

Office furniture — Tables and desks and storage furniture — Test methods for the determination of strength and durability of moving parts

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ICS 97.140

National foreword

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**Office furniture - Tables and desks and storage furniture - Test
methods for the determination of strength and durability of
moving parts**

Mobilier de bureau - Tables de travail de bureau et meubles
de rangement - Méthodes d'essai pour la détermination de
la résistance et de la durabilité des parties mobiles

Büromöbel - Büro-Arbeitstische und Büroschränke -
Prüfverfahren für die Bestimmung der Festigkeit und der
Dauerhaltbarkeit beweglicher Teile

This European Standard was approved by CEN on 27 May 2004.

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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 14074:2004) has been prepared by Technical Committee CEN/TC 207 "Furniture", the secretariat of which is held by UNI.

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1 Scope

This document specifies test methods for the determination of strength and durability of moving parts of desks, tables and storage furniture.

This document does not apply to high density mechanized filing systems, rotary filing systems or plan files.

The tests are intended to simulate normal functional use, as well as misuse that might reasonably be expected to occur.

Safety requirements can be found in EN 14073-2.

Assessment of ageing is not included.

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.

Not applicable – no normative references in this document.

3 Terms and definitions

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

3.1 catch device
device, which keeps or pulls a component in place, but does not require a second action in order to release it, e.g. a magnetic catch or a self-closing-mechanism

3.2 locking mechanism
mechanism that limits access to the interior of a unit or a storage element. It requires a key or a combination in order to operate it or to make it possible to operate it.

4 General test conditions

4.1 Preliminary preparation

The tests specified in this Standard are designed to be applied to an item of furniture that is fully assembled and ready for use.

The tests refer to furniture parts with conventional functions. Combination of tests may be necessary to cover the properties of multi-function parts, e.g. a shelf that can be pulled out on runners shall be tested for strength of shelf supports as well as for strength as an extension element.

Before any of the tests are commenced, the item shall be old enough to ensure that it has developed its full strength.

The furniture shall be tested as delivered. Ready to Assemble furniture shall be assembled according to the instructions supplied with it. If the furniture can be assembled or combined in different ways, the most adverse combination shall be used for each test. This is also applicable to units that can be combined with other units or components.

Wall or screen mounted units shall be installed according to the manufacturers instructions.

Free standing units shall be placed on the floor surface (5.2) with stops (5.4) around each leg or base.

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

Tighten any assembly fittings before testing. Further re-tightening shall not take place unless it is specifically required by the manufacturer.

4.2 Test equipment

The forces in the static load tests shall be applied sufficiently slowly to ensure that the influence of dynamic load is negligible. Unless otherwise stated, the static loads shall be maintained for (10 ± 2) s.

The forces in durability tests shall be applied sufficiently slowly to ensure that heating does not occur. Unless otherwise stated, the durability loads shall be maintained for (2 ± 1) s.

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

The test equipment shall be capable of following the deformations that may occur during the tests.

4.3 Tolerances

Unless otherwise stated:

- forces shall have an accuracy of $\pm 5\%$ of the nominal force;
- dimensions an accuracy of $\pm 1,0$ mm of the nominal dimension;
- masses an accuracy of $\pm 0,5\%$ of the nominal mass;
- velocities an accuracy of $\pm 5\%$ of the nominal velocity;
- angles an accuracy of $\pm 2^\circ$ of the nominal angle.

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

The relationship $10\text{N} = 1$ kg may be used.

4.4 Sequence of testing

The tests shall be carried out on the same unit. The tests shall be carried out on the same part and in the specified sequence, but it is not necessary to test the different parts of the item in the sequence of the clauses.

For any unit fitted with more than one flap, door or extension element that is identical in every respect excluding the direction of opening, it is only necessary to test one of the relevant flaps, doors or extension elements. For an item fitted with flaps, doors or extension elements which are not identical, the flap, door or extension element producing the most adverse conditions shall be tested.

5 Test apparatus

5.1 Obstacles for rolling test

Steel strips, 50 mm wide and 2 mm high with the edges having a radius of 2 mm, 500 mm apart and parallel on the floor surface and perpendicular to the test direction..

