INTERNATIONAL STANDARD

ISO

15822

First edition
2007-06-01

Test method of doorset opening performance in diagonal deformation — Seismic aspects

Méthode d'essai de la performance d'ouverture des blocs-portes en déformation diagonale — Considérations sismiques

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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ISO 15822 was prepared by Technical Committee ISO/TC 162, *Doors and windows*.

Introduction

This International Standard determines the extent to which the opening facility is ensured and retained for doorsets used for emergency passage in order that they be safe in case of an earthquake.

Test method of doorset opening performance in diagonal deformation — Seismic aspects

1 Scope

This International Standard specifies the test method for evaluating the opening function of single-leaf doorset under in-plane diagonal deformation by in-plane static load.

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 1804, *Doors — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1804 and the following apply.

3.1
in-plane displacement
ratio of difference in amounts of horizontal movements of upper and lower ends to the distance between the vertical measuring points

NOTE   In-plane displacement is designated in units of radians.

3.2
opening force
force applied to open the door leaf

3.3
unlocking torque value
force, in torque value, applied to unlock the doorset

4 Principle

The doorset is forced to deform by a static load being gradually applied, and the force necessary to open and unlock the door under such diagonal deformation is measured.

5 Test specimen

The test specimen shall be constructed and installed in operating conditions equivalent to normal and practical use.

If the test specimen contains a glazed area, it shall comply with the requirements of the manufacturer. In case no glass thickness has been specified, the test shall be carried out with the minimum glass thickness specified in the specification.

6 Test apparatus

6.1 Test rig

The test rig shall be a structure where the test specimen can be installed, as shown in Figure 1, in accordance with the manufacturer's specification and the codes of practice. The rig frame shall be sufficiently stiff and rigid to withstand the force applied during the test, and shall be assembled in pin-joint. The details of joints are shown in Figures 2 a) and 2 b).

6.2 Device to apply the force

The device to apply the force shall be able to apply a static force to the test rig to produce diagonal deformation. The force is applied to either the upper or the lower horizontal rig frame. When regarded as a positive force, the force is applied in the direction from the lock side to the hinge side; when regarded as negative force, it is applied in the opposite direction.

6.3 Device to measure the displacement

The device to measure the displacement shall be able to measure the horizontal displacement at measuring points 1 and 2 and vertical displacement at points 3 and 4, as shown in Figure 3. The measuring points shall be 100 mm outside the test rig.

6.4 Device to measure the opening force

The device to measure the opening force shall be able to measure the necessary force, which is applied to the door handle by a pushing or pulling operation, to open the doorset.

6.5 Device to measure the unlocking torque

The device to measure the unlocking torque shall be able to measure the torque value necessary to unlock the doorset by turning the handle or knob.

7 Test procedure

7.1 Installation of the test specimen

The test specimen shall be installed and secured horizontally and vertically, without twists and bends.

