SLOVENSKI STANDARD

SIST EN 1935:2002

01-julij-2002

Stavbno okovje - Enoosni teļ aji - Zahteve in klasifikacija

Building hardware - Single-axis hinges - Requirements and test methods

Baubeschläge - Einachsige Tür- und Fensterbänder -Anforderungen und Prüfverfahren

Quincaillerie pour le bâtiment - Charnieres axe simple - Prescriptions et méthodes d'essai

Ta slovenski standard je istoveten z: **EN 1935:2002**

ICS:

91.190

SIST EN 1935:2002 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1935

February 2002

ICS 91.190

English version

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This European Standard was approved by CEN on 7 December 2001.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 1935:2002 E

Contents

Foreword

This document (EN 1935:2002) has been prepared by Technical Committee CEN/TC 33 "Doors, windows, shutters, building hardware and curtain walling", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2002, and conflicting national standards shall be withdrawn at the latest by November 2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

Wherever reference is made to classes, they are considered to be technical classes and not classes according to Article 3(2) of the Construction Products Directive (89/106/EEC).

A full contribution to the preparation of this standard has been made by the European manufacturers organisation "ARGE".

This European Standard is part of a series of European Standards dedicated to building hardware products.

The test method for the static load tests and the durability tests for hinges intended for side-hanging applications are derived from Swedish Standards SS 3442, SS 3443, and British Standard BS 7352:1990 (see bibliography).

Annexes B and C specify any additional requirements that apply to hinges for use on fire-resistant and/or smoke-control doors or on burglar-resistant doors.

Annexes D, E and F give guidance on the classification of duties and typical applications of hinges for use with doors wider than 950 mm, hinges for doors fitted with door closers and the maintenance of hinges, especially those fitted to emergency escape doors.

Annex J include a flow chart showing the sequence of testing for different test specimens.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Hinges suitable for side-hanging use are usually strong enough for top-hanging applications with hinged elements of the same mass. However the load bearing and wearing surfaces are totally different for the two types of application. It is intended to develop test methods for testing hinges in the top-hanging mode which will make it possible to grade hinges for top-hanging applications more precisely. When hinges are used in top-hanging applications it is important that all aspects of the hinge should be considered, e.g. it may be necessary to take action to prevent loose pins from falling out.

In terms of the Constructive Products Directive (89/106/EEC), the essential requirements of this European Standard are to allow self closing when used on fire/smoke compartmentation doors fitted with door closing devices.

1 Scope

This European Standard specifies requirements for single-axis hinges, of lift-off or fixed pin type, for use on access windows and doors. Such windows and doors may or may not be fitted also with door closing devices. It includes tests for static loads, shear strength and allowable wear during durability cycling for the following hinges:

a) mounted on the edge of the door leaf or window sash and opening in one direction only;

b) whose axis of rotation is within 30 mm of an edge of the movable element for a door leaf mass of up to 160 kg;

c) whose axis of rotation is within 30 mm of the edge for a window sash with a mass up to 60 kg.

This European Standard classifies hinges for four categories of use (see annex A) and also specifies the maximum permissible torque arising from frictional resistance generated within the hinge during endurance testing.

Corrosion protection requirements are specified for those hinges which are not intended to be protected after fitting.

There are no restrictions on the materials or the methods of fabrication used providing the hinge conforms to the requirements relevant to its application.

The suitability of single axis hinges for use on fire/smoke compartmentation door assemblies is determined by performance tests conducted in addition to the performance tests required by this European Standard. Annex B indicates additional requirements for these products.

This European Standard does not apply to hinges incorporating spring-assisted door-closing mechanisms. Door closers incorporating door co-ordinator devices (with or without electrically powered hold-open devices) are covered by EN 1158.

Although the fastenings used to fix hinges to window assemblies and door assemblies are not covered by this European Standard, if the type of fastening to be used is supplied or specified by the manufacturer, such fastenings are used for the tests.

NOTE Performance standards for complete windows and door assemblies (in the course of preparation by CEN/TC 33/WG 1 and TC 33/WG 2) will ensure that the fastenings used to fix the hinge are adequate for their intended duty.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 1634-1, *Fire resistance tests for door and shutter assemblies - Part 1 : Fire doors and shutters*.

EN 1670:1998, *Building hardware — Corrosion resistance — Requirements and test methods.*

prEN 12519, Doors and windows — Terminology.

