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Hardware for furniture — Strength and durability of hinges and their components — Hinges pivoting on a vertical axis

Quincaillerie d'ameublement — Solidité et durabilité des charnières et de leurs composants — Charnières avec pivot vertical

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Foreword

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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).

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

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.

Introduction

The aim of this document is to provide furniture manufacturers, designers and developers with comparable information regarding the performance of all types of hinges pivoting on a vertical axis and their components.

The tests consist of the application of loads, forces and velocities simulating normal functional use, as well as misuse, that can reasonably be expected to occur.

With the exception of the corrosion test in Clause 6.4, the tests are designed to evaluate properties without regard to materials, design/construction or manufacturing processes.

The strength and durability tests only relate to the hinges and the parts used for the attachment (e.g. mounting plates and screws).

The strength and durability tests are carried out in a test frame with specified properties.

The test results are only valid for the hinges tested. These results are used to represent the performance of production models provided that the tested model is representative of the production model.

Hardware for furniture — Strength and durability of hinges and their components — Hinges pivoting on a vertical axis

1 Scope

This document specifies test methods and test parameters for the strength and durability of all types of hinges pivoting on a vertical axis and their components for all fields of application.

With the exception of corrosion, ageing and the influence of heat and humidity are not included.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 6270-2, *Paints and varnishes — Determination of resistance to humidity — Part 2: Condensation (in-cabinet exposure with heated water reservoir)*

ISO 9427:2003, *Wood-based panels — Determination of density*

EN 320:2011, *Particleboards and fibreboards — Determination of resistance to axial withdrawal of screws*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
catch device
device that keeps or pulls a door in place, but does not require a second action in order to release it

EXAMPLE magnetic catch or a self-closing or self-opening mechanism

3.2
damper
mechanism which stops the movement of a door gently

4 Test conditions

4.1 General

The hinges shall be assembled/mounted/adjusted according to the instructions supplied with it.

If mounting, assembly or adjustment instructions are not supplied, the most adverse configuration shall be used and the mounting or assembly method shall be recorded in the test report. Fittings shall be tightened before testing and shall not be re-tightened unless specifically required in the manufacturer's instructions. If the configuration has to be changed to produce the worst-case conditions, this shall be recorded in the test report.

The tests shall be carried out in indoor ambient conditions at a temperature between 15 °C to 27 °C. If during a test the temperature is outside of the range of 15 °C to 27 °C, the maximum and/or minimum temperature shall be recorded in the test report.

Hinges which include structural hardware parts made of hygroscopic plastic materials (e.g. polyamide) shall be conditioned at (23 ± 2) °C and at a relative humidity of (50 ± 5) % for 7 days before testing.

NOTE For accelerating the conditioning process, ISO 1110 [1] can be used.

If a test cannot be carried out as specified, the test shall be carried out as closely as possible to that specified. Any modification to the test method shall be technically justified and recorded in the test report. Before beginning testing, visually inspect the hinges and components thoroughly. Record any defects to eliminate any assumption that they have been caused by the tests. Carry out measurements if specified.

4.2 Application of forces

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

The forces in durability tests shall be applied at a rate to ensure that excessive heating does not occur.

The forces may be replaced by masses. The relation 10 N = 1 kg shall be used for this purpose.

4.3 Tolerances

Unless otherwise stated, the following tolerances are applicable:

Forces: ± 5 % of the nominal force;

Velocities: ± 5 % of the nominal velocity;

Masses: ± 1 % of the nominal mass;

Dimensions: ± 1 mm of the nominal dimension;

Angles: ± 2° of the nominal angle.

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

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

4.4 Sequence of testing

The tests shall be carried out in the same sequence as the clauses are numbered in this document. If the clause sequence is not followed, the sequence shall be recorded in the test report.

4.5 Inspection and assessment of results

Before and after the completion of each test carry out the inspection as specified, after using adjustment device, if available.

Record any changes that have taken place since the initial inspection.

The inspection shall include at least the following:

a) fracture of any component or joint;

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

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

d) loosening of any means of fixing components;

e) any impaired function of a component or part.