7.2 Procedure

7.2.1 The test shall be conducted according to the following procedure from 7.2.2 through 7.2.8.

7.2.2 Check that the door leaf can operate normally and make sure that the doorset can be locked.

7.2.3 Install the displacement measuring device as shown in Figure 2.

7.2.4 Confirm the initial "zero" position of displacement measuring devices.
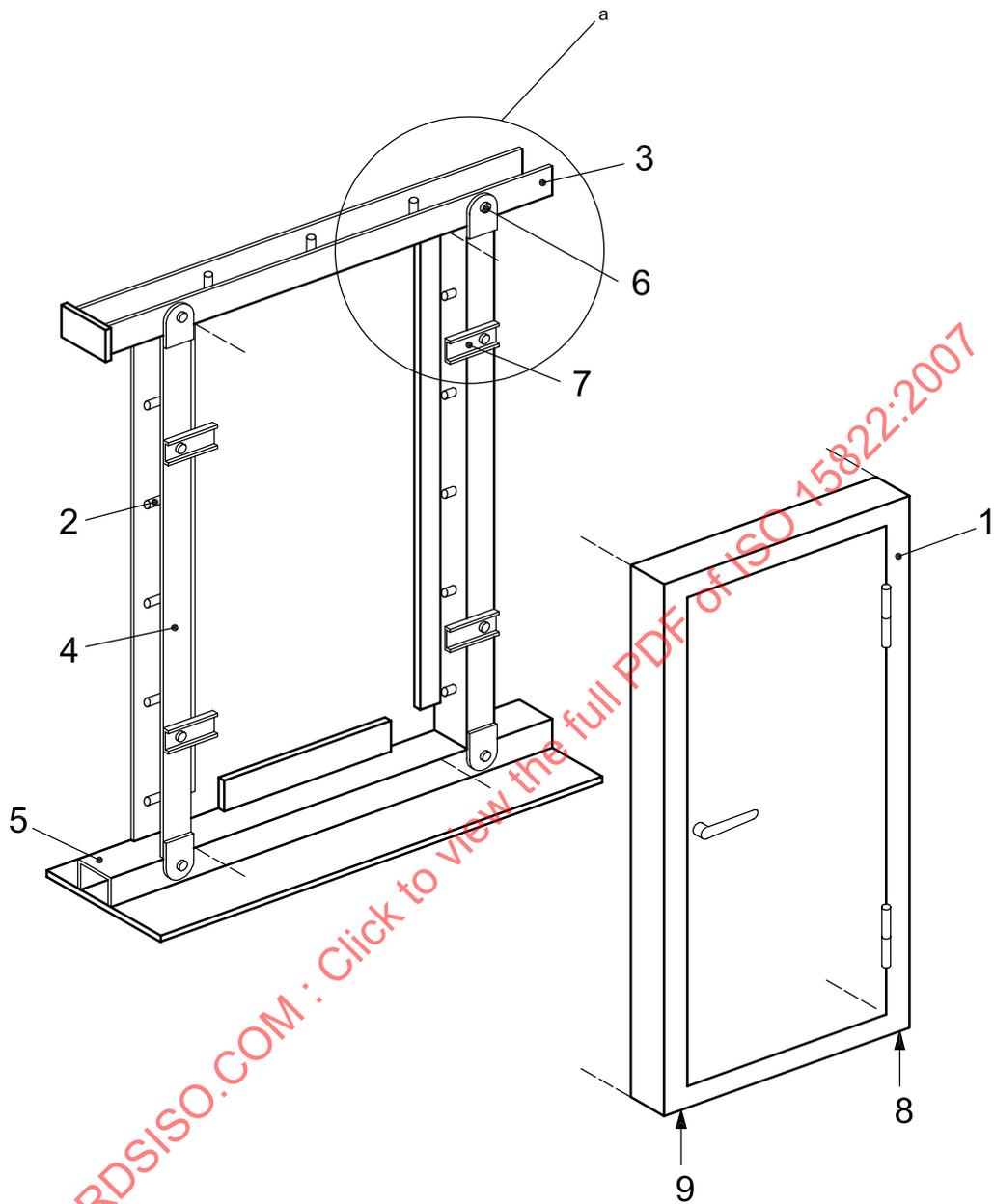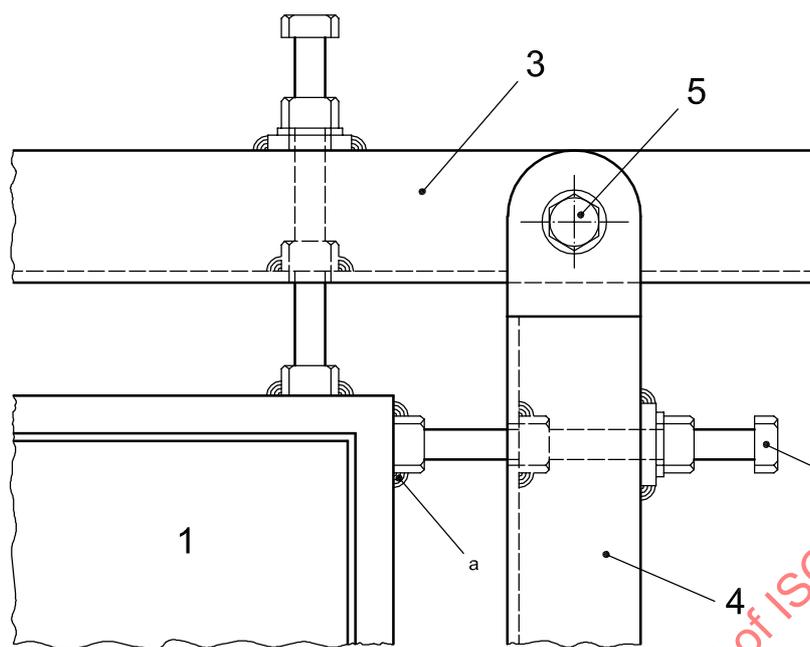
Key

