
**Furniture — Storage units — Test
methods for the determination of
stability**

*Ameublement — Éléments de rangement — Méthodes d'essai pour la
détermination de la stabilité*

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Published in Switzerland

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Foreword

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

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

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

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 7171:1988), which has been technically revised.

The main changes compared to the previous edition are as follows:

- Definitions have been added;
- Figures have been added;
- [Table 1](#) has been moved into the standard from an informative annex;
- Wherever possible, test descriptions have been clarified for ease of use;
- [Annex A](#) has been revised with load and forces for different applications;
- A new [Annex B](#) has been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Furniture — Storage units — Test methods for the determination of stability

1 Scope

This document specifies test methods for determining the stability of free-standing storage units that are fully assembled and ready for use.

The test results are only valid for the unit/component tested. These results can be used to represent the performance of production models provided that the tested model is representative of the production model.

This document specifies test methods only. It does not specify requirements for specific forces that the storage unit must withstand without overturning. It is intended that these be specified in a requirements document.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

extension element

component ([3.13](#)) that can be pulled out and pushed in

EXAMPLE Drawers, suspended pocket files, keyboard trays.

3.2

flap

horizontally hinged door, which opens upwards or downwards

3.3

free standing unit

unit ([3.6](#)) not intended to be attached to a load bearing structure

3.4

interlock

device which restrains the opening of more than one *extension element* ([3.1](#)) at a time

3.5

levelling device

adjustable device intended to keep the item of furniture perpendicular to the floor

3.6

unit

complete item of furniture intended to be tested

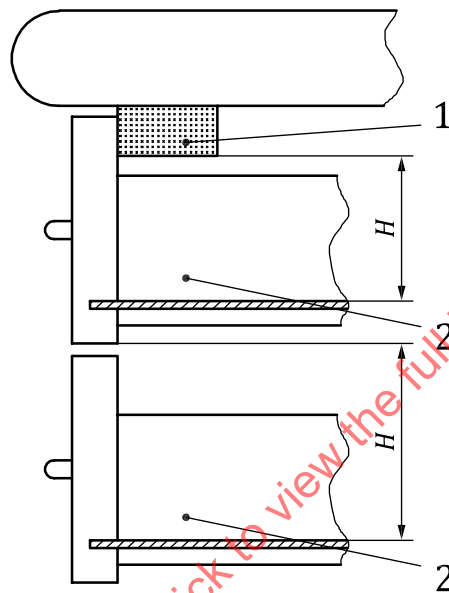
Note 1 to entry: This includes but is not limited to: bookcases, wardrobes, cabinets, wall-mounted or exterior-mounted elements, freestanding and mobile pedestals, lateral and vertical files.

3.7

clear height

unobstructed height above the top of the bottom surface or the structure of the *unit* (3.6)

Note 1 to entry: The top of the extension element bottom and the lower edge of the extension element above, or the structure of the unit (see Figure 1).



Key

- 1 structure of the unit
- 2 extension element
- H clear height

Figure 1 — Clear height

3.8

locking mechanism

mechanism that limits access to the interior of a *unit* (3.6) or a storage element and whose activation requires a key or a combination

3.9

worst case

condition most likely to cause the *unit* (3.6) to overturn

3.10

suspended filing pocket

extendible element usually without a bottom such that contents are suspended by a frame

3.11

wall attachment

type of device to secure the *unit* (3.6) to a wall or other fixed structure to prevent tip over

3.12**height adjustment device**

device intended to enable variation in height of a *unit* (3.6), such as a work top

3.13**component**

part of a *unit* (3.6) including hardware

EXAMPLE *Extension elements* (3.1), doors and *flaps* (3.2).

4 General test conditions**4.1 Preliminary preparations**

The unit(s)/component(s) shall be tested as delivered. The unit(s)/component(s) shall be assembled and/or configured according to the instructions supplied. Unless otherwise stated, the most adverse configuration shall be used for each test. If mounting or assembly instructions are not supplied, the mounting or assembly method shall be recorded in the test report. Fittings shall be tightened before testing and shall not be re-tightened. If the configuration needs to be changed to produce the worst-case conditions, this shall be recorded in the test report.

During testing, the unit shall be placed on the floor and levelled, unless otherwise specified. Levelling devices shall be set to the mid position but not more than 13 mm from the fully closed position.

Unless otherwise specified by the manufacturer, the sample for test shall be stored in indoor ambient conditions for at least 24 hours immediately prior to testing.

[Annex B](#) explains the purpose and the applicability of the test methods that this document contains.

4.2 Application of forces

The test forces shall be applied sufficiently slowly to ensure that negligible dynamic force is applied.

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

[Annex A](#) suggests loads and forces to ensure that this document can be of use where no requirements document is available or to assist in the development of one.

4.3 Tolerances

Unless otherwise stated, the following tolerances are applicable to the test equipment:

- Forces: $\pm 5\%$ of the nominal force;
- Masses: $\pm 1\%$ of the nominal mass;
- Dimensions: nominal dimension $\pm 1 \text{ mm}$;
- Velocities: $\pm 10\%$ of the nominal velocity;
- Angles: nominal angle $\pm 2^\circ$.

The accuracy for the positioning of loading pads shall be $\pm 5 \text{ mm}$.

Test forces, masses, dimensions, velocities and angles used to perform the test shall be targeted at the nominal values specified and shall be subjected to the above tolerances.

NOTE For the purposes of uncertainty measurement, test results are not considered to be adversely affected when the above tolerances are met.

4.4 Prevention of movement during test

If a free standing unit tends to slide during the tests, the unit shall be restrained by stops (5.2), which do not prevent overturning.

