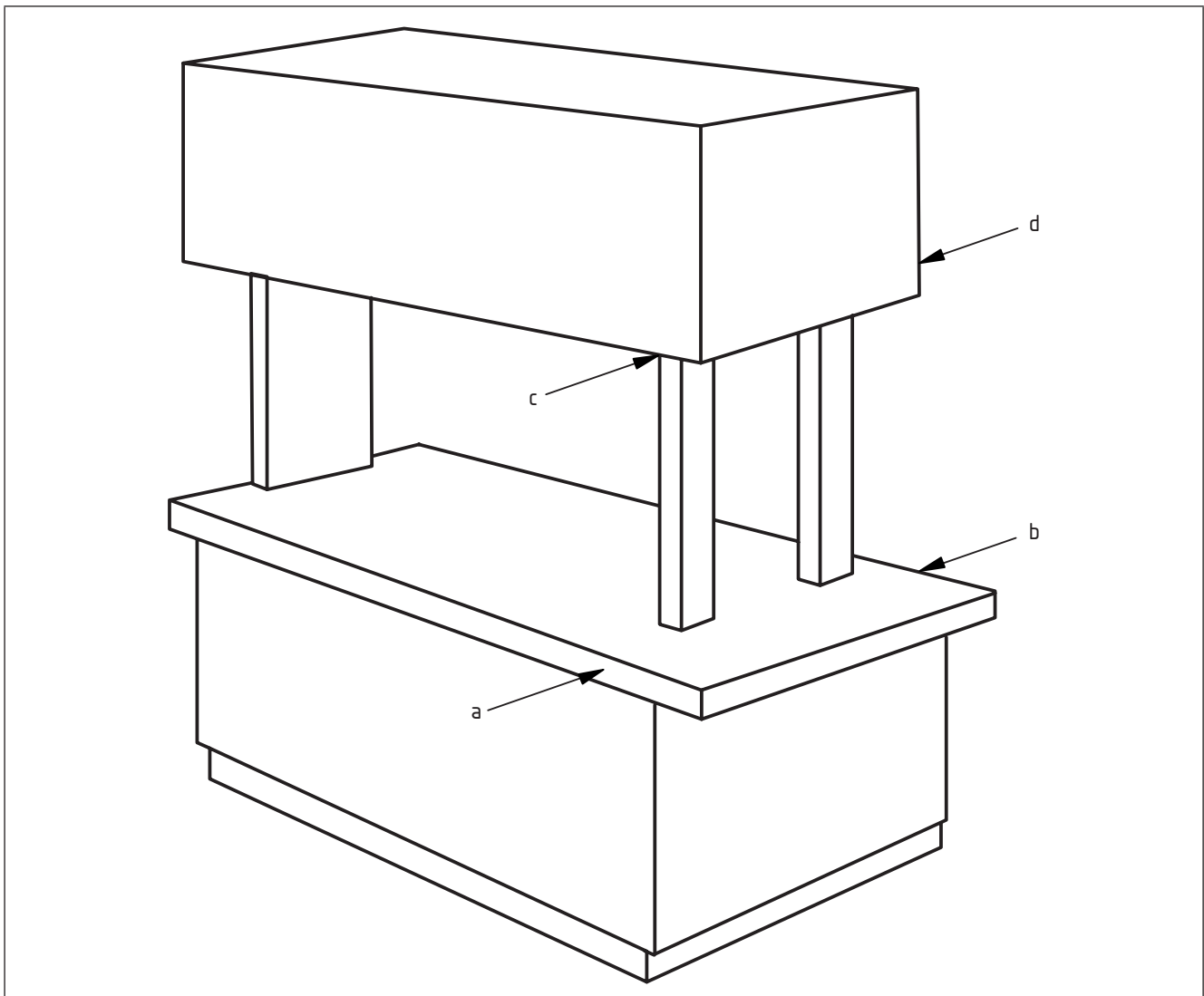
Load all parts intended for storage purposes in accordance with ISO 7170:2005, 4.7.

