



SLOVENSKI STANDARD
oSIST prEN ISO 12944-5:2019
01-julij-2019

Barve in laki - Protikorozijska zaščita jeklenih konstrukcij z zaščitnimi premaznimi sistemi - 5. del: Zaščitni premazni sistemi (ISO/FDIS 12944-5:2019)

Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 5: Protective paint systems (ISO/FDIS 12944-5:2019)

Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Beschichtungssysteme - Teil 5: Beschichtungssysteme (ISO/FDIS 12944-5:2019)

Peintures et vernis - Anticorrosion des structures en acier par systèmes de peinture - Partie 5: Systèmes de peinture (ISO/FDIS 12944-5:2019)

Ta slovenski standard je istoveten z: prEN ISO 12944-5

ICS:

| | | |
|-----------|--|-------------------------|
| 25.220.20 | Površinska obdelava | Surface treatment |
| 87.020 | Postopki za nanašanje barvnih premazov | Paint coating processes |
| 91.080.13 | Jeklene konstrukcije | Steel structures |

oSIST prEN ISO 12944-5:2019

en,fr,de

FINAL
DRAFTINTERNATIONAL
STANDARDISO/FDIS
12944-5

ISO/TC 35/SC 14

Secretariat: DIN

Voting begins on:
2019-05-10Voting terminates on:
2019-08-02**Paints and varnishes — Corrosion
protection of steel structures by
protective paint systems —****Part 5:
Protective paint systems**

*Peintures et vernis — Anticorrosion des structures en acier par
systèmes de peinture —
Partie 5: Systèmes de peinture*

SIST EN ISO 12944-5:2020

<https://standards.iteh.ai/catalog/standards/sist/8f2e3189-861c-45da-b480-75711006d3d7/sist-en-iso-12944-5-2020>

ISO/CEN PARALLEL PROCESSING

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

Reference number
ISO/FDIS 12944-5:2019(E)

© ISO 2019

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 12944-5:2020

<https://standards.iteh.ai/catalog/standards/sist/8f2e3189-861c-45da-b480-75711006d3d7/sist-en-iso-12944-5-2020>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

| | |
|--|-----------|
| Foreword | iv |
| Introduction | vi |
| 1 Scope | 1 |
| 2 Normative references | 1 |
| 3 Terms and definitions | 1 |
| 4 Classification of environments | 3 |
| 5 New work and refurbishment | 3 |
| 5.1 New work and total refurbishment..... | 3 |
| 5.2 Partial refurbishment..... | 4 |
| 6 Types of paint | 4 |
| 6.1 General..... | 4 |
| 6.2 Examples of generic type of paints..... | 4 |
| 6.2.1 Alkyd paints (AK)..... | 4 |
| 6.2.2 Acrylic paints (AY)..... | 4 |
| 6.2.3 Ethyl silicate paints (ESI)..... | 5 |
| 6.2.4 Paints for epoxy coatings (EP)..... | 5 |
| 6.2.5 Paints for polyurethane coatings (PUR)..... | 5 |
| 6.2.6 Paints for polyaspartic coatings (PAS)..... | 6 |
| 6.2.7 Paints for polysiloxane coatings (PS)..... | 6 |
| 7 Paint systems | 6 |
| 7.1 Priming coats and type of primers..... | 6 |
| 7.1.1 General..... | 6 |
| 7.1.2 Types of primer..... | 6 |
| 7.2 Subsequent coats..... | 7 |
| 7.2.1 General..... | 7 |
| 7.2.2 Intermediate coats..... | 7 |
| 7.2.3 Topcoats..... | 7 |
| 7.3 Dry film thickness..... | 7 |
| 7.4 Durability..... | 7 |
| 7.5 Shop and site application..... | 8 |
| 8 Tables for protective paint systems for C2 to C5, Im1, Im2 and Im3 | 9 |
| 8.1 Reading the tables..... | 9 |
| 8.2 Parameters influencing durability..... | 9 |
| 8.3 Designation of the paint systems listed..... | 9 |
| 8.4 Guidelines for selecting the appropriate paint system..... | 9 |
| Annex A (normative) Abbreviated terms and descriptions | 10 |
| Annex B (normative) Minimum requirements for corrosion protection systems | 11 |
| Annex C (informative) Paint systems for carbon steel | 15 |
| Annex D (informative) Paint systems on hot dip galvanized steel | 18 |
| Annex E (informative) Paint systems on thermal-sprayed metallic coatings | 20 |
| Annex F (informative) Pre-fabrication primers | 21 |
| Bibliography | 23 |

ISO/FDIS 12944-5:2019(E)

Foreword

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 14, *Protective paint systems for steel structures*.

This third edition cancels and replaces the second edition (ISO 12944-5:2007), of which it constitutes a minor revision.