4.5 Loading

Unless otherwise specified, all storage components shall be uniformly loaded with the load(s) specified in Table 1.

Table 1 — Loads for stability testing

Component	Load
All horizontal storage areas, including shelves, bottoms, tops and flaps	0,325 kg/dm ²
Extension elements, trays and baskets with clear height (3.7), $H, \leq 1$ dm:	0,2 kg/dm ³
Extension elements, trays and baskets with clear height (3.7), H , between 1 dm and 2,5 dm (H in dm):	$(0,2667 - 0,0667H)$ kg/dm ³
Extension elements, trays and baskets with clear height (3.7), $H, \geq 2,5$ dm:	0,1 kg/dm ³
Hanging rails	2 kg/dm
Suspended filing pockets	1,25 kg/dm

5 Test equipment and apparatus

Unless otherwise specified, the tests can 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 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, so that the loads are always applied at the specified points and in the specified directions.

5.1 Floor surface, consisting of a rigid, horizontal and flat surface.

5.2 Stops, consisting of devices to prevent the article from sliding but not tilting. The lowest height that will prevent the item from moving shall be used.

5.3 Masses, which shall be designed so that they do not reinforce the structure or re-distribute the stresses.

5.4 Loads for filing pockets. Suspended filing pockets shall be loaded with filing paper or an equivalent alternative.

5.5 Loading pads, consisting of rigid discs 100 mm in diameter, with a flat face and a 12 mm front edge blend radius. Where space prevents the use of a 100 mm diameter loading pad, a 50 mm diameter loading pad with similar properties can be used.

6 Stability tests

6.1 General

The stability tests shall be carried out with the unit placed on the test floor (5.1).

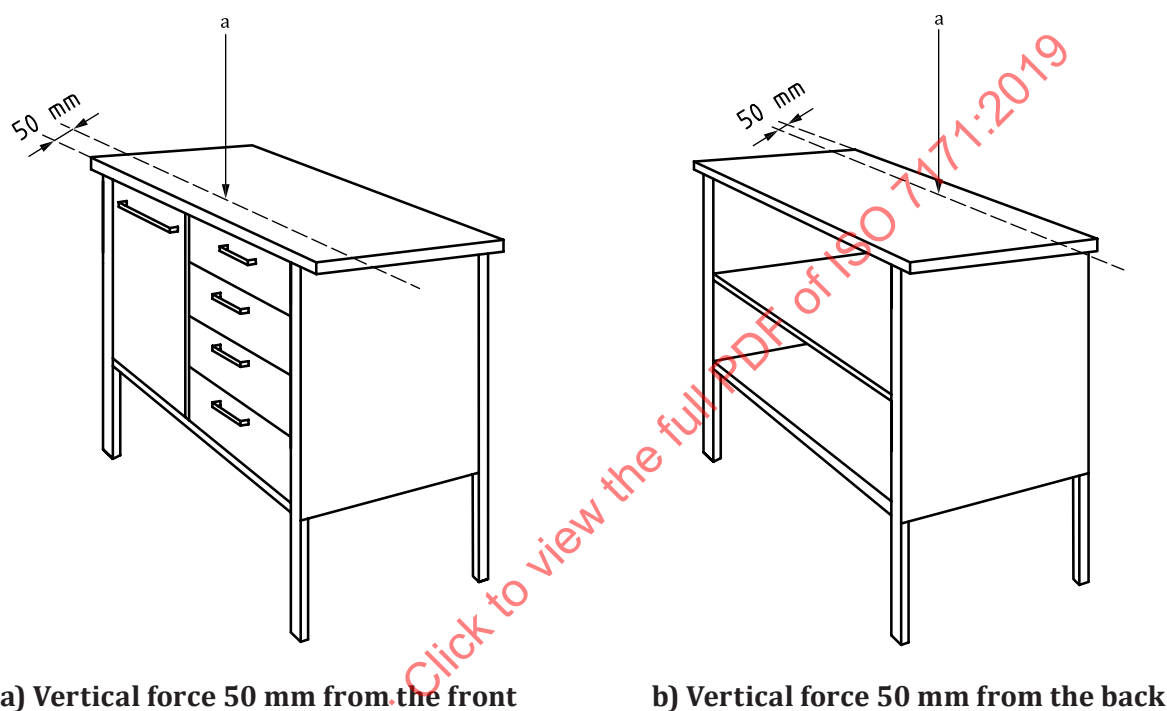
Units for which the manufacturer's instructions state that they are to be placed against a wall or other rigid vertical structure shall not be tested in the rearward's direction. Castors and height adjustment devices shall be in the position most likely to cause the unit to overturn.

6.2 Doors, extension elements and flaps closed, all storage units unloaded

6.2.1 Units that are or can be adjusted to a height of 1 000 mm or less

Apply the specified vertical force by means of the loading pad on the top surface acting 50 mm from the outer edge of the unit at any point likely to cause overturning.

Record if the unit overturns or is supported by an open extension element, opened door or opened flap. If, during testing, the unit is prevented from overturning by an extension element, open door or flap, the component shall be closed and the test repeated.