5 Test equipment

5.1 General

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

The equipment shall not inhibit deflection of the test door, i.e. it shall be able to move so that it will allow the deflection of the test door during testing.

5.2 Masses

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

5.3 Test frame

The tests specified in 6.2 and 6.3 shall be carried out in a test frame (see Figure 1), which is so constructed that the deformation under the applied loads is no more than 1 mm.

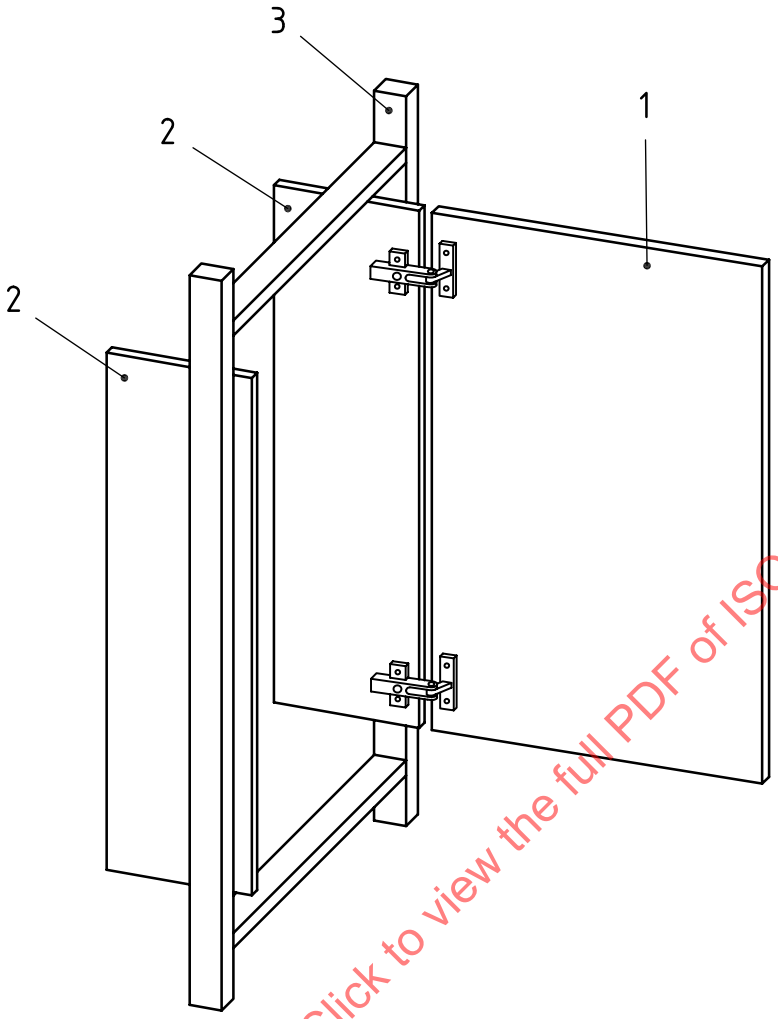
NOTE The test performance of the components in the test frame can only be used as a guide to the performance of the piece of furniture.

Hinges for wooden doors shall be mounted on particle board, 5.4, unless otherwise specified.

Hinges for other materials (e.g. glass, metal or plastic) shall be mounted according to the manufacturer's instructions.

The position of hinges and components on the door and the test frame as well as the size and weight of the door shall be as specified by the manufacturer, see Annex A.

In cases where the door parameters (e.g. height, width, mass) are not specified by the manufacturer, record this situation in the test report and the tests may be carried out using the standard door sizes specified in Annex B, see Table B.1 and Figure B.1.



Key

1 test door
2 test sides
3 test frame

Figure 1 — Test frame and test door

5.4 Particle board properties

The properties of the particle board shall be as specified in Table 1.

Table 1 — Particle board properties

Property	Standard	Requirement
Face withdrawal of screws	EN 320:2011	1 100 ± 100 N
Density	ISO 9427:2003	0,65 ± 0,05 g/cm^3

6 Test procedures and requirements

6.1 General

For the following tests, three sets of hinges shall be used as follows:

The first set shall be used for the first test sequence specified in 6.2.