3 Terms and definitions

For the purposes of this standard, the following terms and definitions apply:

3.1
lift-off hinge
single-axis pivot wih only two knuckles, whose axis of rotation is within 30 mm of an edge of a movable element, either side or top fixing

3.2
fixed pin hinge
single-axis pivot with more than two knuckles, with either fixed or removable pin, whose axis of rotation is within 30 mm of an edge of a movable element, either side or top fixing

4 Classification

4.1 Coding system

For the purposes of this European Standard, hinges shall be classified according to the eight digit coding system described in 4.2 to 4.9.

4.2 Category of use (first digit)

Four categories of use are identified for hinges. Annex A defines the typical applications of hinge grades.

4.3 Durability (second digit)

Three grades are identified for hinges manufactured to this European Standard.

Hinges are graded according to their frequency of use and the maximum mass of the hinged element with which they may be used, in accordance with Table 1.

Hinges intended for use only on windows are tested to:-

— grade 3 : 10 000 cycles

— grade 4 : 25 000 cycles

Hinges intended for use on doors are tested to:-

— grade 4 : 25 000 cycles

— grade 7 : 200 000 cycles

4.4 Test door mass (third digit)

Eight grades are identified according to Table 1 of this European Standard.

4.5 Suitability for use on fire/smoke compartmentation doors (fourth digit)

Two grades of suitability for use on fire/smoke compartmentation doors are identified for hinges manufactured to this European Standard:

— grade 0: not suitable for use on fire resistant and/or smoke control door assemblies;

— grade 1: suitable for use on fire/smoke resistant door assemblies subject to satisfactory assessment of the contribution of the hinges to the fire resistance of the specified fire/door assemblies. Such assessment is beyond the scope of this European Standard (see EN 1634-1).

NOTE Annex B indicates additional requirements for hinges to grade 1.

4.6 Safety (fifth digit)

All hinges are required to satisfy the essential requirement of safety in use. Therefore only grade 1 is identified.

4.7 Corrosion resistance (sixth digit)

Five grades of corrosion resistance are identified according to EN 1670:

— grade 0: no defined corrosion resistance;

— grade 1: mild resistance;

— grade 2: moderate resistance;

— grade 3: high resistance;

— grade 4: very high resistance.

4.8 Security - Burglar-resistance (seventh digit)

Two grades of security are identified for hinges manufactured to this European Standard.

— grade 0: not suitable for use on burglar-resistant door assemblies;

— grade 1: suitable for use on burglar-resistant door assemblies, subject to satisfactory assessment of the contribution of the hinges to the burglar resistance of specified burglar-resistant door assemblies. Such assessment is beyond the scope of this European Standard.

NOTE Annex C indicates additional requirements for hinges manufactured to grade 1.

4.9 Hinge grade (eighth digit)

Fourteen grades of hinge are identified in this European Standard, as listed in Table 1.

Table 1 — Classification summary

First digit			Second Digit		Third digit		Fourth digit Digit	Fifth Digit	Sixth digit	Seventh digit	Eighth digit
Category of use			Durability test Cycles		Test door mass		Fire/smoke suitability	Safety	Corrosion resistance	Security	Hinge grade
Duty	Grade	For use on :	Grade	Number of Test cycles	Grade	Mass kg	Grades available	Grade Availabl	Grades available	Grades Available	Grade
Light	1	Window	3	10 000	0	10	0 or 1	1	0,1,2,3,4	0 or 1	1
Light	1	Window	3	10 000	1	20	0 or 1	1	0,1,2,3,4	0 or 1	2
Light	1	Door or Window	4	25 000	1	20	0 or 1	1	0,1,2,3,4	0 or 1	3
Medium	2	Door	7	200 000	1	20	0 or 1	1	0,1,2,3,4	0 or 1	4
Light	1	Window	3	10 000	2	40	0 or 1	1	0,1,2,3,4	0 or 1	5
Light	1	Door or Window	4	25 000	2	40	0 or 1	1	0,1,2,3,4	0 or 1	6
Medium	2	Door	7	200 000	2	40	0 or 1	1	0,1,2,3,4	0 or 1	7
Light	1	Window	3	10 000	3	60	0 or 1	1	0,1,2,3,4	0 or 1	8
Light	1	Door or Window	4	25 000	3	60	0 or 1	1	0,1,2,3,4	0 or 1	9
Medium	2	Door	7	200 000	3	60	0 or 1	1	0,1,2,3,4	0 or 1	10
Heavy	3	Door	7	200 000	4	80	0 or 1	1	0,1,2,3,4	0 or 1	11
Severe	4	Door	7	200 000	5	100	0 or 1	1	0,1,2,3,4	0 or 1	12
Severe	4	Door	7	200 000	6	120	0 or 1	1	0,1,2,3,4	0 or 1	13
Severe	4	Door	7	200 000	7	160	0 or 1	1	0,1,2,3,4	0 or 1	14