The main changes compared to the previous edition are as follows:

- a) the normative references in [Clause 2](#) have been updated;
- b) the terms and definitions in [Clause 3](#) have been revised;
- c) the document has been restructured and editorially revised;
- d) new types of coatings (polyaspartic, fluoropolymer, fluoroethylene/vinyl ether co-polymer and polysiloxanes coatings) have been added;
- e) descriptions for intermediate coats and topcoats have been added;
- f) the former [Annex A](#) has been divided into the new [Annexes C, D](#) and [E](#);
- g) the former [Annex B](#) has been renumbered to become [Annex F](#);
- h) a new normative [Annex A](#) containing abbreviated terms and descriptions has been added;
- i) a new normative [Annex B](#), "Minimum requirements for corrosion protection systems", has been added;
- j) the former [Annex C](#) has been deleted;
- k) the former [Annex D](#) has been deleted;
- l) a Bibliography has been added.

A list of all parts in the ISO 12944 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 12944-5:2020

<https://standards.iteh.ai/catalog/standards/sist/8f2e3189-861c-45da-b480-75711006d3d7/sist-en-iso-12944-5-2020>

ISO/FDIS 12944-5:2019(E)

Introduction

Unprotected steel in the atmosphere, in water and in soil is subjected to corrosion that may lead to damage. Therefore, to avoid corrosion damage, steel structures are normally protected to withstand the corrosion stresses during the required service life required of the structure.

There are different ways of protecting steel structures from corrosion. ISO 12944 (all parts) deals with protection by paint systems and covers, in the various parts, all features that are important in achieving adequate corrosion protection. Additional or other measures are possible but require particular agreement between the interested parties.

In order to ensure effective corrosion protection of steel structures, owners of such structures, planners, consultants, companies carrying out corrosion protection work, inspectors of protective coatings and manufacturers of coating materials need to have at their disposal state-of-the-art information in concise form on corrosion protection by paint systems. It is vital that such information is as complete as possible, unambiguous and easily understandable to avoid difficulties and misunderstandings between the parties concerned with the practical implementation of protection work.

ISO 12944 (all parts) is intended to give this information in the form of a series of instructions. It is written for those who have some technical knowledge. It is also assumed that the user of ISO 12944 (all parts) is familiar with other relevant International Standards, in particular those dealing with surface preparation.

Although ISO 12944 (all parts) does not deal with financial and contractual questions, attention is drawn to the fact that, because of the considerable implications of inadequate corrosion protection, non-compliance with requirements and recommendations given in ISO 12944 (all parts) can result in serious financial consequences.

ISO 12944-1 defines the overall scope of ISO 12944. It gives some basic terms and definitions and a general introduction to the other parts of ISO 12944. Furthermore, it includes a general statement on health, safety and environmental protection, and guidelines for using ISO 12944 (all parts) for a given project.

This document gives some terms and definitions related to paint systems in combination with guidance for the selection of different types of protective paint system.

Paints and varnishes — Corrosion protection of steel structures by protective paint systems —

Part 5: Protective paint systems

1 Scope

This document describes the types of paint and paint system commonly used for corrosion protection of steel structures.

It also gives guidelines for the selection of paint systems available for different environments (see ISO 12944-2) except for corrosivity category CX and category Im4 as defined in ISO 12944-2 and different surface preparation grades (see ISO 12944-4), and the durability grade to be expected (see ISO 12944-1).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

ISO 2063 (all parts), *Thermal spraying — Zinc, aluminium and their alloys*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 3549, *Zinc dust pigments for paints — Specifications and test methods*

ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

ISO 8503-1, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces*

ISO 12944-1, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 1: General introduction*

ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments*

ISO 19840, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12944-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

ISO/FDIS 12944-5:2019(E)

— IEC Electropedia: available at <http://www.electropedia.org/>

3.1 compatibility
<for products within a paint system> ability of two or more products to be used together successfully as a paint system without causing undesirable effects

3.2 priming coat
first coat of a paint system

3.3 intermediate coat
coat between the *priming coat* (3.2) and the *topcoat* (3.6)

3.4 tie coat
coat designed to improve intercoat adhesion

[SOURCE: ISO 4618:2014, 2.262]

3.5 sealer
coating material applied to porous surface prior to painting to reduce the absorptivity

Note 1 to entry: An example for a porous surface is a thermal sprayed metal layer.

3.6 topcoat
final coat of a coating system

3.7 primer
paint that has been formulated for use as a *priming coat* (3.2) on prepared surfaces

3.8 pre-fabrication primer
fast-drying paint that is applied to blast-cleaned steel to provide temporary protection during fabrication while still allowing welding and cutting

[SOURCE: ISO 4618:2014, 2.204, modified — “primer” has been replaced by “paint”, and “protect it” has been replaced by “provide temporary protection”.]

3.9 dry film thickness
DFT
thickness of a coating remaining on the surface when the coating has hardened/cured

3.10 nominal dry film thickness
NDFT
dry film thickness (3.9) specified for each coat or for the whole paint system

3.11 maximum dry film thickness
highest acceptable *dry film thickness* (3.9) above which the performance of the paint or the paint system could be impaired

3.12 pot life
maximum time, at any particular temperature, during which a coating material supplied as separate components can successfully be used after they have been mixed together

3.13 shelf life

time during which a coating material will remain in good condition when stored in its original sealed container under normal storage conditions

Note 1 to entry: The expression “normal storage conditions” is usually understood to mean storage between +5 °C and +30 °C.

