



# SLOVENSKI STANDARD SIST EN 12500:2000

01-december-2000

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Protection of metallic materials against corrosion - Corrosion likelihood in atmospheric environment - Classification, determination and estimation of corrosivity of atmospheric environments

Korrosionsschutz metallischer Werkstoffe - Korrosionswahrscheinlichkeit in einer atmosphärischen Umgebung - Einteilung, Bestimmung und Abschätzung der Korrosivität von atmosphärischen Umgebungen  
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Protection des matériaux métalliques contre la corrosion - Risque de corrosion dans un environnement atmosphérique - Classification, détermination et appréciation de la corrosité des environnements atmosphériques  
SIST EN 12500:2000  
<https://standards.iteh.ai/catalog/standards/sis/0d2-4a86-6d1c-4d97-a7c9>

**Ta slovenski standard je istoveten z: EN 12500:2000**

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**ICS:**

77.060            Korozija kovin            Corrosion of metals

**SIST EN 12500:2000**            **en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

EN 12500

June 2000

ICS 77.060

English version

Protection of metallic materials against corrosion - Corrosion  
likelihood in atmospheric environment - Classification,  
determination and estimation of corrosivity of atmospheric  
environments

Protection des matériaux métalliques contre la corrosion -  
Risque de corrosion dans un environnement  
atmosphérique - Classification, détermination et  
appréciation de la corrosivité des environnements  
atmosphériques

Korrosionsschutz metallischer Werkstoffe -  
Korrosionswahrscheinlichkeit in einer atmosphärischen  
Umgebung - Einteilung, Bestimmung und Abschätzung der  
Korrosivität von atmosphärischen Umgebungen

This European Standard was approved by CEN on 12 May 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 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.



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COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 262 "Metallic and other inorganic coatings", the secretariat of which is held by BSI.

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 December 2000, and conflicting national standards shall be withdrawn at the latest by December 2000.

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.

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## Introduction

Metals, alloys and metallic coatings can suffer atmospheric corrosion when their surfaces are wetted. The nature and the rate of corrosion effect depend on the corrosion system, which comprises:

- the metallic material(s);
- the atmospheric environment (characterized by time of wetness and the chemical composition of the electrolyte formed on the metallic surface influenced by type and level of air pollution);
- technical parameters (design, profile and mass, manufacture, joining techniques, etc.);
- operation conditions.

The choice of metals, alloys or metallic coatings, and the corrosion resistance of the manufactured products are influenced by the required service life and service conditions, as well as by the corrosivity of the atmosphere.

A classification system for corrosivity of atmospheric environments should be simple and user friendly. This European Standard is based on a quantitative determination of corrosivity (see ISO 9223). When experimental data are unavailable, a qualitative estimation of corrosivity categories is possible. However, a qualitative description of an atmospheric environment can give rise to serious problems because identically described atmospheric environments can cover a wide range of corrosivity. Therefore the determination of corrosivity based on exposure of standard specimens of reference metals is strongly recommended.

This European Standard should be considered a basis document because it does not take into account other technical parameters and operation conditions. [SIST EN 12500:2000](#)

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## 1 Scope

This European Standard establishes a classification system for the corrosivity of atmospheric environments. It:

- defines corrosivity categories of the atmospheric environments taking into account ISO 9223;
- describes the determination of corrosivity based on assessment of mass loss of standard specimens after the first year of exposure;
- can be used to estimate the corrosivity of an environment based on knowledge of local conditions or of specific data that characterize the local conditions, where it is not possible to make an experimental determination.

It cannot be used to determine corrosivity categories from exposure periods of less than or greater than the first year.

The classification system contributes to:

- the knowledge and comparison of corrosivity of atmospheric environments at different locations;
- the choice of materials and corrosion protection measures.

This European Standard does not characterize the corrosivity of special service atmospheric environments, e.g. chemical and metallurgical plants and environments with extreme chloride deposition such as splash zones.

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## 2 Normative references

This European Standard incorporates by dated and 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).

ISO 8407, *Corrosion of metals and alloys — Removal of corrosion products from corrosion test specimens.*

ISO 8565, *Metals and alloys — Atmospheric corrosion testing — General requirements for field tests.*

ISO 9224, *Corrosion of metals and alloys — Corrosivity of atmospheres — Guiding values for the corrosivity categories.*

## 3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply. 3.1 and 3.2 are taken from EN ISO 8044 and are repeated here for convenience.

