

EUROPEAN STANDARD

EN 1670

NORME EUROPEENNE

EUROPAISCHE NORM

^^

1CS91.190

Descriptors: buildings, doors, windows, shutters: buildings, closures, hardware, protective coatings, corrosion resistance, classifications, electrodeposition, anodizing, salt spray tests, testing conditions, acceptability, marking

English version

Building hardware - Corrosion resistance - Requirements and test methods

Quincaillerie pour le bailment - Resistance a la corrosion -
-Prescriptions et methodes d'essai

Schlosser und Baubeschläge - Korrosionsverhalten
Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 2 August 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITE EUROPEEN DE NORMALISATION
EUROPAISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

> 1998 CEN All rights of exploitation in any form and by any means reserved
worldwide for CEN national Members.

Ref. No. EN 1670:1998 E

Contents

Page Foreword

.....	3
0 Introduction.....	3
1 Scope.....	4
2 Normative references.....	4
3 Definitions.....	5
4 Classification.....	5
5 Requirements.....	5
5.1 General requirements	5
5.2 Electrodeposited nickel plus chromium	5
5.3 Electrodeposited nickel	6
5.4 Electrodeposited zinc on iron or steel.....	6
5.5 Anodized oxide coating on aluminium	6
5.6 Other coatings or uncoated hardware	7
5.7 Acceptance conditions.....	7
6 Test conditions.....	8
6.1 General conditions.....	8
6.2 Specific conditions	8
7 Marking.....	8
Annex A (informative) Bibliography.....	9
Annex B (informative) Classification : Meaning and application to particular situations.....	10

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 33 "Doors, windows, shutters and building hardware", the secretariat of which is held by AFNOR.

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

A full contribution to the preparation of this standard has been made by the European Manufacturer's Organisation "ARGE".

Informative annexes are cited in the content list.

Corrosion protection alone is not specified in any of the six essential requirements of the Construction Products Directive but is an implicit requirement for durability. This European Standard provides for the corrosion resistance of all building hardware, classified according to application.

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 February 1999, and conflicting national standards shall be withdrawn at the latest by February 1999.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

0 Introduction

CEN recently inaugurated CEN/TC 262 "Corrosion protection of metallic materials", the first meeting being held in January 1991. The scope agreed for CEN/TC 262 includes the establishment of standards for the evaluation of corrosion likelihood by means of performance tests and of the various systems used for corrosion protection. CEN/TC 33 recognises that developments by CEN/TC 262 may make it necessary to revise this European Standard in a few years' time, replacing it by a new one based solely on the performance testing of building hardware. Although the accelerated corrosion tests currently available are only partly successful in this respect, several members of CEN/TC 33 have expressed their support in principle for such an approach.

One member of the CEN/TC 33/WG 4/TG 2, predominantly exposed in his region to a continental climate, prefers the sulphur dioxide test with the general condensation of moisture according to ISO 6988 since the salt spray test in accordance to ISO 9227 does not cover the kind of stressing exerted by industrial environments. The majority of others members prefers the salt spray test in accordance with ISO 9227 as well as the corrodokote test according to ISO 4541. Because of these reasons this standard specification can be applied only restrictively within the member bodies confronted with prevailing industrial atmospheric conditions.

1 Scope

This European Standard specifies the requirements for the corrosion resistance of hardware for doors, windows, shutters and curtain walling.

The standard specifies requirements for both coated and uncoated surfaces, four grades (classes) of corrosion resistance being laid down in accordance with the different conditions of use (grades(classes) 1 to 4). A grade (class) 0 is also included for which no requirements have been specified. Requirements for levels of corrosion higher than those laid down for grade (class) 4 have not been included in this standard and are subject to agreement where required.

This standard also applies to the metal fasteners required for fixing building hardware.

The requirements for protective finishes specified in this standard are derived from ISO standards. Where materials are used uncoated or where other finishes are used that are not covered by ISO standards, classification is based on performance in neutral salt spray tests as specified in ISO 9227.

NOTE: The term "grade" used in this European Standard corresponds to the term "class" used in ISO standards.

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.

- ISO 1456 Metallic coatings - Electrodeposited coatings of nickel plus chromium and of copper plus nickel plus chromium
- ISO 1458 Metallic coatings - Electrodeposited coatings of nickel
- ISO 2081 Metallic coatings - Electroplated coatings of zinc on iron or steel
- ISO 4520 Chromate conversion coatings on electroplated zinc and cadmium coatings
- ISO 4628-2 Paints and varnishes - Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect -Part 2: Designation of degree of blistering
- ISO 7599 Anodizing of aluminium and its alloys - General specifications for anodic oxide coatings on aluminium
- ISO 9227 Corrosion tests in artificial atmospheres - Salt spray tests

3 Definitions

For the purposes of this standard the following definition applies :

significant surface : Those parts of the surface of a product that are normally visible when the +1 product is installed and can be touched by a ball 20 mm mm in diameter and those other

surfaces on which a specified corrosion resistance is essential to ensure the continuance of correct function.