The second set shall be used for the second test sequence specified in 6.3.

The third set shall be used for the corrosion test specified in 6.4.

All overload and functional tests shall be carried out according to the same column (1, 2 or 3) in Annex B.

6.2 Overload tests

6.2.1 General

Hardware or hinges that belong to level 1 (see Table B.2) shall not be tested.

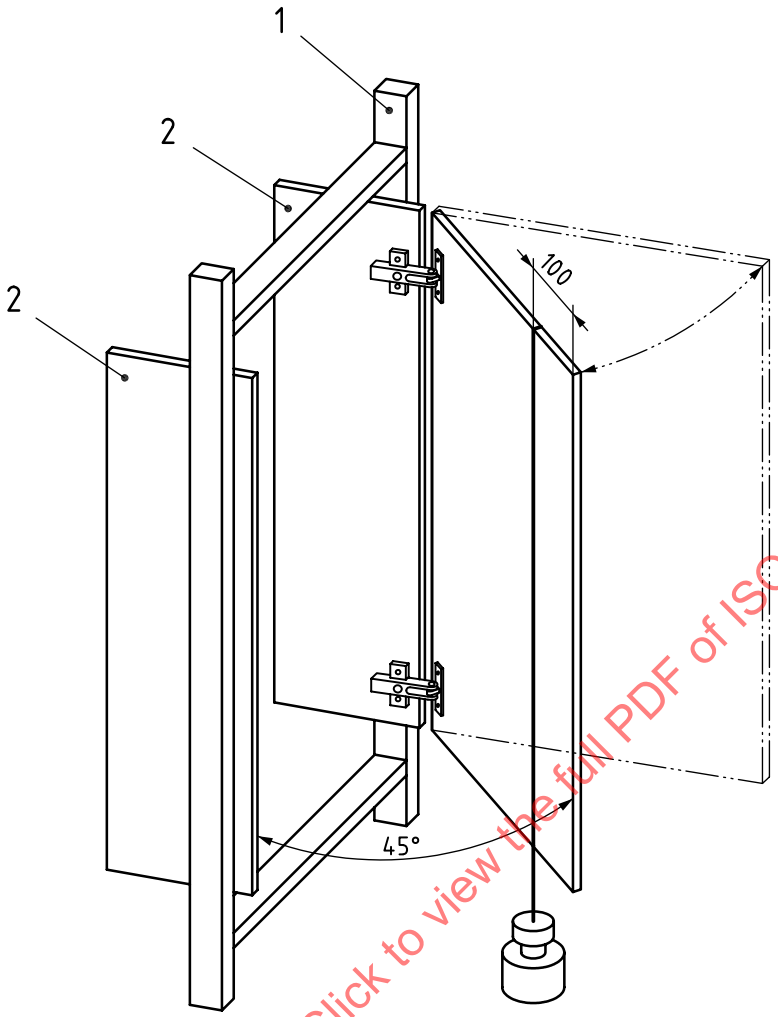
6.2.2 Vertical static overload

Load the door as shown in Figure 2 with the mass specified in Annex B (see Table B.2). The mass shall be suspended 100 mm from the edge furthest from the hinge.

Open and close the door 10 full cycles (back and forth) from a position 45° from fully closed to a position 10° from fully opened, up to a maximum of 135° from the fully closed position.

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

The door and/or hinges shall not become detached.



