

SLOVENSKI STANDARD

SIST EN ISO 10289:2002

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Nadomešča:

SIST EN ISO 1462:1999

SIST EN ISO 4540:1999

SIST EN ISO 8403:1999

Metode za korozijsko preskušanje kovinskih in drugih anorganskih prevlek na kovinskih podlagah - Vrednotenje vzorcev in izdelkov po korozijskem preskusu (ISO 10289:1999)

Methods for corrosion testing of metallic and other inorganic coatings on metallic substrates - Rating of test specimens and manufactured articles subjected to corrosion tests (ISO 10289:1999)

Verfahren zur Korrosionsprüfung von metallischen und anderen anorganischen Überzügen auf metallischen Grundwerkstoffen - Bewertung der Proben und Erzeugnisse nach einer Korrosionsprüfung (ISO 10289:1999)

Méthodes d'essai de corrosion des revêtements métalliques et inorganiques sur substrats métalliques - Cotation des éprouvettes et des articles manufacturés soumis aux essais de corrosion (ISO 10289:1999)

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ICS:

25.220.20	Površinska obdelava	Surface treatment
25.220.40	Kovinske prevleke	Metallic coatings

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en

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN ISO 10289

January 2001

ICS 25.220.20; 25.220.40

Supersedes EN ISO 1462:1995, EN ISO 4540:1995
and EN ISO 8403:1995

English version

Methods for corrosion testing of metallic and other inorganic
coatings on metallic substrates - Rating of test specimens and
manufactured articles subjected to corrosion tests (ISO
10289:1999)

Méthodes d'essai de corrosion des revêtements
métalliques et inorganiques sur substrats métalliques -
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Grundwerkstoffen - Bewertung der Proben und
Erzeugnisse nach einer Korrosionsprüfung (ISO
10289:1999)

This European Standard was approved by CEN on 1 December 2000.

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 Management Centre 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 Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Foreword

The text of the International Standard from Technical Committee ISO/TC 107 "Metallic and other inorganic coatings" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 262 "Metallic and other inorganic coatings", the secretariat of which is held by BSI.

This European Standard supersedes EN ISO 1462:1995, EN ISO 4540:1995 and EN ISO 8403:1995.

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 July 2001, and conflicting national standards shall be withdrawn at the latest by July 2001.

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.

Endorsement notice

The text of the International Standard ISO 10289:1999 has been approved by CEN as a European Standard without any modification.

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

International Standard ISO 10289 was prepared by Technical Committee ISO/TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 7, *Corrosion tests*.

This first edition cancels and replaces ISO 1462:1973, ISO 4540:1980 and ISO 8403:1991.

Annexes A and B of this International Standard are for information only.

**Methods for corrosion testing of metallic
and other inorganic coatings on metallic
substrates — Rating of test specimens and
manufactured articles subjected to
corrosion tests**

*Méthodes d'essai de corrosion des revêtements métalliques et
inorganiques sur substrats métalliques — Cotation des éprouvettes et des
articles manufacturés soumis aux essais de corrosion*

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Introduction

The rating method described in this International Standard recognizes that decorative and protective metallic and inorganic coatings on metallic substrates can be either anodic or cathodic to the substrate. In rating these coatings for the effects of corrosion, two evaluations shall be made:

- the ability of the coating to protect the substrate from corrosion and thus prevent degradation of the base metal;
- the ability of the coating to retain its integrity and thus maintain a satisfactory appearance.

Although these functions overlap, they can be evaluated separately in terms of:

- a protection rating (R_p) relating to the corrosion of the basis metal;
- an appearance rating (R_A) relating to the deterioration of the coating.

The protection rating (R_p) assigns a number representing the ability of the coating to protect the basis metal from corrosion.

The appearance rating (R_A) assigns a sequence of letters and numbers to the overall appearance of the specimen which includes all deterioration caused by the corrosion test or environment.

NOTE 1 Imperfections on a panel or article before exposure testing should be noted and given due consideration when evaluating the results of the examination. Deliberate imperfections may also be introduced as part of a test programme.

The coating system has to be known and reported if this rating system is applied. It is especially important to know, if possible, whether the coating is anodic or cathodic to the base metal.

NOTE 2 Determination of the anodic and cathodic corrosive mechanisms can be extremely difficult in some cases (chromated zinc on steel or multiple coatings). For the purposes of this document knowledge of these mechanisms is not necessary.