Apply a horizontal force of 150 N, by means of the loading pad (B.5.1.1), to the end furthest away from the wall fixing. Apply the force alternately to one edge and then to the opposite edge (positions a and b as shown in Figure B.2) or, in the case of island units, to positions 150 mm from each end. Apply the force at each position in accordance with ISO 7170:2005, 4.3.

Apply the force for the number of cycles specified in Table 1.

Repeat the test on the overhead units, applying the force alternately to positions c and d as shown in Figure B.2.

Figure B.2 Horizontal fatigue test – Positions for application of force



## B.6 Vertical fatigue test

### B.6.1 Apparatus

**B.6.1.1** *Loading pad*, as specified in ISO 7170:2005, 5.4.

### B.6.2 Procedure

Load all parts intended for storage purposes in accordance with ISO 7170:2005, 4.7.

Apply a vertical force of 300 N, by means of the loading pad (**B.6.1.1**), to each unsupported edge and to any point on the top where it is likely to cause failure. In the case of edges, apply the force to the centre of the edge and not more than 100 mm from the edge. Apply the force to each position in accordance with ISO 7170:2005, 4.3.

Apply the force to each position for the number of cycles specified in Table 1.

## B.7 Appliance housing sustained load test

### B.7.1 Apparatus

**B.7.1.1** *Oven housing jig*, comprising two pieces of steel tubing, of square cross-section, one with a cross-section of 30 mm × 30 mm made of steel 2.5 mm thick and one with a cross-section of 25 mm × 25 mm made of steel 3.0 mm thick, so that the smaller one slides into the larger one to produce a rectangular support, the size of which can be adjusted, as shown in Figure B.3. In each corner shall be welded a steel plate 6 mm thick, each plate being drilled with an M10 threaded hole into which is fitted a 10 mm thick steel levelling foot by means of a threaded shaft (see Figure B.3).

**B.7.1.2** *Flat board*, of chipboard or wood, 18 mm thick and of appropriate dimensions to fit inside the carcass containing the appliance shelf without touching the sides or back panel.