Key

1 test frame

2 test sides

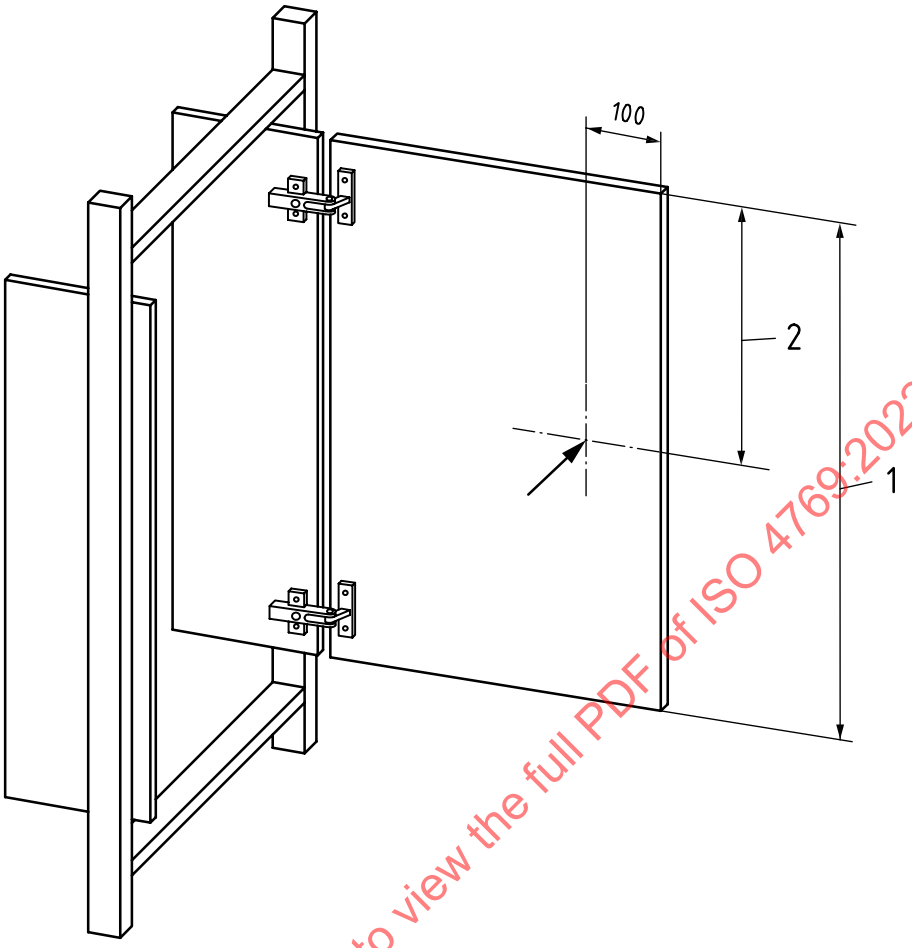
Figure 2 — Vertical static overload

6.2.3 Horizontal static overload

This test applies only to hinges with a maximum opening angle < 135°.

Apply the horizontal static load specified in Annex B (see Table B.2) 10 times perpendicular to the plane of the door on its horizontal centreline 100 mm from the edge furthest from the hinge, as shown in Figure 3.

The door, hinges or their components shall not become detached.



Key

1 door height

2 half door height

Figure 3 — Horizontal static load

6.3 Functional tests

6.3.1 General

During testing according to 6.3, the test door shall be loaded according to Annex A or Annex B.

6.3.2 Operating forces

6.3.2.1 General

The operating forces shall be measured before and after the durability test. The measurements of operating forces shall be made with the door unloaded.

6.3.2.2 Closing force, hinges with self-closing mechanisms

The closing force of hinges with self-closing mechanisms shall be measured as shown in Figure 4.

Before measuring the closing force F_0, the door shall be fully opened 10 times by hand.