1   test specimen
2   device to secure test specimen in the frame
3   upper horizontal rig frame
4   vertical rig frame
5   lower horizontal rig frame
6   pin joint (pin support)
7   guide
8   hinge side
9   lock side

a   See Figures 2 a) and 2 b).

Figure 1 — Example of test rig
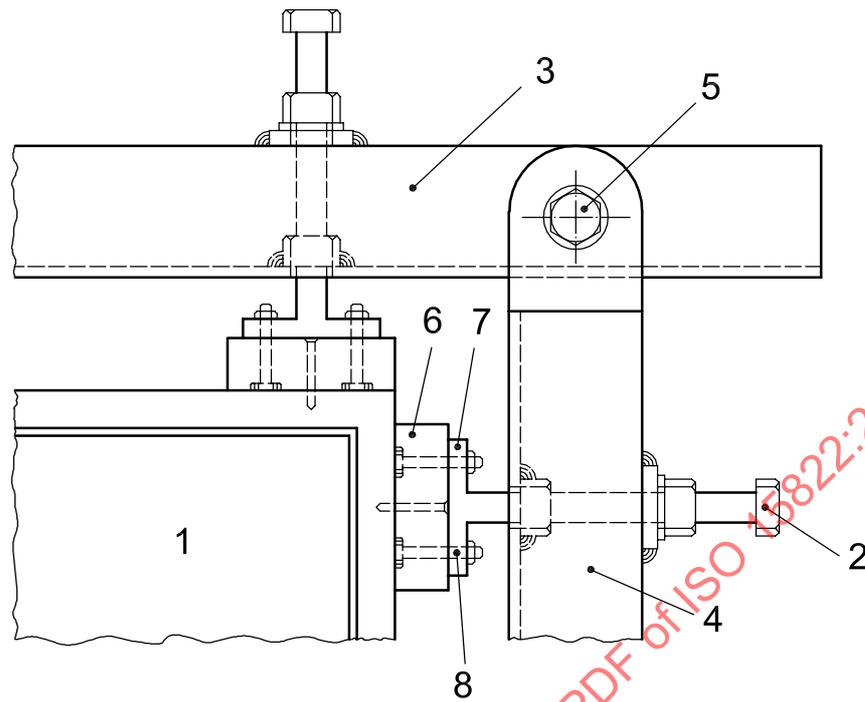
Key

1 test specimen
2 device to secure test specimen in the frame
3 upper horizontal rig frame
4 vertical rig frame
5 pin joint (pin support)

a Weld.

a) Example of test specimen secured by welding

**Figure 2 — Methods of securing the test specimen in the frame**

Key

1   test specimen
2   device to secure test specimen in the frame
3   upper horizontal rig frame
4   vertical rig frame
5   pin joint (pin support)
6   backing (chip board)
7   steel plate
8   screw