Key

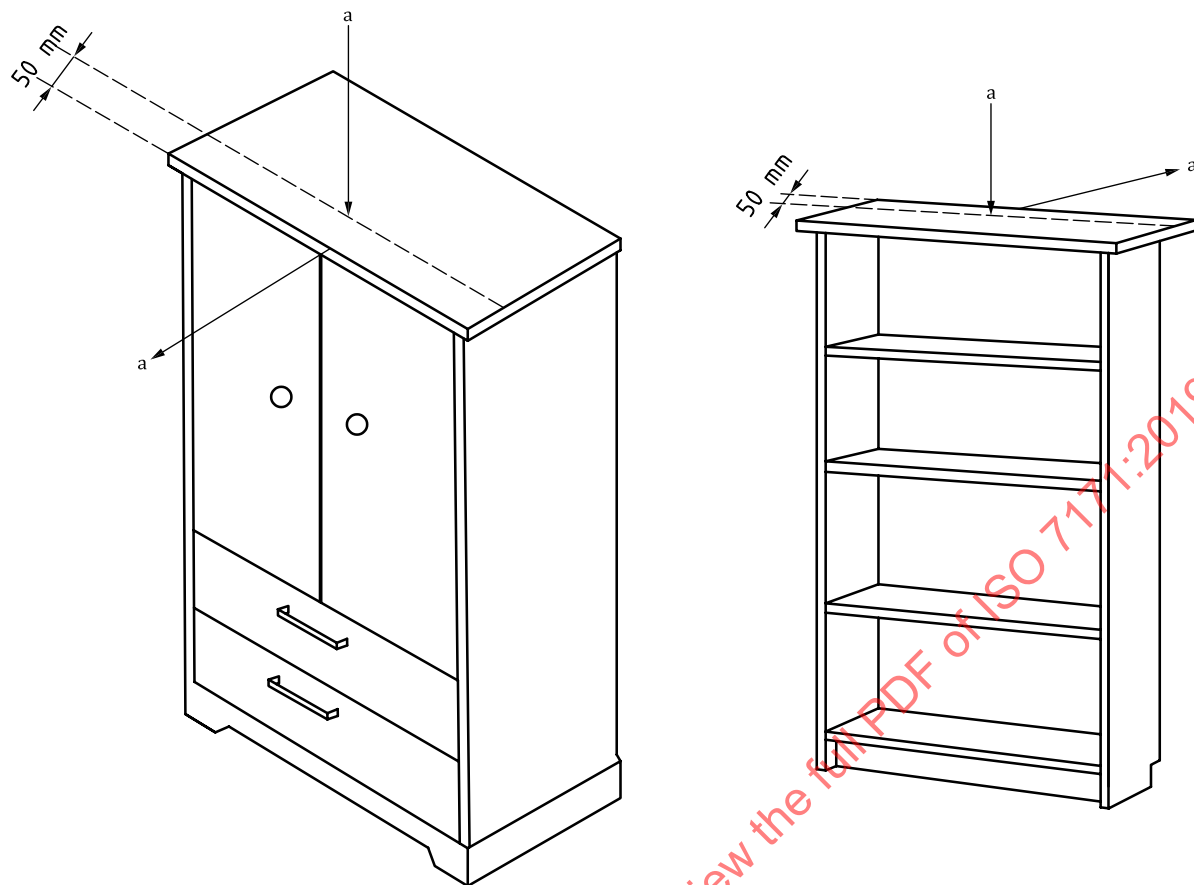
a Force.

Figure 2 — Examples of units that are or can be adjusted to a height of 1 000 mm or less

6.2.2 Units that are or can be adjusted to a height of more than 1 000 mm

Apply a vertical force of 350 N together with the specified outward horizontal force on the top surface acting 50 mm from the outer edge of the unit at any point likely to cause overturning.

Record if the unit overturns or is supported by an open extension element, opened door or opened flap. If, during testing, the unit is prevented from overturning by an extension element, open door or flap, the component shall be closed and the test repeated.



- a) Vertical force 50 mm from the front and outward horizontal force acting forward
- b) Vertical force 50 mm from the back and outward horizontal force acting backwards

Key

a Force.

Figure 3 — Examples of units that are or can be adjusted to a height of more than 1 000 mm

6.3 Opening doors, extension elements and flaps, all storage units unloaded

Apply a horizontal force one at a time to all doors, extension elements or flaps just sufficient to open them 40 mm. Then close the component before testing the next. The opening force shall be applied to the centre of the handle, knob, key, etc.