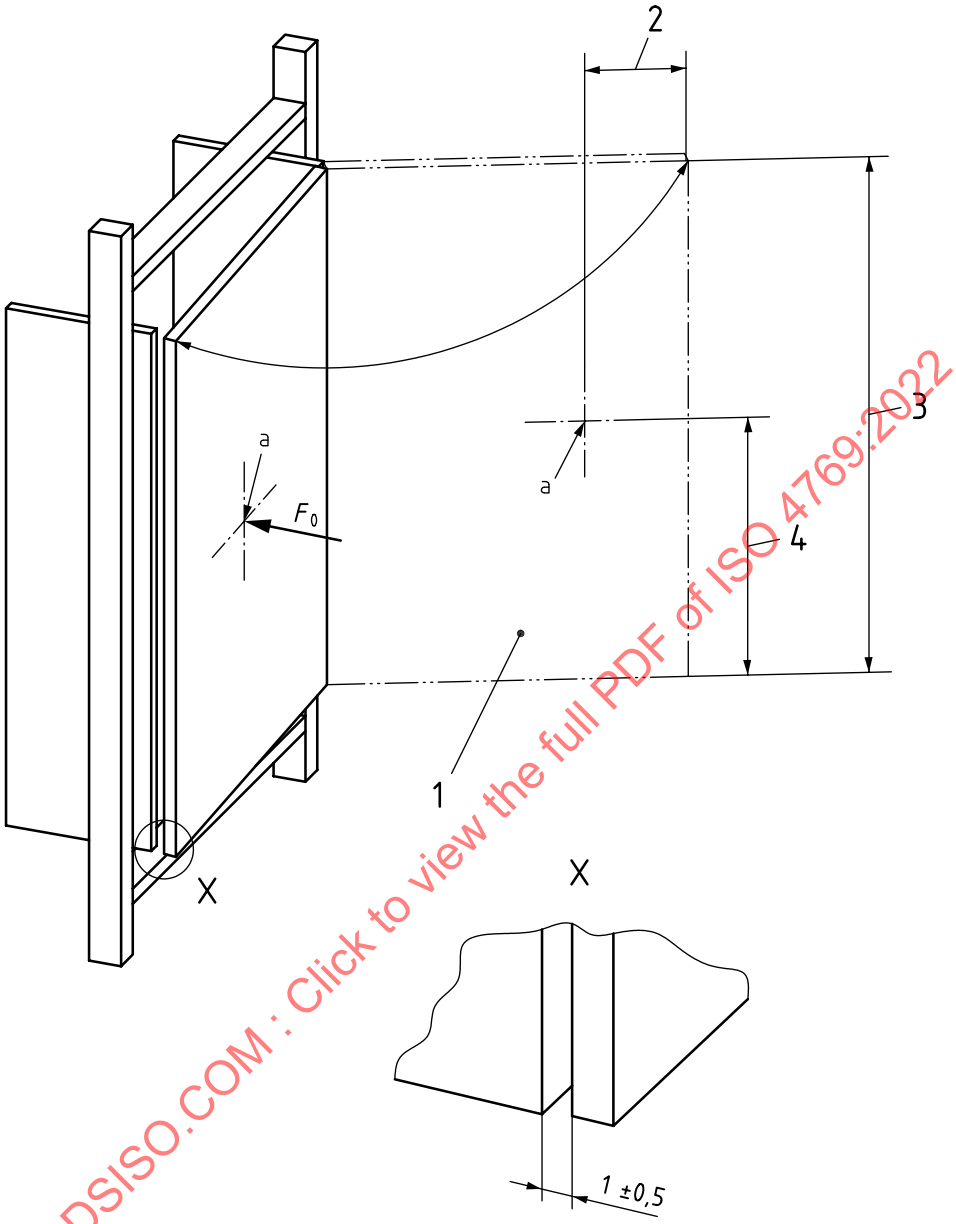
The door shall be moved slowly towards the closed position. The static closing force shall be measured at a position $1^{+0,5}_{-0,5}$ mm before the fully closed position.

NOTE The closing speed can have an influence on the measured closing force. It is suggested to keep it as slow as possible, approximately 1 mm/s. In case of damper mechanisms, it can be necessary to reduce the closing speed to obtain the maximum self-closing force.

During the measurement, the opening and closing forces shall be applied perpendicular to the front.

The closing force of hinges with self-closing spring mechanism shall not be less than 0,5 N before and after the durability test.

Dimensions in millimetres



Key

1 test door (see figure 1)
2 100 mm
3 door height
4 half door height
a Measuring point.
F_0 closing force

Figure 4 — Measuring the closing force F_0

6.3.2.3 Opening and closing forces

The opening and closing forces, *F*, shall be measured at the measuring point, see Figure 4, through the full opening angle using a constant and slow opening/closing speed.