4.10 Example of classification

2	7	3	0	1	1	1	10

This denotes a hinge for use in medium duty situations tested to 200 000 cycles, for use on doors with a mass up to 60 kg, with no stated fire resistance, mild corrosion resistance, suitable for use on burglar resistant doors, and with a hinge grading of 10.

5 Requirements

5.1 Initial friction torque measurements

For hinges tested in accordance with 6.4 the maximum permissible frictional torque shall be:

— 2 Nm for grades 1 to 7,

— 3 Nm for grades 8 to 11 and

— 4 Nm for grades 12 to 14.

5.2 Static load

5.2.1 Load-deformation

For hinges tested in accordance with 7.3.2:

a) the lateral displacement under load shall not exceed 2 mm,

b) the vertical displacement under load shall not exceed 4 mm,

c) the ateral and vertical residual displacements after unloading shall be within the shaded area of Figure G.1 except that, when it is known that the hinges will be used in top hung mode only, the lateral deformation measured in this test may be increased from 0,6 mm to 1 mm;

d) there shall be no breakage of any component nor any cracking visible to normal or corrected vision.

5.2.2 Overload

For hinges tested in accordance with 7.3.3:

e) there shall be no breakage of any hinge leaf, knuckle, barrel or pin nor any cracking or deformation visible to normal or corrected vision;

f) the hinged test element shall remain connected to the frame even though the hinge may have been rendered inoperable.

5.3 Shear strength

NOTE This test shall not be applied to lift-off type hinges, (those with only two knuckles).

For hinges tested in accordance with 7.4:

g) there shall be no breakage or cracking of any hinge leaf, knuckle, barrel or pin, or lateral deformation greater than 3 mm;

h) the additional lateral and vertical displacements after test shall not exceed 1 mm and the hinge shall operate for 20 cycles without breakage of any hinge leaf, knuckle, barrel or pin;

NOTE This requirement does not apply to severe-duty hinges in grade 14 for use on burglar-resistant door assemblies (see 4.8).

i) for severe-duty hinges for use on burglar-resistant door assemblies, grade 14, unlimited permanent deformation shall be regarded as permissible provided that the hinge can be opened to the lesser of 95° or the full angular movement initially permitted by the hinge at least once after test, by a torque not exceeding 220 Nm.

5.4 Durability

For hinges tested in accordance with 7.5:

j) the amount of lateral and vertical wear of the hinge under test, measured as displacements from the datum surface, shall be within the shaded area of Figure G.2;

k) the maximum permissible frictional torque measured after the first 20 cycles and also after completion of the test shall be 2 Nm for grades 1 to 7, 3 Nm for grades 8 to 11, and 4 Nm for grades 12 to 14.

5.5 Corrosion resistance

5.5.1 Hinges not intended to be protected after fitting

The requirements of 5.6 of EN 1670:1998 shall be met, according to the hinge classification (see 4.7).

The grade of corrosion resistance achieved shall be included in the hinge classification coding according to 4.7.

5.5.2 Hinges intended to be protected after fitting

For hinges intended to be protected after fitting, e.g. by painting in situ, the corrosion resistance classification code shall be zero (see 4.7).

5.6 Hinges for use on fire-resistant and/or smoke-control doors

Hinges to be used on a fire-resistant or smoke-control door assembly shall comply with the additional requirements of annex B.

5.7 Hinges for use on burglar-resistant doors

Hinges to be used on burglary-resistant doors shall comply with the appropriate requirements of annex C.

5.8 Families of hinges with common design features

Whenever, in a family of hinges for different applications, there is a similarity of important design criteria such as pin diameter, knuckle diameter, type of washer, leaf thickness, materials, and the length of a hinge is not more than 20 % greater, or 12,5 % less than that of the hinge tested, it shall not be necessary for every variation of type to be subjected to the durability test. However in every case the load-deformation, overload and shear strength (when applicable) test shall be performed. The load-deformation, overload and shear strength test shall be carried out when the shape of the hinge leaf is different from the tested hinge even though the other parameters are the same.