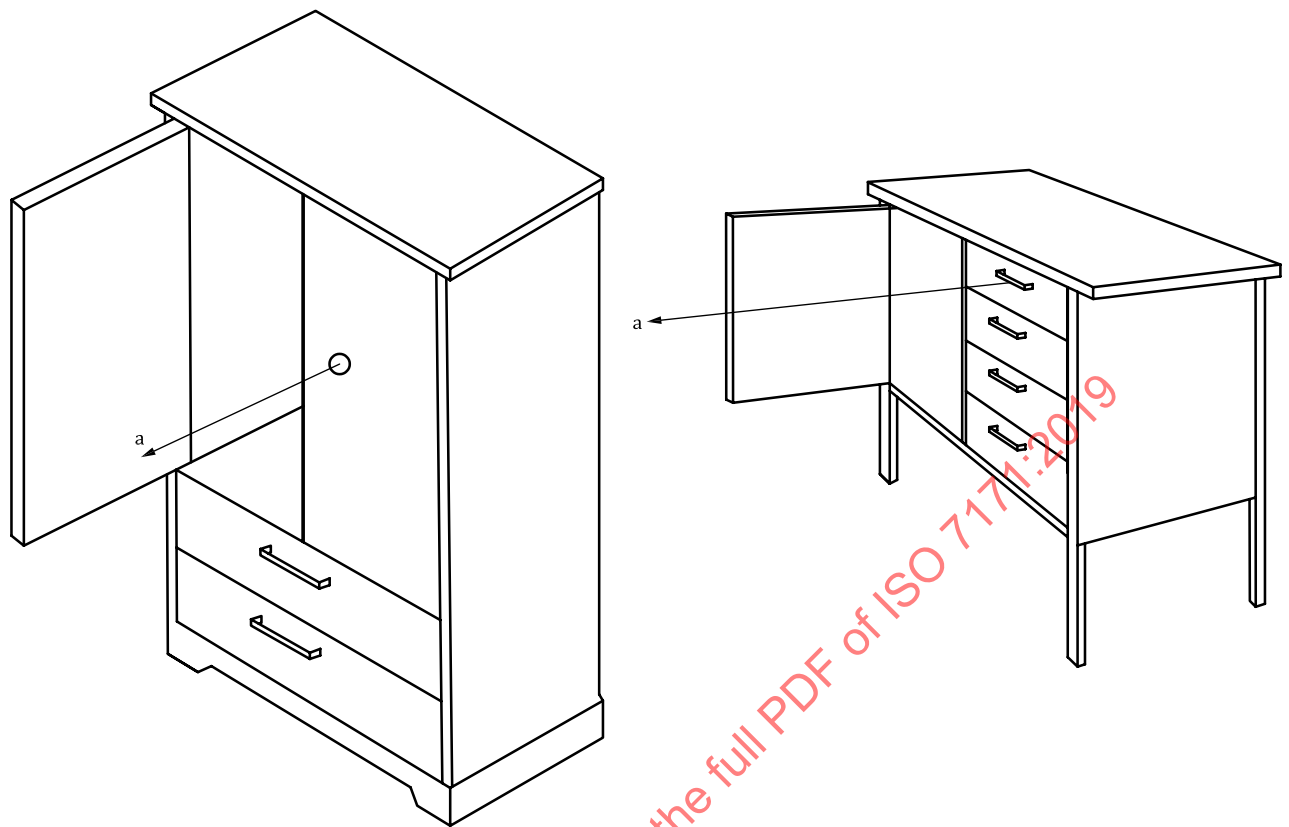
For units with one door, the test shall be carried out with the door opened to its maximum but not more than 90°.

When two or more doors are fitted, the test shall be carried out with the worst-case door opened to its maximum but not more than 90°. All other doors shall be closed.

With the worst-case door open, open all extension elements and flaps behind that door, except where there are no stops, in which case they shall be opened to two thirds of the internal length.

Locking mechanisms shall be unlocked.

Record if the unit overturns or is supported by an open extension element, opened door or opened flap. If, during testing, the unit is prevented from overturning by an extension element, open door or flap, the component shall be closed and the test repeated.



a) Horizontal force outwards from a closed door

b) Horizontal force outwards from a top drawer

Key

a Force.

Figure 4 — Examples of units opening doors, extension element and flaps, all storage units unloaded

6.4 Doors, extension elements and flaps opened and unlocked

6.4.1 All storage areas unloaded and all doors, extension elements and flaps open

All doors shall be opened to their maximum but not more than 90° and all extension elements shall be fully opened, except where there are no open stops, in which case they shall be opened to two thirds of the internal length. All flaps shall be fully opened.

Interlock mechanisms shall not be overridden.

Record if the unit overturns or is supported by an open extension element, opened door or opened flap.

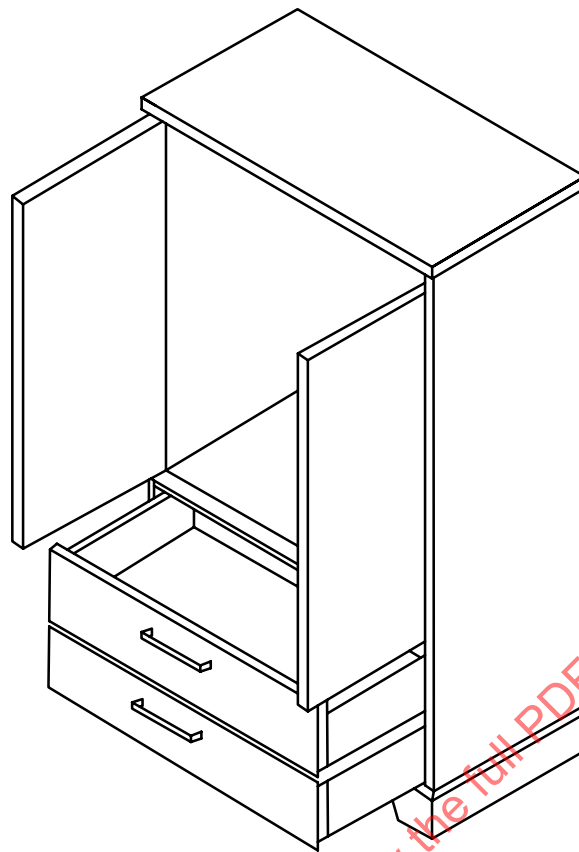


Figure 5 — Example of a unit with all storage areas unloaded and all doors, extension elements and flaps open