The opening and closing forces shall not be more than 20 N before and after the durability test.

NOTE In case of damper mechanisms, it can be necessary to reduce the opening/closing speed to obtain the forces.

6.3.3 First vertical static load test

Load the door as shown in Figure 2 with the mass specified in Annex B. The mass shall be suspended 100 mm from the edge furthest from the hinge.

Open and close the door 10 full cycles (back and forth) from a position 45° from fully closed to a position 10° from fully opened, up to a maximum of 135° from the fully closed position.

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

Carry out inspection and assessment according to 4.5 without the test load.

After the test, the hinges and their components shall fulfil their functions.

6.3.4 First horizontal static load

This test applies only to hinges with a maximum opening angle < 135°.

Apply the horizontal static load specified in Annex B 10 times perpendicular to the plane of the door on its horizontal centreline 100 mm from the edge furthest from the hinge, as shown in Figure 3.

Carry out inspection and assessment according to 4.5 without the test load.

After the test, the hinges and their components shall fulfil their functions.

6.3.5 Slam shut

The door shall be closed by means of a string or cord attached to the back of the door.

The cord shall act at the point a, see Figure 5, perpendicular to the face of the door, when it is fully closed and shall not change direction by an angle greater than 20° during movement.

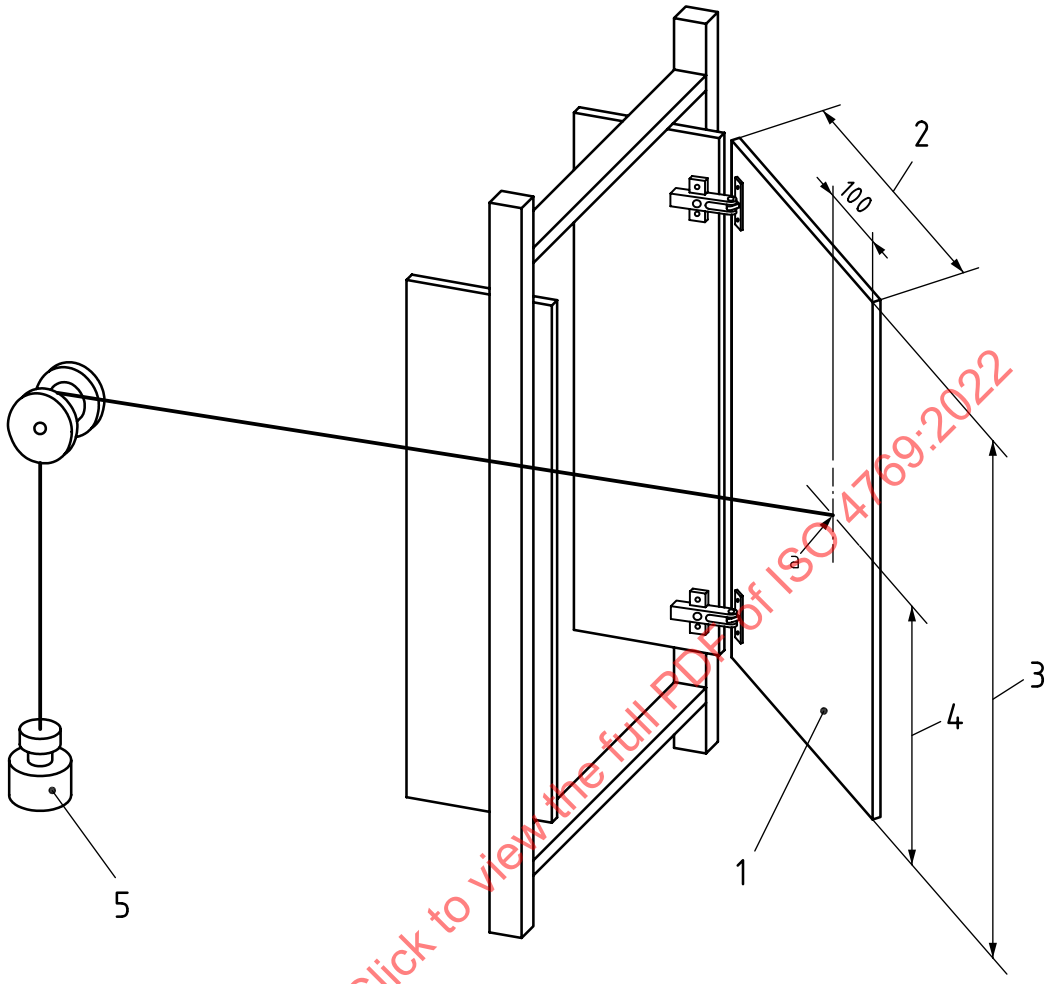
The test mass shall act until 10 mm before the door is fully closed. The mass shall fall through a distance of 300 mm. The test shall be carried out as shown in Figure 5.