### 3.1 corrosivity

ability of an environment to cause corrosion of a metal in a given corrosion system

[EN ISO 8044:1999]

### 3.2 corrosion likelihood

qualitative and/or quantitative expression of the expected corrosion effects in a defined corrosion system

[EN ISO 8044:1999]

### 3.3 type of atmospheric environment

characterization of the atmospheric environment on the basis of corrosive agents present and their levels

NOTE Principle corrosive agents are gases (especially sulfur dioxide) and salts (especially chlorides and sulfates).

### 3.4 category of location

conventionally defined typical exposure conditions of a component or structure, e.g. in the open air, under shelter, in closed space

### 3.5 time of wetness

period during which a metal surface is covered by a film of electrolyte that is capable of initiating atmospheric corrosion

NOTE Guidance values for time of wetness can be calculated from the temperature and relative humidity (RH) by summing the hours when RH > 80 % and the temperature is > 0 °C.

## 4 Classification of corrosivity of atmospheric environments

The corrosivity of an atmospheric environment shall be classified either by determination of the corrosivity in accordance with clause 5 or, where this is not possible, by estimation of the corrosivity in accordance with clause 6.

Estimation of corrosivity as described in clause 6 and annex E can lead to misinterpretation, which in turn, can result in inappropriate corrosion protection. Therefore, the determination of corrosivity by exposure of standard specimens of reference metals is strongly recommended.

For the purposes of this European Standard, atmospheric environments shall be classified into five corrosivity categories for metallic materials, denoted C1 to C5, in accordance with Table 1.

## 5 Determination of corrosivity categories

Corrosivity categories shall be determined from measurements of mass loss per unit surface area of standard specimens of carbon steel, zinc, copper and aluminium after the first year of exposure in accordance with Table 1. Flat standard specimens shall be treated prior to and after exposure and shall be evaluated in accordance with annexes A and B.

A given atmospheric environment shall be characterized by four figures corresponding to corrosivity categories for the four reference metals, in the following order: carbon steel, zinc, copper, aluminium. To apply these corrosivity categories to these and other materials, ISO 9224 shall be taken into account as well as the expertise of a corrosion specialist.

The mass loss per unit surface area after the first year of exposure given in Table 1 shall not be extrapolated to predict long-term corrosion behaviour.



**Table 1 — Mass loss per unit surface area for the first year of atmospheric exposure of standard specimens of reference metals and the related corrosivity categories**

Mass loss per unit surface area g/m <sup>2</sup>				Corrosivity category	
Carbon steel	Zinc	Copper	Aluminium		
≤ 10	≤ 0,7	≤ 0,9	Negligible	Very low	C1
> 10 to 200	> 0,7 to 5	> 0,9 to 5	≤ 0,6	Low	C2
> 200 to 400	> 5 to 15	> 5 to 12	> 0,6 to 2	Medium	C3
> 400 to 650	> 15 to 30	> 12 to 25	> 2 to 5	High	C4
> 650 to 1 500	> 30 to 60	> 25 to 50	> 5 to 10	Very high	C5

NOTE 1 The values of mass loss per surface area used for derivation of the corrosivity categories are identical to those given in ISO 9223.

NOTE 2 The materials and procedures are characterized in ISO 9226 (see annexes A and B).

NOTE 3 Thickness loss (in micrometres,  $\mu\text{m}$ ) can be calculated (see annex C).

NOTE 4 Aluminium experiences localized corrosion but the values shown in Table 1 are expressed as uniform corrosion. Maximum pit depth after only 1 year of exposure is a better indicator of potential damage. However mass loss data shown in the table are significant enough and increase with the corrosivity of the atmospheric environment.

NOTE 5 Values exceeding the upper limits in category C5 represent atmospheric environments beyond the scope of this European Standard (e.g. splash zone).

NOTE 6 For special purposes such as the selection of protective paint systems a corrosivity category can be subdivided (e.g. C5 marine, C5 industrial, see ISO 12944-2).

## 6 Estimation of corrosivity categories

### 6.1 General

If it is not possible to determine the corrosivity categories by exposure of standard specimens of reference metals, an estimation of corrosivity can be based on:

- climatic influences;
- types of atmospheric environments;
- categories of location.

The corrosivity of an atmospheric environment increases with the time of wetness and the level of corrosive agents.

A qualitative description of typical environments related to the corrosivity categories for corrosivity estimation is given in annex E.

NOTE Corrosivity categories can also be estimated by considering the combined effect of the following environmental factors: time of wetness, concentration of sulfur dioxide and deposition of chlorides (see ISO 9223).