5.2 Floor surface

A rigid, horizontal and flat surface.

For the rolling test, a horizontal smooth steel surface.

5.3 Wall Surface

A rigid, vertical and flat surface.

5.4 Stops

Devices to prevent the unit from sliding no higher than 12 mm except in cases where the design of the unit necessitates the use of higher stops, in which case the lowest that will prevent the item from sliding shall be used.

5.5 Masses

Masses shall not reinforce the structure or redistribute the stresses.

If bags with metal shots etc. are used they shall be divided into small compartments to prevent the contents from moving during the tests.

Loads shall be evenly distributed unless otherwise stated.

Suspended pocket files shall be loaded with typing paper or a suitable representation of it and where applicable pocket files shall be oriented in the most adverse direction.

5.6 Glass marbles

Glass marbles between 10 mm and 15 mm in diameter shall be used for the slam open test for extension elements described in (6.2.3). They shall be in a flexible bag large enough to allow them to move freely during the test.

5.7 Loading pad

A rigid cylindrical object 100mm in diameter (or 50 mm in diameter to be used in limited space), having a flat face with 12 mm radius on the edge.

5.8 Apparatus for slam open/shut of extension elements

Apparatus as well as calibration instructions are given in annex A.

6 Test methods

6.1 Determination of loading of storage parts

The volume of extension elements shall be taken as the area of the bottom of the extension element multiplied by the clear height. The clear height is the distance between the top surface of the bottom of the extension element and the lower edge of the front of the extension element of the extension element above, or the structure of the unit.

All parts intended for storage purposes shall be uniformly loaded according to Table 1 unless otherwise specified by the manufacturer.

Table 1 — Loading of storage parts

Part	Load	
Shelves	kg/dm ²	1,5
Clothes Rails	kg/dm	5,0
Extension elements	kg/dm ³	0,5
Suspended pocket files	kg/dm ^{a)}	4,0
a) Measured perpendicular to the suspended pocket file.		

Further loads shall be placed on top of free standing units if this is necessary to prevent tilting.

6.2 Extension elements

6.2.1 Strength of extension elements

Load the extension element according to 6.1.

Open the extension element to its open stops. If it is not fitted with open stops, and is intended to be taken out, open it to the point at which one-third of its inside length (depth) remains inside the unit, see figure 1.

Apply a vertical force equal to the total mass of the extension element up to a max of 250 N to one top front corner, see figure 1. The total mass is the weight of the extension element plus the load specified in 6.1.

If the extension element is forced out of the unit it shall be re-assembled if necessary and returned to the unit. This shall be recorded in the report.

Carry out the test ten times.

Before and after the test, inspect the function of the extension element (including the opening and closing forces if required).

Dimensions in millimetres

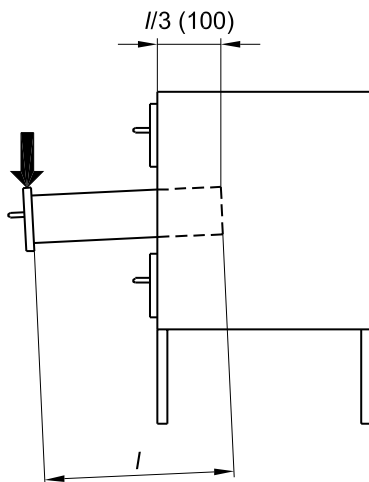


Figure 1 — Strength of extension elements

6.2.2 Durability test of extension elements

Load the extension element according to 6.1.

Open and close the extension element without vertical and horizontal support, over its full distance of travel, without forcing the stops, for 50 000 cycles. The recommended rate is maximum 6 cycles per minute.

If an extension element is not equipped with open stops, open it from the fully closed position to the point at which one-third of the inside length (depth) of the extension element remains inside the unit, see figure 2.

The operating force shall be applied at the level intended in normal use (i.e. the extension element handle) or, in case of two handles, in the middle between the handles. Ensure that no downwards force is applied to the extension element runners when closing the extension element.

Before and after the test, inspect the appearance and function of the extension element and runners (including the opening and closing force if required).