**B.7.1.3** *Spirit level*.

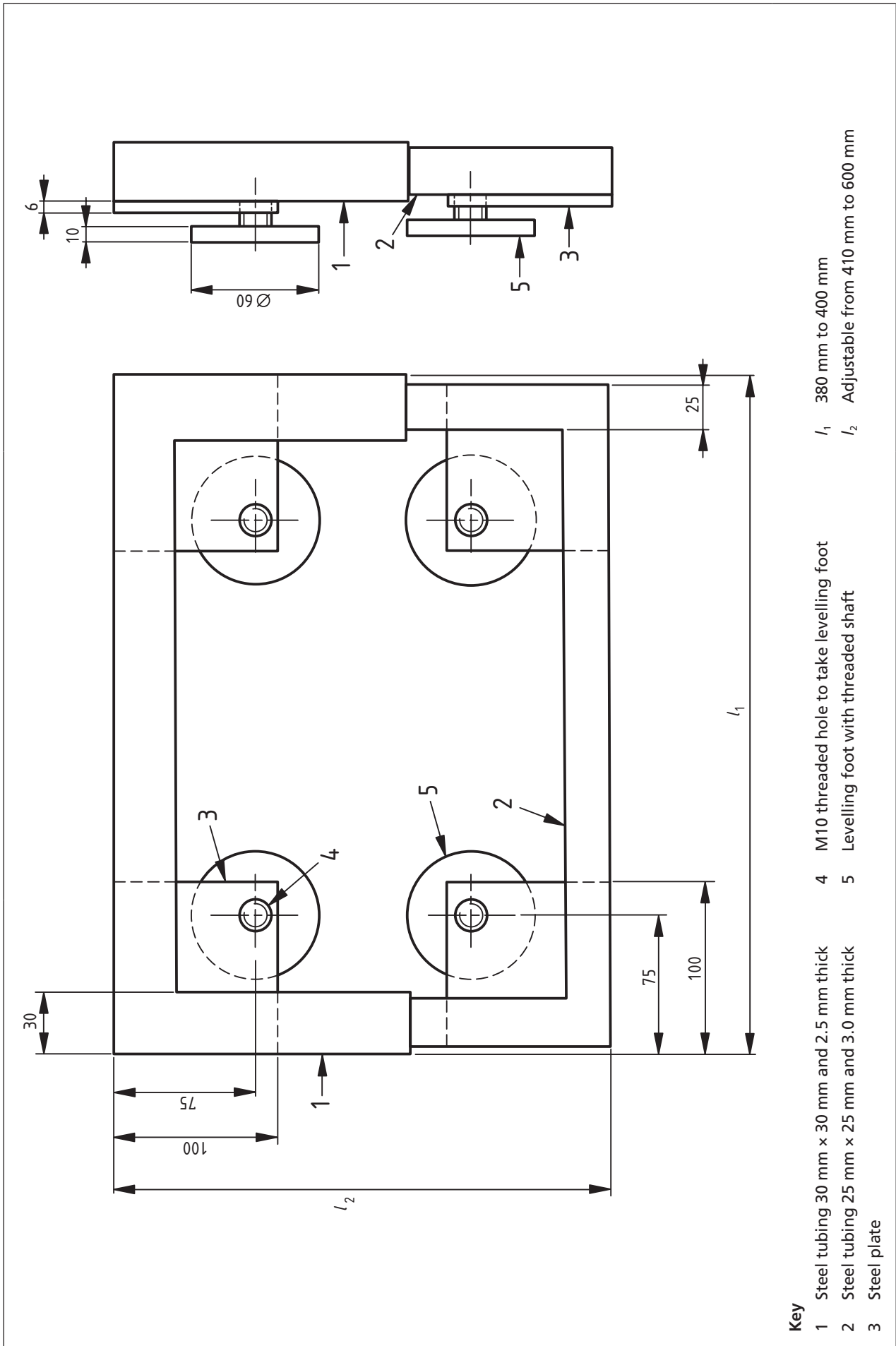
### B.7.2 Procedure

Load all parts intended for storage purposes in accordance with ISO 7170:2005, 4.7, with the exception of the appliance shelf.

Place the oven housing jig (**B.7.1.1**) onto the appliance shelf and adjust it to fit the shelf area, ensuring that it does not touch the carcass sides or back panel. Place the board (**B.7.1.2**) on top of the jig ensuring that it does not touch the carcass sides or back panel. Level the board by adjusting the levelling feet on the jig and checking it with the spirit level.

Load the board with the mass specified in Table 1, and leave the unit loaded for seven days.

Figure B.3 Oven housing jig



## B.8 Strength test for carousel units

### B.8.1 Apparatus

**B.8.1.1** *Loading pad*, as specified in ISO 7170:2005, 5.4.

### B.8.2 Procedure

Load all parts intended for storage purposes in accordance with ISO 7170:2005, 4.7, with the exception of the carousel unit.

Load the tray of the carousel unit with a mass of 1.25 kg/dm<sup>2</sup> of tray surface area.

Rotate the carousel unit so that the tray surface is fully exposed.

Apply the vertical force specified in Table 1 progressively to a point at the centre of the outside edge of the carousel tray. Apply the force until the point at which the force is applied has deflected downwards by 100 mm or the specified vertical force has been reached.

Perform the test a total of ten times.

## B.9 Durability test for carousel units

### B.9.1 Apparatus

**B.9.1.1** *Loading pad*, as specified in ISO 7170:2005, 5.4.

**B.9.1.2** *Rotating device for rotating the carousel tray*, which can rotate the tray without applying any vertical force to the carousel unit.

### B.9.2 Method

Load all parts intended for storage purposes in accordance with ISO 7170:2005, 4.7, with the exception of the carousel unit.

Load the tray of the carousel unit with a mass of 1.25 kg/dm<sup>2</sup> of tray surface area.

For carousels equipped with a built-in stop in the open position, open the carousel fully without stressing the stop.

By means of the rotating device (**B.9.1.2**) rotate the carousel through at least 270° and then rotate it back to the starting position, at a maximum speed of 0.25 m/s, this comprising one cycle.

Repeat this procedure for the number of cycles specified in Table 1.

## Bibliography

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 14749:2005, *Domestic and kitchen storage units and worktops*

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