Methods for corrosion testing of metallic and other inorganic coatings on metallic substrates — Rating of test specimens and manufactured articles subjected to corrosion tests

1 Scope

This International Standard gives a method of evaluating the condition of decorative and protective metallic and inorganic coated panels or articles which have been exposed to corrosive environments for test or for other purposes.

It is applicable to test panels or components exposed to natural atmospheres, in mobile or static conditions, or subjected to accelerated tests.

NOTE 1 Examples of such tests are given in the Bibliography.

This International Standard recognizes that the protection rating can be assessed objectively in accordance with clause 6. However, the assessment of appearance depends on many subjective factors (see 6.2).

NOTE 2 The edges of test panels or components may be protected, e.g. by tape or wax (paraffin), if this is an agreed part of the test and is recorded in the test report. This is essential if the specimens are cut from larger pieces and have exposed uncoated edges.

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2 Terms and definitions

2.1

protection rating

R_p

rating number (see Table 1) assigned to the ability of the coating to protect the basis metal from corrosion

2.2

protection defect

defect used to assess the protection rating, including crater corrosion, pin-hole corrosion, corrosion stain due to corrosion from the substrate, blisters and other defects that involve basis metal corrosion

NOTE Blisters on electroplated aluminium and zinc alloy die castings usually signify base metal corrosion, but the inspector's judgement may be required to decide whether a blister does or does not arise at the substrate-coating interface.

2.3

appearance rating

R_A

rating number and symbols (see Table 2) assigned to describe the overall appearance of the specimen, including all defects caused by exposure

2.4

appearance defect

defect that detracts from the appearance of the specimen (see Table 2)

2.5

performance rating

combination of the protection rating number (R_p) followed by a slash mark followed by the appearance rating number (R_A), i.e. R_p/R_A

2.6

coating system

particular series of deposits including the thickness and type of layers in multilayer deposits and treatments which have been applied to the basis metal

2.7

significant surface

part of the surface which is essential in the appearance or serviceability of the article and which is to be covered or is covered by the coating (see clause 5)

3 Principle

This International Standard establishes a rating system for evaluating the deterioration of the coating and the basis metal due to corrosion. The rating method described in this International Standard is applied to evaluate the appearance of the coating, as well the extent of the corrosion on test panels or the significant surfaces of components which have been subjected to performance tests.

The result of inspecting a surface, called the performance rating, is recorded as two separate ratings, the protection rating (R_p) and the appearance rating (R_A).

When recording the rating of a surface, the type(s) and severity of defect(s) contributing to the rating shall be noted if this information is required. This information is recorded using agreed symbols for the defects and the extent of these defects.

When only the protection rating (R_p) is required, it is permitted to omit the appearance rating (R_A). However, in such a case, a written dash should follow the protection rating in order to indicate deliberate omission of the appearance rating.

4 Types of defect

It is possible for defects to affect both the protection rating (R_p) and the appearance rating (R_A). In this rating system, the protection rating is a simple numerical rating while the appearance rating is permitted to include specific defects along with a numerical rating designating the intensity.

A list of defects is given in Table 2. Additions may also be made to the list, as appropriate, when recording specific defects.

Defects include crater corrosion, pin-hole corrosion, general corrosion of the coating, corrosion products, blisters, and any other defect that involves the coating. Some defects, such as blisters, can be associated with the coating, the basis metal, the interface between the coating and the basis metal, or between layers in the coating.

Other defects can have a small corrosion content but an appreciable affect on the appearance, e.g., staining, tarnishing, cracks, etc.

Defects on the surface of the basis metal such as scratches, porosity, non-conducting inclusions, roll and die marks, cold shuts and cracks can adversely affect the performance of coatings applied thereto, despite the observance of the best finishing practices. Such defects shall be reported and rated separately.

Ensure that the coating system is reported, because the significance of certain defects can be dependent on whether the coating is anodic or cathodic to the basis metal.

Note defects that develop on exposure, e.g. peeling or spalling of the coating, since this indicates possible improper preparation of the basis metal or improper application of the coating.

5 Method of inspection

Use drawings or suitably marked samples to indicate the significant surface.

It may sometimes be necessary or appropriate to expose material which is defective in certain respects before carrying out environmental testing. In such cases, make an inspection and record the findings before the specimens are tested.

If deliberate damage is applied to a surface, record the damage before the specimens are tested and so reported. If the specimen is purposely deformed, rate the deformed areas separately.

Material may be inspected either on the exposure racks or in a more suitable location. Ensure that lighting during inspection is as uniform as possible; avoid direct reflection from sun or clouds, and use various angles of inspection to ensure that all defects are revealed.