Dimensions in millimetres

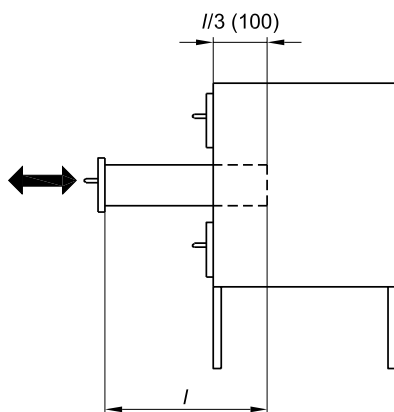


Figure 2 — Durability test of extension elements

6.2.3 Slam open of extension elements

Place the extension element on its runners and load it according to 6.1 with glass marbles (5.6) or in case of suspended pocket files, with typing paper or a suitable representation of it (5.5). Close the extension element to a position 300 mm from the fully open position (or fully close the extension element if the travel is less than 300 mm).

Testing shall be carried out with an apparatus working according to one of the two methods specified in A.1 and A.2 in Annex A.

The calibration slam open velocities shall be 1,3 m/s for a 5 kg extension element and 1,0 m/s for a 35 kg extension element (see A.1.3).

Apply the force on the centreline of the extension elements front or back at the same level as the handle.

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

Slam the extension elements open 10 times.

Before and after the test, inspect the appearance and function of the extension element and runners (including the opening and closing force if required)

6.2.4 Interlock test

When interlocks are fitted, one extension element shall be fully extended and an outward force of 200 N shall be applied to the handles of each of the remaining extension elements one at a time.

The test shall be carried out a total of 10 times on each element. Record if the extension elements are retained closed.

6.3 Hinged or pivoted doors

6.3.1 Vertical load on doors

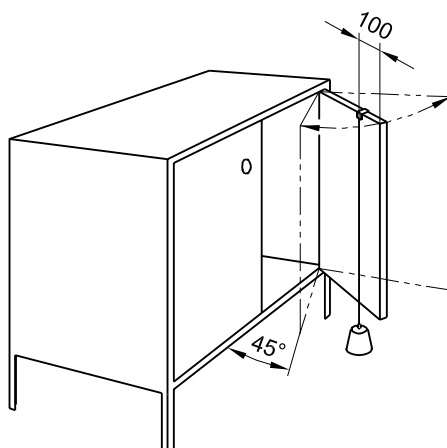
Load the door as shown in figure 3 with a mass of 30 kg placed 100 mm from its outer edge.

Swing the door 10 full cycles (back and forth) from a position 45° from fully closed to a position 10° from fully opened, but to a maximum of 135°. The recommended rate is maximum 6 cycles per minute.

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

Before and after the test, inspect the appearance and function of the door (unloaded) after using any adjustment provided.

Dimensions in millimetres

**Figure 3 — Vertical load on doors**

6.3.2 Horizontal static force on open door

This test is only applicable to doors having a maximum opening angle of 135° or less.

Apply a horizontal static force of 80 N to the fully opened door perpendicular to the plane of the door on its horizontal centre line 100 mm from the outer edge of the door in the direction of the opening, (see figure 4). Apply the load 10 times.

Before and after the test, inspect the appearance and function of the unloaded door after using the adjustment provided.

Dimensions in millimetres

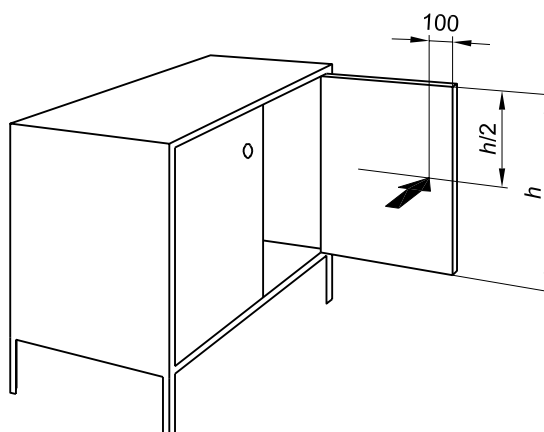


Figure 4 — Horizontal static force on open door

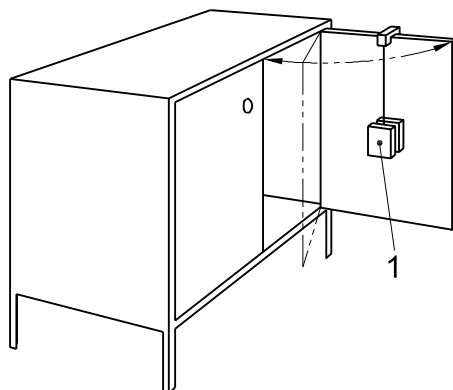
6.3.3 Durability test on hinged and pivoted doors