For any change of materials, this concession shall not apply unless it is clear that the alternative material is superior. In all cases the load-deformation, overload and shear strength test (when applicable) shall be performed.

6 Test apparatus

6.1 Initial friction torque measurements, static load and durability tests

The test apparatus shall be capable of supporting a hinged test element weighing 480 kg, under which load the vertical axis between the two hinges shall not alter by more than 1 mm from the unloaded position and shall conform to the perpendicular attitude described below. The apparatus shall be constructed from materials that are not significantly affected by changes in atmospheric conditions. The distance between the centres of the test hinge and of the lower hinge shall be 1 540 mm ± 5 mm. The axes of rotation of the hinges shall be vertical within 0,1° and co-linear within 2 mm. The centre of gravity of the hinged test element shall be 463 mm ± 10 mm from the vertical axis of rotation and 770 mm ± 10 mm below the centre of the test hinge.

The test apparatus shall provide suitable mounting plates, positioned such that the centre of gravity of the hinged element is equidistant between the fixing holes provided in the hinge leaves. The axis of rotation of the hinge shall be parallel to the vertical face of the hinged element (see Figure H.2).

The lower hinge shall be positioned so as to allow free vertical movement in order that any wear or deformation within the test hinge would result in movement of the hinged test element. The mass of the hinged element shall be supported vertically by the test hinge only. The lower hinge shall exhibit an angular frictional torque of less than 1 Nm.

The position at which horizontal and vertical movement is recorded shall be as shown in Figure H.3.

A suitable apparatus shall be provided to cycle the hinged element smoothly through the lesser of 92,5° ± 2,5° or the full angular movement permitted by the hinge at a rate of (600 ± 30) cycles per hour. The

opening and closing forces shall be applied without shock at 90° to the hinged test element 425 mm ± 75 mm below the top test hinge centre and at least 400 mm from the vertical axis of rotation.

All tests are to be carried out on two hinges fastened to a rigid test apparatus. The vertical test loads are all carried by a single hinge.

NOTE A suitable test apparatus is illustrated in Figure H.1.

6.2 Shear strength test

The test apparatus shall consist of two adjustable square-edged metal blocks having meeting faces vertical within a tolerance of ± 0,5 mm to which the hinge under test can be fitted. One block shall be mounted on a rigid bed and the other shall be free to move vertically, e.g. by mounting on a pivoted beam as illustrated in Figure H.4. Means of loading the movable block shall be provided at the point indicated.

6.3 Method of fastening hinges to test apparatus

If the hinge manufacturer supplies or specifies the type of fastenings to be used, the hinges under test shall be fixed to the test rig with such fastenings.

If the hinge manufacturer does not supply or specify the type of fastening to be used and, if the hinges under test are provided without fastenings but with fixing holes, these shall be used to fasten the hinge to the test apparatus by means of well fitting machine screws that pass through the holes and have a head shape matched to the contour of the holes.

Hinges that cannot be fastened directly to the test apparatus shall be rigidly fastened first to auxiliary fixtures that match as closely as possible the intended profile shape of the door, window or shutter using the methods specified by the manufacturer for fitting the hinges, such as bolts, clamps or welding. These auxiliary fixtures shall include suitable mortises if they are essential to the proper functioning of the hinge under test. The auxiliary fixtures shall then be rigidly fixed to the mounting plates provided on the test apparatus as shown in Figure H.1 and Figure H.4.

For all fastenings, a torque of 2 Nm ± 0,1 Nm shall be applied unless otherwise specified by the hinge manufacturer.

6.4 Initial measurements

Mount the hinge under test on the test apparatus specified in 6.1 using the appropriate method as specified in 6.3.

Load the hinged test element to the mass specified in Table 1 according to the class of hinge under test.

Rotate the hinged element through the lesser of 92,5° ± 2,5° or the full angular movement permitted by the hinge for 20 cycles without shock.

Measure and record the torque required to initiate movement of the hinged test element at opening angles of 0 ± 5°, 30° ± 5°, 60° ± 5° and 90° ± 5°.

Measure and record the initial horizontal and vertical gaps between the hinge elements and the datum surfaces.

7 Test methods

7.1 Sampling

7.1.1 General

Twelve hinges shall be provided from which five shall be selected for testing as specified in 7.1.2 to 7.1.5 (see flow chart, annex J). If any hinge fails to meet all of the appropriate acceptance criteria for a test then further hinges from the initial sample shall be retested as specified in 7.2.