4 Classification

Requirements are specified for four grades (classes) of corrosion resistance classified as low, moderate, high and very high which may be typified by situations ranging from mild exposure in interior environments that are normally dry to very severe exposure in exterior environments in very polluted localities.

The standard also includes a grade (class) 0 which is applicable to a limited range of products for which a defined corrosion resistance is not relevant.

Grade (class) 0 : no defined corrosion resistance ;

grade (class) 1 : low resistance ;

grade (class) 2 : moderate resistance ;

grade (class) 3 : high resistance ;

grade (class) 4 : very high resistance. See Annex B for the meaning of this

classification and its application to particular situations.

5 Requirements

5.1 General requirements

Dependent upon the hardware surface protection the requirement of one of the grades (classes) given in 5.2 to 5.7 shall be met.

The following requirements shall not apply to grade (class) 0 finishes for which no defined corrosion resistance is relevant.

5.2 Electrodeposited nickel plus chromium

If coated with electrodeposited nickel plus chromium or with copper plus nickel plus chromium the requirements of the appropriate service condition number is ISO 1456 shall be met as follows :

- grade (class) 1 : ISO 1456 service condition number 1 (mild);

- grade (class) 2 : ISO 1456 service condition number 2 (moderate);

- grade (class) 3 : ISO 1456 service condition number 3 (severe);
- grade (class) 4 : ISO 1456 service condition number 4 (exceptionally severe).

5.3 Electrodeposited nickel

If coated with electrodeposited nickel the requirements of the appropriate service condition number of ISO 1458 shall be met as follows :

- grade (class) 1: ISO 1458 service condition number 1 (mild);
- grade (class) 2: ISO 1458 service condition number 2 (moderate);
- grade (class) 3: ISO 1458 service condition number 3 (severe);
- grade (class) 4: not applicable ; such grade (class) is not covered by ISO 1458.

NOTE: Some people are susceptible to an allergic reaction if in prolonged contact with uncoated nickel plate. This can be avoided by coating nickel plate with a suitable clear varnish.

5.4 Electrodeposited zinc on iron or steel

If coated with electroplated zinc on iron or steel, the requirements of the appropriate classification code of ISO 2081 plus a chromate conversion coating meeting the requirements of the class of ISO 4520 specified to match that classification, shall be met as follows :

- grade (class) 1 : ISO 2081 classification code Fe/Zn5 + ISO 4520 class 1A, 1 B, 2C or 2D ;
- grade (class) 2 : ISO 2081 classification code Fe/Zn8 + ISO 4520 class 1A, 1 B, 2C or 2D ;
- grade (class) 3 : ISO 2081 classification code Fe/Zn12 + ISO 4520 class 2C or 2D ;
- grade (class) 4 : as specified for grade (class) 3 with the additional requirement that the minimum local thickness of zinc shall be 16 μ m.

5.5 Anodized oxide coating on aluminium

If coated with an anodized oxide coating on aluminium the requirements of the appropriate grade (class) of ISO 7599 shall be met as follows :

- grade (class) 1 : ISO 7599 class AA 5 ;
- grade (class) 2 : ISO 7599 class AA 10 ;
- grade (class) 3 : ISO 7599 class AA 10 ;
- grade (class) 4 : ISO 7599 class AA 15.

NOTE: Aluminium foundry alloys that contain a high proportion of alloying elements such as copper, zinc or silicon are subject to anodizing problems when anodized to film thicknesses greater than 8 μm (notably darkening of or striations in the anodic film). However, film thicknesses in the range of 5 μm to 10 μm may be suitable for service in grade (class) 2 or grade (class) 3 situations when frequent cleaning of the anodized surface can be guaranteed, when the fitting can easily be replaced or when some deterioration of the surface finish can be accepted. Otherwise such foundry alloys which have been anodized to a film thickness less than 10 μm should not be specified for fittings intended for service in situations other than grade (class) 1.

5.6 Other coatings or uncoated hardware

If uncoated or protected with a surface coating not specified in 5.2 to 5.5 the article shall be exposed to a neutral salt spray test in accordance with ISO 9227, the grades (classes) for corrosion resistance being given below :

- grade (class) 1 : 24 h ⁺¹ h ;
- grade (class) 2 : 48 h ⁺² h ;
- grade (class) 3 : 96 h ⁺⁴ h ;
- grade (class) 4 : 240 h ⁺⁴ h.