b)   Example of test specimen secured by screws

Figure 2 — Methods of securing the test specimen in the frame *(continued)*

Dimensions in millimetres
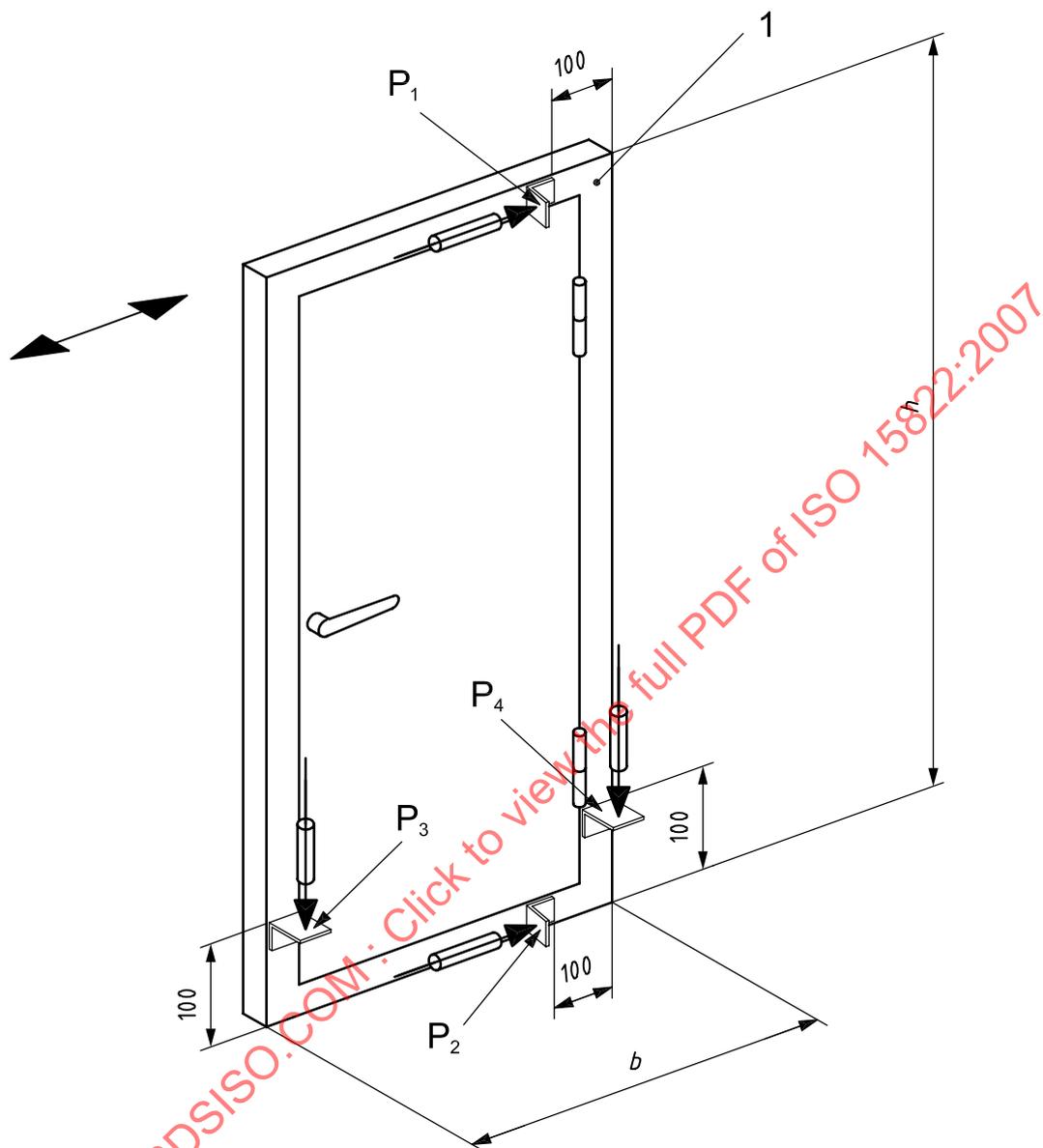
Key

1   door frame

P_1 measuring point 1

P_2 measuring point 2

P_3 measuring point 3

P_4 measuring point 4

h distance between measuring points 1 and 2, expressed in millimetres

b distance between measuring points 3 and 4, expressed in millimetres

Figure 3 — Example of displacement measuring points

7.2.5 Apply the required force for in-plane displacement and repeat this procedure three times, then increase it by steps from smaller to larger displacements.

The in-plane displacement, R, shall be determined by eight steps:

$\pm\,1/400, \pm\,1/300, \pm\,1/200, \pm\,1/150, \pm\,1/120, \pm\,1/90, \pm\,1/75$ and $\pm\,1/60$.

However, in case steps other than the above are required, their values shall be agreed by the parties involved.

In the case of steps being specified by the parties involved, the test may be conducted from the two steps preceding the specified step.