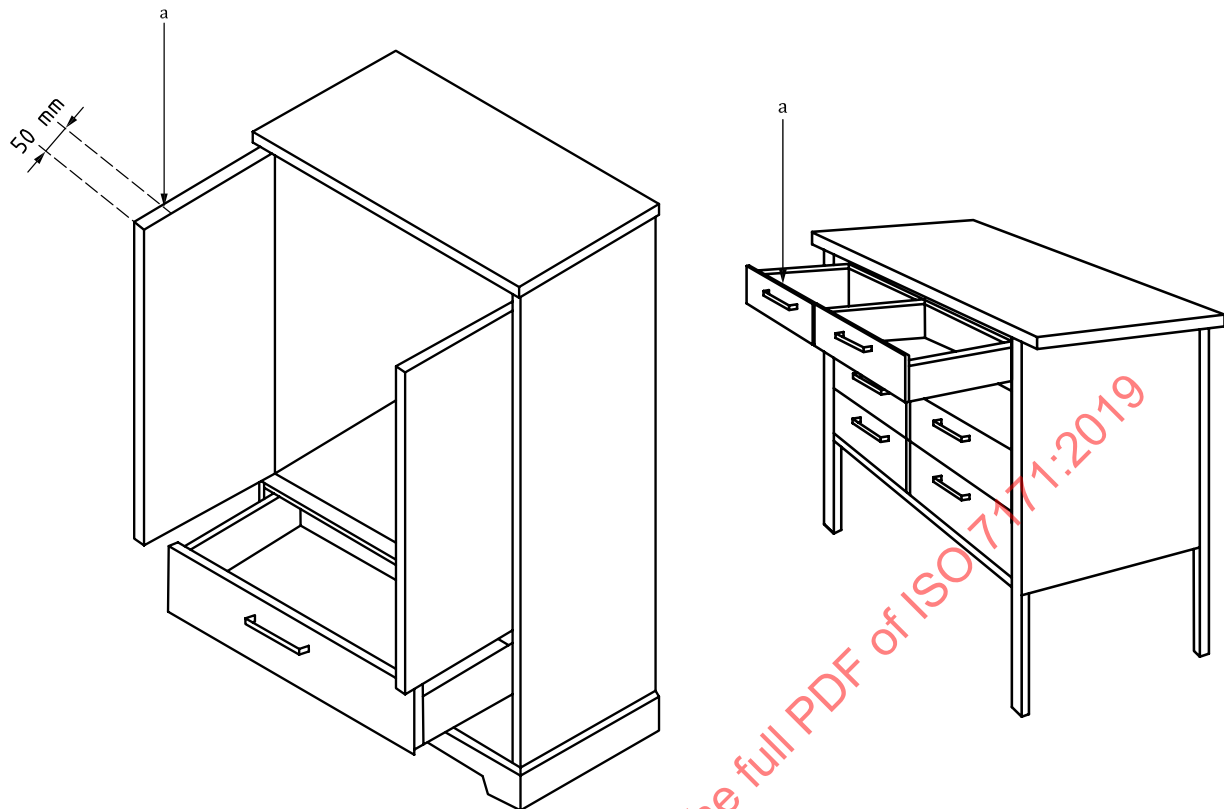
6.4.2 All storage areas unloaded with overturning load

Doors shall be opened to their maximum but not more than 90° and extension elements shall be fully opened, except where there are no open stops, in which case they shall be opened to two thirds of the internal length. Flaps shall be fully opened.

Extension elements and flaps shall be opened across the full width of the unit. Only one extension element in each vertical line of extension elements shall be opened to produce the configuration most likely to cause overturning.

Apply the specified vertical force to any point likely to cause overturning, on the centreline of the front of an extension element or 50 mm from the outer edge of a door or flap.

Record if the unit overturns or is supported by an open extension element, opened door or opened flap. If, during testing, the unit is prevented from overturning by an extension element, open door or flap, the component shall be closed and the test repeated.



a) Vertical force acting 50 mm from the outer edge of an open door b) Vertical force acting on the centreline of the front of an extension element

Key

a Force.

Figure 6 — Example of units, all storage areas unloaded with overturning load

6.4.3 All storage areas loaded with overturning load

All storage areas shall be loaded with the loads specified in [Table 1](#).

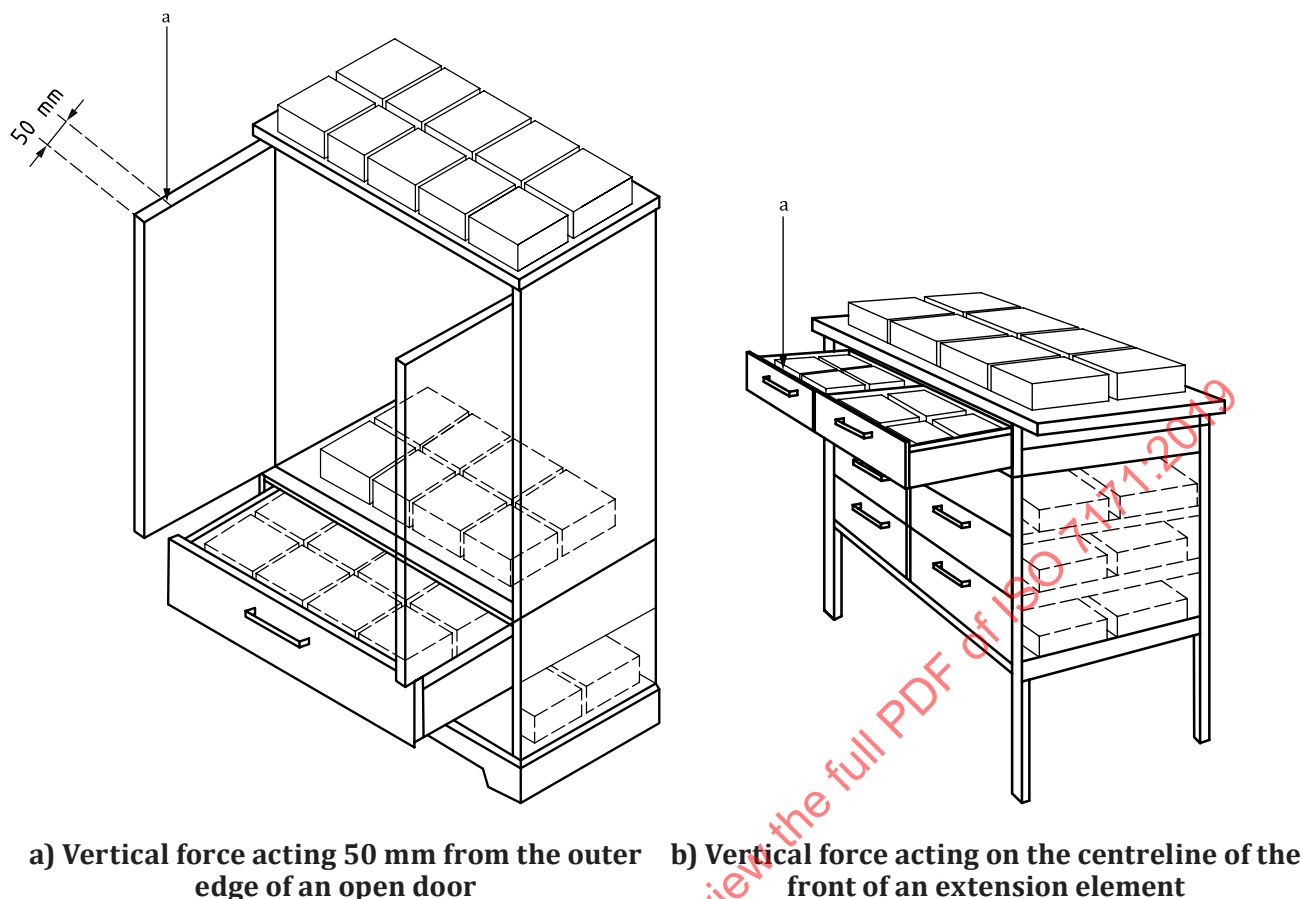
Doors shall be opened to their maximum but not more than 90° and extension elements shall be fully opened, except where there are no open stops, in which case they shall be opened to two thirds of the internal length. Flaps shall be fully opened.