Attach a mass of 2 kg (see figure 5) equally distributed on both sides of the door on the vertical center line.

Fully open the door to a maximum of 135° and close it for 50 000 cycles (back and forth) without forcing built-in stops in the open position. The recommended rate is maximum 6 cycles per minute.

Any door closing catch mechanism fitted shall be operated at every cycle. This does not include locking mechanisms.

Before and after the test, inspect the appearance and function of the unloaded door after using any adjustment provided.



Key

1 2 x 1Kg

Figure 5 — Durability test on hinged and pivoted doors

6.4 Sliding doors and horizontal roll fronts

6.4.1 Durability test of sliding doors and horizontal roll fronts

Using the handle, open and close the sliding door 40 000 cycles, or for roll fronts 20 000 cycles from the fully closed position to a position 50 mm from the fully opened position (see figure 6). The recommended rate is maximum 6 cycles per minute.

If the door/roll front has a catch mechanism, it shall be operated at every cycle. This does not include locking mechanisms.

Before and after the test, inspect the appearance and function of the sliding door or roll front (including the opening and closing force, if required).

Dimensions in millimetres

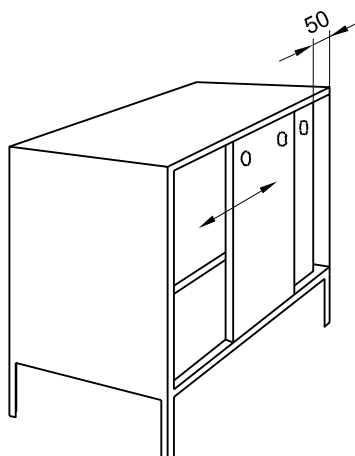


Figure 6 — Durability test of sliding doors and horizontal roll fronts

6.4.2 Slam shut/open of sliding doors and horizontal roll fronts

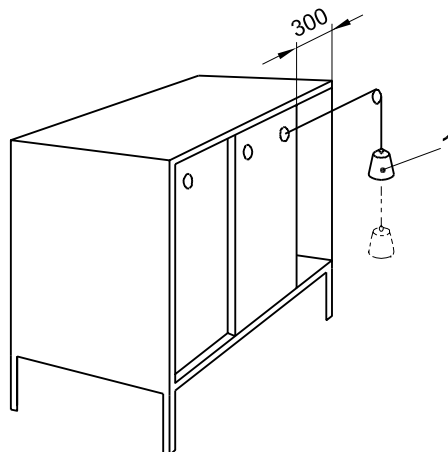
The sliding door or roll front shall be opened/closed by means of a cord attached to the centre of the handle. If the handle has a length greater than 200mm, the cord shall be attached 100mm below the top of the handle up to a maximum height from the floor of 1 200mm.

Determine the mass w , required to just move the door. The test weight shall be 4 kg plus the mass w .

Start the movement 300 mm from the closed/opened positions respectively. The test force shall be removed 10 mm before the sliding door/roll front is fully closed/opened. The test shall be carried out as shown in figure 7.

Close/open the door/roll front 10 times towards the fully closed/opened positions using the test mass.

Before and after the test, inspect the appearance and function of the door/roll front and runners (including the opening and closing force, if required).

**Key**

1 W + 4Kg

Figure 7 — Slam shut/open of sliding doors and horizontal roll fronts**6.5 Vertical roll fronts****6.5.1 Durability of vertical roll front**

Open and close the roll front fully 20 000 cycles. The recommended rate is maximum 6 cycles per minute.

If the roll front has a catch mechanism, it shall be operated at every cycle. This does not include locking mechanisms.