5.7 Acceptance conditions

Coated finishes shall withstand exposure for the time specified without corrosion of the base metal substrate visible to unaided normal or corrected vision excepting an average of one spot per 650 mm^2 of significant surface and without any spots larger than 1,5 mm in any direction.

The degree of blistering of organic coatings shall be not worse than density 2 and the size of any blisters shall not exceed size 3 as both designated in ISO 4628-2.

Uncoated metals shall show no sign of tarnish, visible to unaided normal or corrected vision as blackening or discolouration of the surface.

NOTE 1: Corrosion of the base metal substrate should not be confused with surface corrosion of its finish. In the case of steel substrates, corrosion is rust of a reddish brown appearance. Corrosion of aluminium or zinc alloy substances is white and corrosion of brass or bronze substrates is green.

After any corrosion test required by the relevant clause, the product shall be capable of functioning normally.

NOTE 2: For hardware which is assembled from dissimilar materials, electrochemical (galvanic) corrosion may occur. The neutral salt spray test specified in 5.6 is recommended as a useful method for checking such assemblies. If corrosion which affects the functionality or appearance is apparent at the end of the appropriate period of neutral salt spray testing, steps should be taken to eliminate the contacts between dissimilar materials. The absence of any such corrosion is usually an indication of satisfactory corrosion resistance in service.

6 Test conditions 6.1

General conditions

The test methods necessary to ensure compliance with clause 5 shall be those specified in the relevant ISO standards invoked in that clause except that:

- a) Any corrosion tests required shall be carried out on products assembled as normally supplied.
- b) When the specimen under test is a product which does not have a substantially flat surface which can be placed as specified in ISO 9227, then the product shall be placed in the test cabinet in its normal orientation in use. Within the restriction, the product shall be placed so as to minimize the disruption of flow of the atmosphere within the test cabinet.

6.2 Specific conditions

Some product standards may need to distinguish between the requirements for appearance and function, for example padlocks. The product standard should specify which corrosion tests are to be carried out and the acceptance criteria for functionality and/or appearance. It should also be stated whether such tests are to be carried out on samples which have previously been subjected to other test procedures or are to be subjected to other test procedures afterwards, or whether the corrosion tests are to be performed on fresh samples.

7 Marking

The corrosion resistance of hardware shall be designated by specifying the number of this European Standard followed by the grade (class) achieved.

EXAMPLE : EN 1670 : grade (class) 1.

The marking shall be quoted in the literature relevant to the hardware and on its labelling or packaging, or by marking the product itself, or optionally by more than one of these methods.

Annex A (informative)

Bibliography

- ISO 4541 1978 Metallic and other non-organic coatings - Corrodkote corrosion test (CORR test)
- ISO 6988 1985 Metallic and other non-organic coatings - Sulphur dioxide test with general condensation of moisture.

These additional references to accelerated corrosion tests may be invoked in some of the normative references (see clause 2) and used in the quality control of finishing processes.

Annex B (informative) Classification : Meaning and application to particular situations

Classification and corrosion resistance Typically applicable to service in:

Grade (class) 0	No defined corrosion resistance
Grade (class) 1 (low) interiors	Environments that are normally dry, including the majority of interiors
Grade (class) 2 (moderate)	Environments that are sometimes damp in the majority of normal rural and suburban localities, including interiors where condensation may occur.
Grade (class) 3 (high)	Environments that are often wet and/or subject to slight pollution by sulphur dioxide, acid, alkali or salt, including some particularly damp interiors and the majority of exterior environments.
Grade (class) 4 (very high)	Environments in very polluted localities such as those subject to a combination of industrial and coastal pollution.

EXAMPLE 1 :

Products typically in grade (class) 0 are bronze products which are intended to develop a natural surface patina after long exposure to the atmosphere, brass products which are supplied unlacquered and are intended to be cleaned frequently to remove atmospheric tarnish and steel hinges which are intended to be painted after fitting as part of the decorative treatment of a door or window.

EXAMPLE 2:

In interior environments such as swimming baths where condensation occurs frequently grade (class) 3 protection will give better service than grade (class) 2 protection.

EXAMPLE 3 :

Grade (class) 1 protection is often insufficient for window fittings that are on the interior of weatherstrips because of the occurrence of condensation or because they become exposed to exterior atmospheres when the windows are opened. Even grade (class) 2 protection may be insufficient for such fittings if they are subject to abnormally high condensation which is more likely to occur with some types of metal window frames. In these circumstances, grade (class) 3 protection is preferable.

EXAMPLE 4:

For exceptionally severe service in extremely polluted environments, the very high corrosion resistance of grade (class) 4 may not be sufficient and specialist advice about treatments that confer extremely high corrosion resistance or the use of materials that are exceptionally resistant to corrosion should be sought.