Extension elements and flaps shall be opened across the full width of the unit. Only one extension element in each vertical line of extension elements shall be opened to produce the configuration most likely to cause overturning.

Unless prominently and durably marked by the manufacturer with a maximum load, the total mass of the unit shall be the weight of the unloaded unit plus the load in the unit when loaded with the loads specified in [Table 1](#).

Apply a vertical force to any point most likely to cause overturning, on the centreline of the front of an extension element or 50 mm from the outer edge of a door or flap.

Record if the unit overturns or is supported by an open extension element, opened door or opened flap. If, during testing, the unit is prevented from overturning by an extension element, open door or flap, the component shall be closed and the test repeated.



Key

a Force.

Figure 7 — Example of units, all storage areas loaded with overturning load

6.5 Doors, extension elements and flaps closed and locked, all storage units loaded

All storage areas shall be loaded with the loads specified in [Table 1](#).

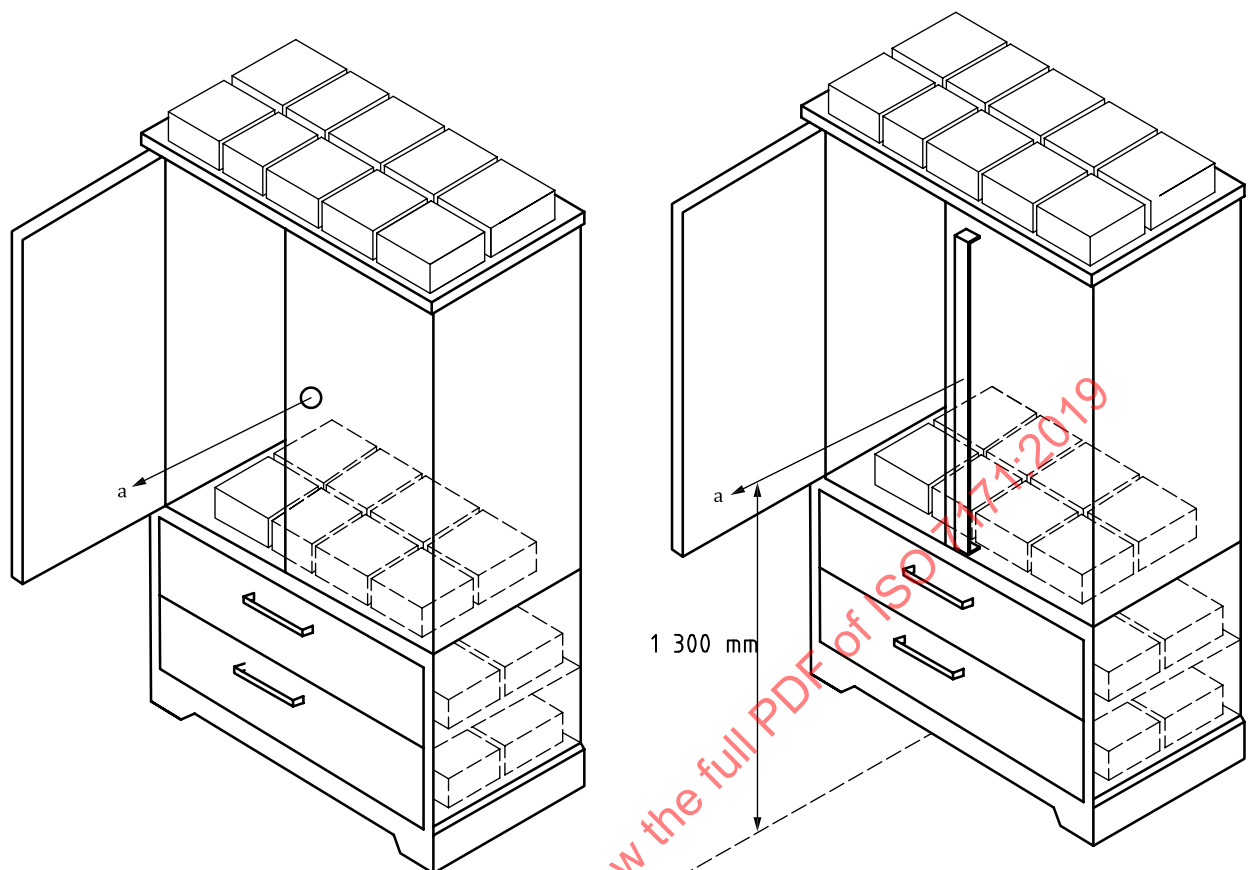
When two or more doors can be locked, the test shall be carried out on one closed door with the other door opened to its maximum but not more than 90°.