Open the door to starting position. Determine the mass, *m1*, required to initiate moving the door. The test mass from Annex B shall be the mass, *m2*.

Slam shut the door 10 times using the masses (*m1* + *m2*).

Where dampers are used, slam shut the door for additional 100 times using the masses (*m1* + *m3*). If the minimum mass of *m3* does not cause the slam to override the damper function, increase the value of *m3* in steps of 100 g until this happens, however, not more than to the maximum mass of *m3* specified in Annex B.

Dimensions in millimetres



Key

1 test door (see figure 1)
2 door width
3 door height
4 half door height
5 masses m1 + m2

Figure 5 — Slam shut at point a

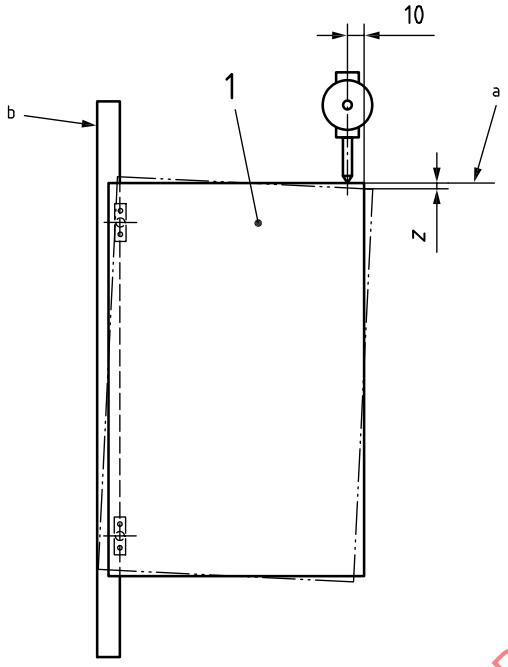
Carry out inspection and assessment according to 4.5.

After the test, the hinges and their components shall fulfil their functions.

6.3.6 Determination of reference point for the door sagging

The reference point shall be determined on the closed test door before the durability test 6.3.7 (see Figure 6).

Dimensions in millimetres



Key

1 test door (closed position)

a Reference edge.

b Test side panel.