Before and after the test, inspect the appearance and function of the roll front and runners (including the opening and closing forces, if required).

6.6 Flaps**6.6.1 Strength of flaps**

With the flap in its fully opened/extended position, apply a downward static force of 250 N using the loading pad (5.7) 10 times, 50 mm from the weakest corner (see figure 8).

Inspect the unit before and after the test.

Dimensions in millimetres

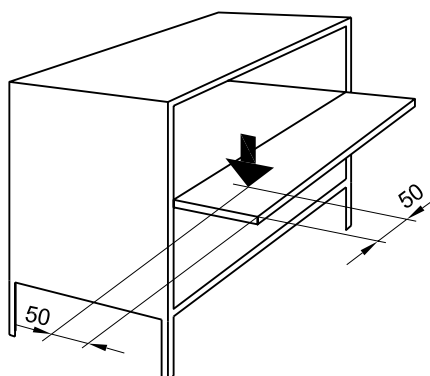


Figure 8 — Strength of flaps

6.6.2 Durability of flaps

Open and close the flap fully 20 000 cycles. The recommended rate is maximum 6 cycles per minute.

If the flap has a catch mechanism, it shall be operated at every cycle. This does not include locking mechanisms.

When the flap is fitted with an adjustable friction stay it shall be adjusted so that the flap will just open under its own weight and re-adjusted not more than 10 times during the test.

Before and after the test, inspect the appearance and function of the flaps, hinges etc. re-adjusting, if possible and taking note of whether a friction stay will allow a flap to just open under its own weight.

If required, measure the braking force of any friction stay before and after the test.

6.7 Rolling test for mobile filing pedestals

This test is only applicable to mobile filing pedestals.

Load the unit as specified in 6.1.

At least one castor shall be run over two obstacles (5.1) at a mean speed of 0,5 m/s for a distance of one meter. At the end of one meter the direction of travel shall be reversed and the castor shall return to the starting point. This cycle shall be repeated until the castors have been running for 2 minutes.

There shall then be a cooling period of 2 minutes before the next 2 minute test run is started.

The procedure shall be repeated until 2 000 cycles have been completed. One cycle consists of one movement to and fro.

Inspect the castors and the structure for damage affecting function immediately after testing and after a recovery period of 24 hours.

7 Test report

The test report shall include at least the following items:

- a) number of this document;
- b) details of the piece of furniture tested;
- c) manner of installation if appropriate;
- d) any defects observed before testing;
- e) test results according to the applicable clauses;
- f) details of any deviations from this document;
- g) name and address of the test facility;
- h) date of test.

Annex A (informative)

Apparatus for slam open and shut test of extension elements

A.1 Slam open test with pneumatic actuator

A.1.1 Principle

Lightweight (empty) extension elements are slammed at consistently higher speeds than heavy (full) extension elements, but friction does not significantly affect the slamming speed.