If doors and flaps provide access to other extension elements or flaps, these shall be opened when carrying out the test.

Apply the specified horizontal outwards force in turn to all locked doors, extension elements and flaps. The force shall be applied to the centre of the handhold, handle, knob, etc. in the direction of opening.

In case of no obvious handhold or if the handhold length covers the whole width or height of the door, apply the force at the most outward or upper position but not more than 1 300 mm above the floor.

Record if the unit overturns or is supported by an open extension element, opened door or opened flap. If, during testing, the unit is prevented from overturning by an extension element, open door or flap, the component shall be closed and the test repeated.



a) Horizontal force outwards from the locked doors handhold

b) Horizontal force outwards from the locked doors handhold at 1 300 mm from the floor

Key

a Force.

Figure 8 — Example of units with doors, extension elements and flaps closed and locked, all storage units loaded

6.6 Dynamic stability test for units with castors

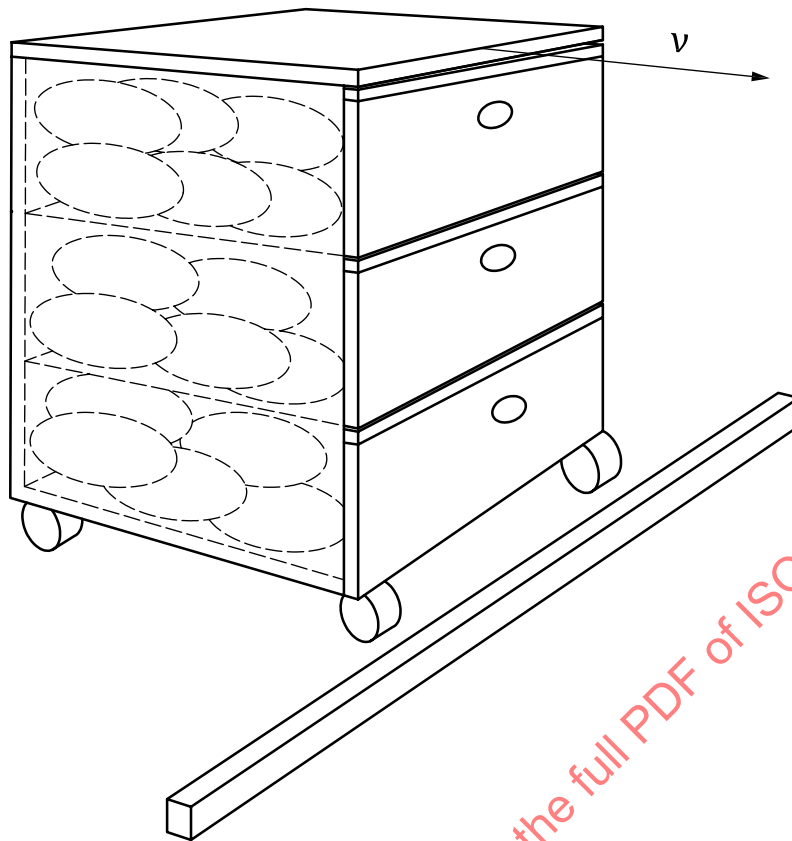
All storage areas shall be loaded with the loads specified in [Table 1](#), utilising glass marbles in a suitable bag. All doors, extension elements and flaps shall be closed. Any locking castor shall be unlocked.

Place the storage unit on the test floor ([5.1](#)) with a stop ([5.2](#)). If the unit has a handle for moving the unit then the unit shall be placed such that the handle is parallel to the stop and is the furthest edge from the stop.

If the unit has no handles and has doors or extension elements, the unit shall, wherever possible, be positioned such that the front of the doors, or extension elements, are perpendicular to the stop.

The storage unit shall travel at a velocity, v , of 0,5 m/s towards a stop. The means of moving the unit shall be removed (50 ± 5) mm before the stop and the unit shall be allowed to strike a stop.

Record if the unit overturns.