4 Classification of environments

The following five atmospheric corrosivity categories are relevant for this document:

- C1 very low;
- C2 low;
- C3 medium;
- C4 high;
- C5 very high.

The atmospheric environments defined in ISO 12944-2 are considered, except corrosivity category CX. Systems for offshore-CX environments are described in ISO 12944-9. For other CX environments, individual systems need to be defined according to the special needs of that environment.

The following three categories for water and soil are relevant for this document:

- Im1 immersion in fresh water;
- Im2 immersion in sea or brackish water;
- Im3 buried in soil.

The immersed environments defined in ISO 12944-2 are considered, except category Im4. Systems for offshore, related structures and Im4 environments are described in ISO 12944-9.

5 New work and refurbishment

5.1 New work and total refurbishment

The surfaces to be coated encountered in new structures are carbon steel of rust grade A, B and C as defined in ISO 8501-1, as well as hot dip galvanized steel and thermal-sprayed metallic coating (see ISO 12944-1). Possible surface preparation is described in ISO 12944-4. The substrate and the recommended surface preparation grade are given in [Table B.1](#). The quality of the surface preparation is essential for the durability of a coating system. The paint systems listed in [Annex C](#), [Annex D](#) and [Annex E](#) are typical examples of systems used in the environments listed in [Clause 4](#) when applied to steel surfaces with rust grades A to C, as defined in ISO 8501-1, or to hot dip galvanized steel or thermal-sprayed metallic coating. Where the steel has deteriorated to the extent that pitting corrosion has taken place (rust grade D as defined in ISO 8501-1), the dry film thickness or the number of coats shall be increased to compensate for the increased surface roughness, and the paint manufacturer should be consulted for recommendations.

In principle, no corrosion protection is required for corrosivity category C1. If, for aesthetic reasons, painting is necessary, a system intended for corrosivity category C2 (with a low durability) may be chosen.

If unprotected steelwork destined for corrosivity category C1 is initially transported, stored temporarily or assembled in an exposed situation (for example, a C4/C5 coastal environment), corrosion will commence due to air-borne contaminants/salts and will continue even when the steelwork is

ISO/FDIS 12944-5:2019(E)

moved to its final category C1 location. To avoid this problem, the steelwork should either be protected during site storage or given a suitable primer coat. The dry film thickness should be appropriate for the expected storage time and the severity of the storage environment.

5.2 Partial refurbishment

Systems for partial refurbishment should be specified and agreed separately for every object between the interested parties. The paint systems listed in [Annex C](#), [Annex D](#) and [Annex E](#) may be used, if they are suitable. In special cases, other types of systems might be required for repair works.

The necessary surface preparation of any old coating and the compatibility of the coating system to be applied should be tested in an appropriate manner before starting the repair works.

Test areas can be prepared to check the manufacturer's recommendations and/or compatibility with the previous paint system.

6 Types of paint

6.1 General

Based on the corrosivity category, various examples of paint systems, which are informative in nature, are given in [Tables C.1 to C.6](#), [Table D.1](#) and [Table E.1](#) in relation to the expected durability. The systems have been included because of their proven track record, but the list is not intended to be exhaustive and other similar systems are also acceptable. Only the generic types of binders mentioned in the systems in [Tables C.1 to C.6](#), [Table D.1](#) and [Table E.1](#) are described in this clause. Pigments, fillers and additives are important ingredients of a paint as well. Depending on the composition of the paint, the performance of the coating can vary strongly within a given binder technology. The binder types described in [Clause 6](#) are only examples, other generic types of coatings can be used as well.

In addition, new technologies are continually being developed, often driven by government legislation, and these should always be considered where appropriate and where performance has been validated by

- a) the track record of such technologies, and/or
- b) the results of testing at least in accordance with ISO 12944-6.

NOTE Information given in [6.2](#) concerns only the chemical and physical properties of paints and coatings and not the way they are used. Variations can be expected for each type of paint, depending on its formulation.

6.2 Examples of generic type of paints

6.2.1 Alkyd paints (AK)

In these single pack paints, the film hardens/forms by evaporation of solvent and/or water, and by reaction of the binder with oxygen from the atmosphere.

6.2.2 Acrylic paints (AY)

Acrylic paints are single pack coating materials; water-borne and solvent-borne types are available. The film of solvent-borne acrylic paints dries by solvent evaporation with no other change of form, i.e. the process is reversible and the film can be re-dissolved in the original solvent at any time. In water-borne acrylic paints the binder is dispersed in water. The film hardens by evaporation of water and coalescence of the dispersed binder to form a film. The process is irreversible, i.e. this type of coating is not re-dispersible in water after drying.

The drying time will depend, among other things, on air movement, relative humidity and temperature.