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

**Part 9:  
Protective paint systems and  
laboratory performance test methods  
for offshore and related structures**

*Peintures et vernis — Anticorrosion des structures en acier par  
systèmes de peinture —*

*Partie 9: Systèmes de peinture protectrice et méthodes d'essai de  
performance en laboratoire pour la protection des structures  
offshore et structures associées*



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# Contents

	Page
<b>Foreword</b> .....	<b>iv</b>
<b>Introduction</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>2</b>
<b>3 Terms and definitions</b> .....	<b>3</b>
<b>4 Field of application</b> .....	<b>4</b>
4.1 Type of environment.....	4
4.2 Type of surface and surface preparation.....	5
4.3 Type of paint.....	5
<b>5 Relationship between artificial ageing and natural exposure</b> .....	<b>5</b>
<b>6 Paints</b> .....	<b>5</b>
6.1 General.....	5
6.2 Quality assurance.....	6
6.3 Packaging and labelling.....	6
6.4 Required product information.....	6
6.5 Paint identification.....	7
6.5.1 General.....	7
6.5.2 Fingerprint check.....	7
6.5.3 Routine batch check.....	7
6.6 Confidential information.....	8
<b>7 Protective paint systems</b> .....	<b>8</b>
7.1 Description.....	8
7.2 Minimum requirements for protective paint systems.....	9
<b>8 Application testing of paints</b> .....	<b>10</b>
<b>9 Performance testing of the paint system</b> .....	<b>10</b>
9.1 Preparation and conditioning of test panels.....	10
9.1.1 Type and size of panel and number of panels.....	10
9.1.2 Surface preparation.....	11
9.1.3 Application and curing.....	11
9.1.4 Dry film thickness.....	11
9.1.5 Over-coating time.....	11
9.1.6 Conditioning/curing.....	11
9.1.7 Porosity detection.....	12
9.1.8 Scribe line.....	12
9.1.9 Assessment of corrosion.....	12
9.2 Qualification tests.....	12
9.3 Assessment — Methods and requirements.....	12
9.3.1 General.....	12
9.3.2 Assessment.....	13
<b>10 Test report</b> .....	<b>14</b>
<b>Annex A (normative) Scribe line for cyclic ageing test and sea water immersion</b> .....	<b>15</b>
<b>Annex B (normative) Cyclic ageing test</b> .....	<b>17</b>
<b>Annex C (normative) Fingerprint</b> .....	<b>18</b>
<b>Annex D (informative) Examples of test reports</b> .....	<b>19</b>
<b>Bibliography</b> .....	<b>23</b>

## 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](http://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](http://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 on 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 the following URL: [www.iso.org/iso/foreword.html](http://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 first edition of ISO 12944-9 cancels and replaces ISO 20340:2009, which has been technically revised.

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

## Introduction

Unprotected steel in the atmosphere, in water and in soil is subject to corrosion that can lead to damage. Therefore, to avoid corrosion damage, steel structures are normally protected to withstand the corrosion stresses to which they will be subjected during the 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 this document may 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.

Offshore and related structures require specific attention in order to be able to withstand the severe corrosion stresses to which they are exposed during their service life and to minimize the risk of failures that would impact safety, operating costs or capital cost.

In order to establish sufficient corrosion protection and ensure optimum performance of the coating, it is necessary to specify the requirements for the protective paint system(s) along with the relevant laboratory performance tests to assess its (their) likely durability.

In order to achieve the same performance as indicated by testing, proper surface preparation and application of the paint is essential. Close attention needs to be given to the execution of the work.

This document places emphasis on high-durability paint systems, with the aim of minimizing maintenance and hence reducing safety considerations and environmental impact.



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

## Part 9:

## Protective paint systems and laboratory performance test methods for offshore and related structures

### 1 Scope

This document specifies the performance requirements for protective paint systems for offshore and related structures (i.e. those exposed to the marine atmosphere, as well as those immersed in sea or brackish water). Such structures are exposed to environments of corrosivity category CX (offshore) and immersion category Im4 as defined in ISO 12944-2.

This part of ISO 12944 describes paint systems for high durability according to ISO 12944-1.

This document is applicable to structures made of carbon steel and does not cover Cd/Bi Cr and Zn/Bi Cr surfaces. It is not applicable to surfaces under insulation or concrete.

This document is applicable for paint systems intended for a service temperature range between  $-20\text{ }^{\circ}\text{C}$  and  $+80\text{ }^{\circ}\text{C}$ , and the performance testing is aimed at verifying suitability of the paint systems for this temperature range.

This document is applicable for paint systems for submerged service (Im4) which are intended for ambient operating temperatures up to a maximum of  $50\text{ }^{\circ}\text{C}$ .

This document specifies:

- the test methods to be used to determine the composition of the separate components of the protective paint system;
- the laboratory performance test methods for the assessment of the likely durability of the protective paint system;
- the criteria to be used to evaluate the results of performance tests.

This document covers the requirements for new work and any repairs necessary before start-up. It can also be used in relation to maintenance where complete refurbishment is carried out and the underlying metal substrate is completely exposed by abrasive blast-cleaning.

It does not address maintenance in general where methods of surface preparation other than abrasive blast-cleaning are typically used.

This document deals with structures, made of carbon steel of not less than 3 mm thickness, which are designed using an approved strength calculation.

The following are not covered by this document:

- structures built of stainless steel as well as those built of copper, titanium or aluminium or their alloys;
- steel cables;
- buried structures;
- pipelines;

— the interiors of storage tanks.

## 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 1514, *Paints and varnishes — Standard panels for testing*

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

ISO 2811 (all parts), *Paints and varnishes — Determination of density*

ISO 2812-2, *Paints and varnishes — Determination of resistance to liquids — Part 2: Water immersion method*

ISO 3233-1, *Paints and varnishes — Determination of the percentage volume of non-volatile matter — Part 1: Method using a coated test panel to determine non-volatile matter and to determine dry film density by the Archimedes principle*

ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile-matter content*

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

ISO 4624, *Paints and varnishes — Pull-off test for adhesion*

ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

ISO 4628-3, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting*

ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

ISO 4628-5, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking*

ISO 4628-6, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 6: Assessment of degree of chalking by tape method*

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 8503-2, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel — Comparator procedure*

ISO 9117-3, *Paints and varnishes — Drying tests — Part 3: Surface-drying test using ballotini*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

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 12944-4, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 4: Types of surface and surface preparation*

ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems*

ISO 15711:2003, *Paints and varnishes — Determination of resistance to cathodic disbonding of coatings exposed to sea water*

ISO 16474-3:2013, *Paints and varnishes — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

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*

ISO 29601, *Paints and varnishes — Corrosion protection by protective paint systems — Assessment of porosity in a dry film*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12944-1, ISO 12944-5, ISO 1461, ISO 2063 (all parts) and the following apply.

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

#### 3.1

##### **offshore and related structures**

permanently installed or moored structures with high requirements for long-term integrity

Note 1 to entry: Typical examples are oil and gas production facilities.

#### 3.2

##### **product technical-data sheet**

##### **product TDS**

document designed to provide information on a specific paint product

Note 1 to entry: The type of information typically includes product uses, features, service properties, application properties, application instructions, packaging information and information on storage and handling.

Note 2 to entry: See 6.4 for specifically required minimum information.

#### 3.3

##### **safety data sheet**

##### **SDS**

document designed to provide information regarding the health and safety aspects of a paint product or thinner

Note 1 to entry: The SDS typically includes information concerning generic material identification, hazardous ingredients, physical data, fire and explosion data, health hazards, reactivity data, spill or leak procedures, special protection requirements and other special precautions.