Key

v velocity

Figure 9 — Example of unit with castors for dynamic stability test

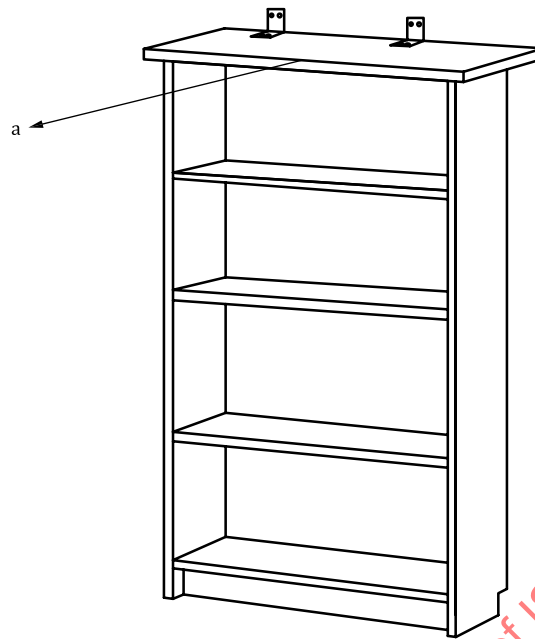
6.7 Strength test for wall attachments

This test is applicable to safety devices intended to prevent the overturning of an unloaded storage furniture.

Apply the specified horizontal outwards force in the direction most likely to cause the unit to overturn.

The force shall be maintained for not less than 10 s and not more than 15 s.

Record if the unit overturns.



Key

a Force.

Figure 10 — Example of a unit for strength test for wall

7 Test report

The test report shall include at least the following information:

- a) A reference to this document, i.e. ISO 7171:2019;
- b) Name and address of the laboratory;
- c) Name and address of the laboratory, and location where the tests were carried out, if different from the address of the laboratory;
- d) Unique identification of the report including an identification of each page and an identification of the end of the test report;
- e) Name and address of the client;
- f) Description and identification of the item tested, e.g. product type and "name", photos;
- g) Condition of the test item when received, e.g. ready-to-assemble, mounted, defects;
- h) Date of receipt of the test item;
- i) Date(s) of the performance of test;
- j) Identification of the test method(s), load(s) and force(s) used;
- k) Name(s), function(s) and signature(s) of the person(s) authorizing the test report;
- l) Statement that the results relate only to the items tested;
- m) Date of issue of the report.

Annex A (informative)

Loads and forces for storage furniture stability tests

A.1 Principle

Loads and forces are suggested in this annex to ensure that this document can be of use where no requirements document is available or to assist in the development of one.

The suggested loads and forces are intended to ensure that specifiers can gain experience in the use of this document in a manner which will make it possible to compare the test results with those of other specifiers. For example, without any guidance, if one specifier chooses to use a 250 N load, this has no meaning to another specifier who has chosen to use a 100 N load.

The suggested loads and forces are intended to be sufficient to cover the full range of domestic and contract applications. However, the loads and forces which are appropriate to testing, e.g. the loads and cycles applied to a filing cabinet drawer for general office use, may be different from the loads and cycles appropriate to a filing cabinet drawer for use in a hospital, bank or home office.

The suggested loads and forces are provided to allow specifiers the freedom to carry out the tests in the manner they consider preferable.

A.2 Requirements

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

The requirements should be determined by the specifier. However, the following is proposed.

The requirements for stability only apply to units where the height to the top of the unit is 600 mm or more above the floor level, and when the potential energy exceeds 60 Nm.

The potential energy shall be determined by multiplying the total mass (kg) of the unit (or the part), gravity (m/s^2) and the height (m) above the floor to the centre of gravity. The total mass is the mass of the unit loaded according to [Table 1](#).

NOTE For the purpose of this document, gravity can be considered to be $10 m/s^2$.

This annex contains tables with suggested forces and loads for different fields of applications.

- [Table A.1](#) determines a basic level of stability for storage units in general domestic and contract use.
- [Table A.2](#) determines the level of stability for storage units intended for the storage of clothing consisting of at least one drawer and/or doors.
- [Table A.3](#) determines the level of stability for storage units intended for heavy use as filing papers or similar.

Where specified, the unit shall be loaded in accordance with the loads calculated in [Table 1](#). When the unit or component is conspicuously and durably marked by the manufacturer with a maximum load, the unit or component shall be loaded with the stated maximum load multiplied by 0,5 but shall not exceed the load calculated using [Table 1](#).

The unit shall not overturn when tested according to this document using [Tables A.1, A.2 or A.3](#). If the storage unit is prevented from overturning by an open extension element, open door or open flap, the stability requirements are not fulfilled unless the intention is to prevent overturning.

Table A.1 — Forces for stability tests for storage units in general domestic and contract use

Test No	Test	Subclause	Loading	Force
1	Doors, extension elements and flaps closed, all storage units unloaded - Units that are or can be adjusted to a height of 1 000 mm or less	6.2.1	Vertical force, N	750
2	Doors, extension elements and flaps closed, all storage units unloaded - Units that are or can be adjusted to a height of more than 1 000 mm	6.2.2	Outward force, N	50
3	Opening doors, extension elements and flaps, all storage units unloaded	6.3	NA	NA
4	All storage areas unloaded and all doors, extension elements and flaps open	6.4.1	NA	NA
5	All storage areas unloaded with overturning load	6.4.2	Vertical force, N Components ^a <1 000 mm from the floor Components ^a ≥1 000 mm and <1 600 mm from the floor Components ^a ≥1 600 mm from the floor	100 150 100
6	All storage areas loaded with overturning load	6.4.3	Vertical force, N Components ^a <1 000 mm from the floor Components ^a ≥1 000 mm and <1 600 mm from the floor Components ^a ≥1 600 mm from the floor	20 % of total mass of the unit but not greater than 200 N 20 % of total mass of the unit but not greater than 300 N 20 % of total mass of the unit but not greater than 200 N
7	Doors, extension elements and flaps closed and locked	6.5	Outward force, N	100
8	Dynamic stability test for units with castors	6.6	NA	NA
9	Strength test for wall attachments	6.7	Outward force, N	300
NA: Not applicable				
^a Determined as the vertical distance between the floor and where to apply the force to the component.				