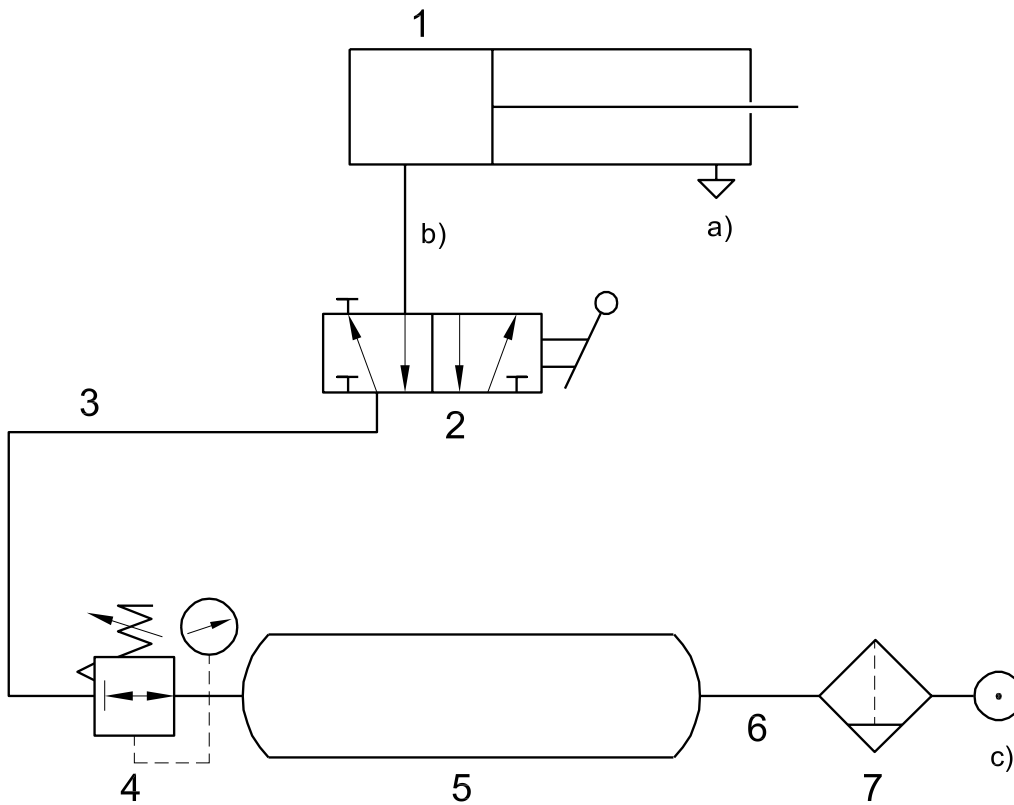
Standard 'empty' (5 kg) and 'full' (35 kg) extension elements with minimal friction are used to simulate these conditions. Using these extension elements the speed of the extension element slamming apparatus is adjusted to the slamming velocities specified.

A.1.2 Apparatus

A suitable apparatus for slam shut tests of extension elements 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. This rate of flow is controlled by the incorporation of connecting tubing of specified bores and lengths. (See figure A.1).

A.1.3 Calibration

Using two standard extension elements, having masses of 5kg and 35kg respectively, and exhibiting a total frictional force in the runners of not greater than 10N, calibrate the apparatus to produce the closing and opening velocities specified in 6.2.3.



Key

- 1) Cylinder (diameter 40mm, stroke 300mm)
- 2) Valve ¼"(nominal air flow > 900 l/min)
- 3) Tube (bore 6 mm, length 720mm)
- 4) Pressure regulator (nominal air flow > 900 l/min)
- 5) Air reservoir (radius 37,5mm; length 350mm; volume 1,545 6 cm³)
- 6) Tube (bore 3mm, length 1040mm)
- 7) Air cleaner (nominal air flow > 900 l/min)

- a) Free outlet
- b) Valve to be mounted directly on cylinder
- c) Primary pressure 6 KPa

Figure A.1 — Circuit diagram for pneumatic extension element slamming apparatus

A.2 Slam open test with weight and string

A.2.1 Slam open test

The extension element shall be opened by a hanging weight (m) that is attached to the extension element by means of a string or cord. The force exerted by the weight is removed 10 mm before the extension element reaches its end stops. The movement is started 300 mm from fully opened position.

Dimensions in millimetres

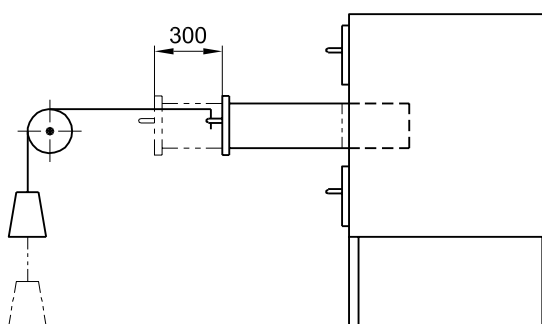


Figure A.2 — Extension element-slamming apparatus with hanging weight

The mass (m) of the hanging weight is calculated by the following formula

$$m = 2,5 \times \sqrt[3]{M}$$

M is the total mass of the extension element.

The slam velocity after a travel distance of 300 mm will be equal to the slam velocity exerted by the pneumatic slamming apparatus of A.1 calibrated 1,3 m/s for 5 kg and 1,0 m/s for 35 kg.

Bibliography

- [1] EN 14073-2,. *Office furniture - Storage furniture - Part 2: Safety requirements*

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