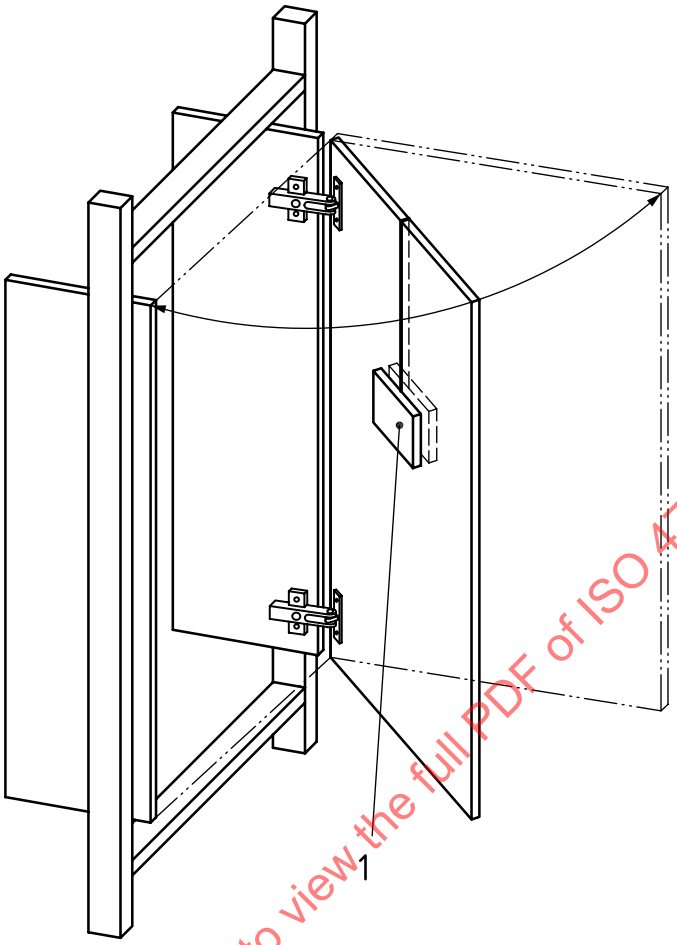
Z door sagging

Figure 6 — Measuring the door sagging

6.3.7 Durability

Attach two masses, 1 kg each, one on each side of the door at the middle of the vertical centreline (see Figure 7).

Fully open the door to a maximum of 130° and fully close it for the number of cycles (back and forth) according to Annex B, without forcing built-in stops in the open position.



Key

1 1 kg masses

Figure 7 — Durability test of pivoted doors

The door shall be gently opened and closed at each cycle without forcing dampers and/or catch devices including self-opening and self-closing mechanisms. If the hinges have dampers and/or catch devices, including self-opening and self-closing mechanisms, these shall be allowed to operate correctly according to their function at each cycle.

The rate shall be a maximum of 6 cycles per minute with the pause in the closed position. When dampers start to function, the angular velocity can be (45 ± 20)°/s.

Carry out inspection and assessment according to 4.5 without the test load.

After the test, the hinges and their components shall fulfil their functions.

6.3.8 Deflection (sagging) test

After the durability test and after removing the two 1 kg masses, the sagging (z in Figure 6) shall be determined before and after using adjustment systems. The accuracy of the measurement shall be ±0,1 mm.

The sagging before using adjustment systems shall not exceed 0,5 % of the width of the door.

6.3.9 Second vertical static load

Load the door as shown in Figure 2 with the mass specified in Annex B. The mass shall be suspended 100 mm from the edge furthest from the hinge.

Open and close the door 10 full cycles (back and forth) from a position 45° from fully closed to a position 10° from fully opened, up to a maximum of 135° from the fully closed position.

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

Carry out inspection and assessment according to 4.5 without the test load.

After the test, the hinges and their components shall fulfil their functions.

6.3.10 Second horizontal static load

This test applies only to hinges with a maximum opening angle < 135°.

Apply the horizontal static load specified in Annex B 10 times perpendicular to the plane of the door on its horizontal centreline 100 mm from the edge furthest from the hinge, as shown in Figure 3.

Carry out inspection and assessment according to 4.5 without the test load.

After the test, the hinges and their components shall fulfil their functions.

6.4 Corrosion resistance

The corrosion test shall be carried out when required on the third set of hinges according to ISO 6270-2.

Requirement: 3 cycles AHT.

With the exception of cutting edges, screw slots, rivet heads, aluminium and moulded parts of zinc, all parts which are visible when the hinges are mounted shall show no corrosion. The function shall be maintained.

If the corrosion test has not been carried out, information on this shall be included in the product information (Annex A).

7 Test report

The test report shall include at least the following information:

a) reference to this document and the applied requirement document;

b) description of the hinges tested and the test door parameters;

c) any defects observed before testing;

d) test results according to subclauses 6.2.1 to 6.4;

e) details to be included in the product information (Annex A);

f) load and test rate used for the durability test;

g) details of any deviations from this document;

h) name and address of the test facility;

i) date(s) of test.