At the conclusion of the test, if the condition of the specimens allows, inspect them in the uncleaned condition. If dirt, salt deposits, etc., mask the defects and create difficulties with inspection, the surface may be sponged with a mild soap solution and then rinsed with water. However, exert no pressure during such cleaning in order to avoid accidentally upgrading the rating by, for example, cleaning off the corrosion products. Cleaning solutions should be compatible with the coatings and not cause any degradation of the coating. In the case of intermediate, periodic inspections do not clean or otherwise disturb the specimens.

Allow surfaces to dry before they are inspected.

Defects to be noted and taken into account when rating surfaces include only those which can be seen by normal or corrected vision.

NOTE 1 Optical aids may be used subsequently to characterize defects, after initial detection.

Edge defects, occurring within 5 mm of the edge of a specimen or tape/wax, may be noted in the report, but should not normally influence the numerical rating. Similarly, disregard contact and rack marks, mounting holes, etc.

NOTE 2 Edge defects may be difficult to assess on deeply worked manufactured specimens, such as threads, bores etc. In these cases it may be necessary to obtain agreement between purchaser and supplier regarding the exact defective area to be reported.

When the coating is anodic to the basis metal, white corrosion product developed from the edges of the specimen shall not constitute failure.

Rubbing, polishing, chemical cleaning, etc., of the surface of the specimen may be used to facilitate study of the surface but confine it to the minimum practicable area, preferably not more than 100 mm² on a surface of 100 mm × 150 mm. Note this area for subsequent ratings.

6 Assignment of ratings

6.1 Assignment of protection rating (R_p)

The numerical rating system is based on the area of the substrate that exhibits corrosion, by the following formula:

$$R_p = 3(2 - \log A) \quad (1)$$

where A is the percentage of the total area which shows basis metal corrosion. R_p is rounded off to the nearest whole number, leading to the tabulation given in Table 1.

NOTE 1 In some cases, calculating the exact area may be difficult, especially on deeply worked specimens such as thread, bores, etc. In these cases, it may be necessary for the inspector to estimate the area as closely as possible.

Strict application of equation (1) would lead to ratings greater than 10 for specimens with extremely small defective areas. Therefore, equation (1) is only defined for areas where $A > 0,046\,416\%$. A rating of 10, accordingly, is arbitrarily assigned to a surface showing no corrosion of the basis metal.

If desired, fractional ratings may be assigned between the ratings listed in Table 1.

NOTE 2 When coating systems anodic to the basis metal are used, it may be impossible to assess a legitimate protection rating number due to the extreme voluminous corrosion products formed by the coating. Because of the highly absorbable nature of these corrosion products, they would tend to obliterate the true area of substrate corrosion. An example would be a zinc coating on steel exposed in a saline atmosphere. Although this International Standard may be used to rate the performance of zinc on steel, it may be difficult in some environments to define the protection rating.

If the defects are very localized, standards in the form of dot charts or photographs, such as those given in annexes A and B, may be used. Flexible graticules having 1 mm, 2 mm, or 5 mm squares could also be used to assess the corroded area.

If a large group of specimens is being inspected at one time, it is recommended that they be assessed individually by use of equation (1). When the entire group has been rated, the individual ratings should then be reviewed to ensure that each of the ratings assigned actually reflects the extent of the defects relating to those of the other specimens. The review acts as a check on individual ratings and helps to ensure that the inspector's judgement or frame of reference has not changed during the course of the inspection because of such factors as changes in lighting conditions or fatigue.

Inspection is improved by:

- removing individual items from their racks and grouping them with other specimens for comparison;
- arranging all of the specimens in order of merit.

Table 1 — Protection (R_p) and appearance (R_A) ratings

Area of defects A (%)	Rating R_p or R_A
No defects	10
$0 < A \leq 0,1$	9
$0,1 < A \leq 0,25$	8
$0,25 < A \leq 0,5$	7
$0,5 < A \leq 1,0$	6
$1,0 < A \leq 2,5$	5
$2,5 < A \leq 5,0$	4
$5,0 < A \leq 10$	3
$10 < A \leq 25$	2
$25 < A \leq 50$	1
$50 < A$	0

Examples of assessing the protection rating R_p by this method are:

- slight rusting over 1 % of the surface 5/—;
- no visible defects 10/—.

6.2 Assignment of appearance rating (R_A)

The appearance rating is assessed in terms of:

- the type of defect, as given in Table 2;
- the area affected by a particular defect using the scale 10 to 0 as described in Table 1;