The in-plane displacement, R, expressed in radians, is defined by the Equation (1):

$$R = \frac{\delta_1 - \delta_2}{h} - \frac{\delta_3 - \delta_4}{b} \tag{1}$$

where

δ_1 is the horizontal displacement at measuring point 1, expressed in millimetres;

δ_2 is the horizontal displacement at measuring point 2, expressed in millimetres;

δ_3 is the vertical displacement at measuring point 3, expressed in millimetres;

δ_4 is the vertical displacement at measuring point 4, expressed in millimetres;

h is the distance between the points 1 and 2, expressed in millimetres;

b is the distance between the points 3 and 4, expressed in millimetres.

7.2.6 Observe visually any bend, indentation or damage at the first and third deformation cycle of each step.

7.2.7 Measure and record the values of the unlocking torque value, to 0,1 N, and the opening force, to 10 N, at the first and third deformation cycle of each step, in accordance with Figures 4 and 5.

7.2.8 Complete the test when

a) either any failure in operating the doorset or any damage makes it impossible to continue the test,

b) or the specified number of cycles has been carried out.

8 Expression of results

The following test results shall be recorded at each step:

a) in-plane displacement;

b) maximum unlocking torque value;

c) maximum opening force;

d) locations and degree of deformation, damage or deterioration of the test specimen during the test, including abnormality of hardware.
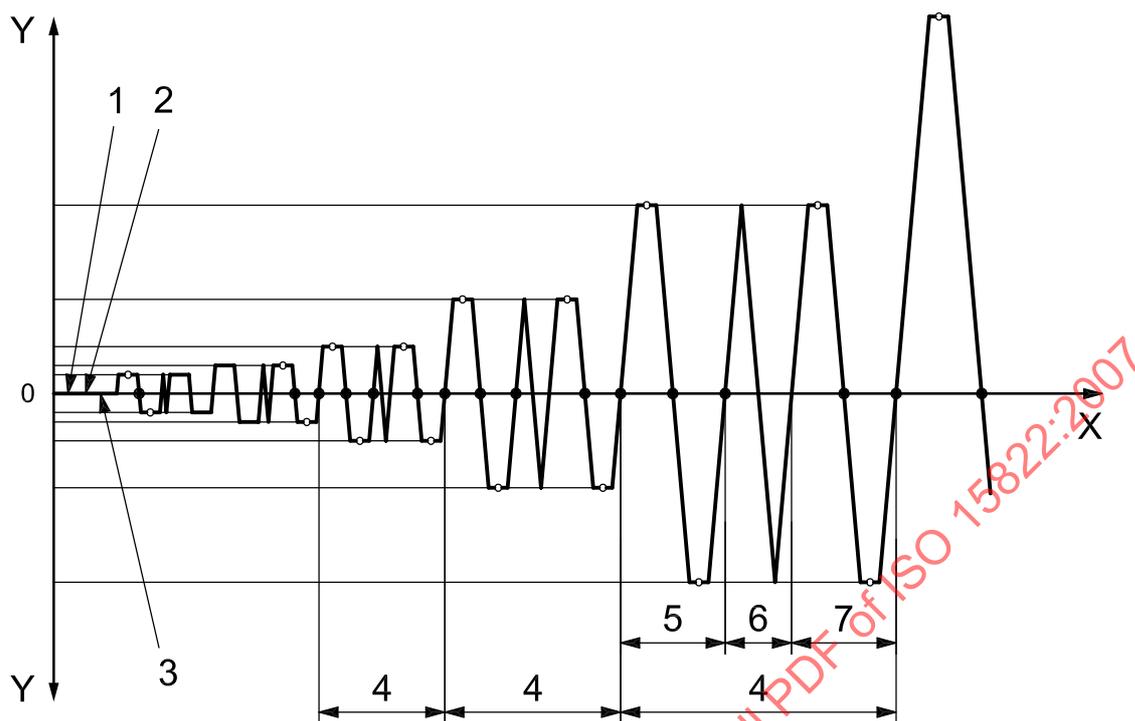
Key

X   time, expressed in seconds

Y   in-plane displacement, R

1   confirmation of door actuation

2   mounting measuring device

3   confirmation of initial settings

4   deformation step

5   first deformation, second deformation cycle

6   second deformation step, second deformation cycle

7   third deformation, second deformation cycle

o   Maintaining the force applied to the test specimen, perform the procedures in 7.2.6 and 7.2.7

•   The door leaf is closed and locked

Figure 4 — Chart of force application to deform