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Metallic and other inorganic coatings - Phosphate conversion coating of metals

Metallische und andere anorganische Überzüge - Phosphatüberzüge auf Metallen

Revêtements métalliques et autres revêtements inorganiques - Couches de conversion au phosphate sur métaux

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Metallic and other inorganic coatings — Phosphate conversion coating of metals

Revêtements métalliques et autres revêtements inorganiques — Couches de conversion au phosphate sur métaux

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This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 107/SC 8, *Chemical conversion coatings*.

Introduction

Phosphate conversion coatings are applied to ferrous metals, aluminium, zinc and their alloys (including zinc- and zinc-alloy-plated steel, cadmium and their alloys) either as an end finish or as an intermediate layer for other coatings. They are intended to

- a) impart corrosion resistance,
- b) improve adhesion to paints and other organic finishes,
- c) facilitate cold-forming operations, such as wire drawing, tube drawing and extrusion, and
- d) modify surface frictional properties so as to facilitate sliding.

Phosphate conversion coatings are produced by treatment with solutions, the main constituents of which are the appropriate dihydrogen orthophosphates. These coatings are applied principally to ferrous materials, aluminium, zinc and cadmium and differ in coating mass per unit area and apparent density, depending on

- a) the construction material and surface condition of the components,
- b) previous mechanical and chemical treatment of the components, and
- c) processing conditions for phosphating.

All phosphate conversion coatings are more or less porous but can be sealed substantially by subsequent sealing processes.

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Metallic and other inorganic coatings — Phosphate conversion coating of metals

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1 Scope

This International Standard specifies a process for the determination of requirements for phosphate coatings which are basically destined for application on ferrous material, aluminium, zinc, cadmium and their alloys (see Annex A).

2 Normative references

The following referenced documents are indispensable for the application 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 2080, *Metallic and other inorganic coatings — Surface treatment, metallic and other inorganic coatings — Vocabulary*

ISO 3892, *Conversion coatings on metallic materials — Determination of coating mass per unit area — Gravimetric methods*

ISO 4519, *Electrodeposited metallic coatings and related finishes — Sampling procedures for inspection by attributes*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2080 apply.

4 Information to be supplied by the purchaser to the processor

The following information shall be given by the customer:

- a) description of coating;
- b) in case of phosphating steel parts with a strength class 10.9/10, the safety against brittle fracture (hydrogen embrittlement) is of primary importance. The phosphating process must be carried out in such a manner that any damage because of hydrogen induced brittleness is excluded. Technical

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measures to minimise the risk of hydrogen induced brittleness have to be defined by the user respectively by the customer;

- c) the sampling procedure, the acceptable quality limit or any other requirement and test whenever they deviate from ISO 4519;
- d) the surface treatment or phosphating;
- e) the appearance of the surface;
- f) the corrosion resistance;
- g) the quality, appearance and condition of base metal, if any of these properties affect the usability and /or appearance of coatings.

Heat treatment in accordance with the recommendations cannot guarantee full freedom from hydrogen embrittlement. Inspection procedures should be set whenever possible.

5 Coating types and their importance

5.1 Coating types

The conversion coating shall be declared according to Table 1.

Table 1 — Declaration of conversion coatings

Elements detected	Coating type
Me (Fe)	Feph
Manganese	Mnph
Zinc (no Calcium)	Znph
Zinc and calcium	ZnCaph

There are other coating types of zinc phosphate, which are altered because of the build-in of iron and/or nickel and /or manganese. This altered metal is usually present as a double salt, like $Zn_2ME(PO_4)_2 \times 4 H_2O$, whereby ME can be Fe(II), Ni or Mn. Zinc will continue to be the main metal part of those coatings, which do not have an own marking to avoid confusion. It should also be noted that metal taken from the basic material, is included in the conversion coating.

5.2 Designation of conversion coating

The designation of the conversion coating shall consist of the following information:

- a) number of this standard;
- b) followed by a hyphen;
- c) designation of basic material; by means of the material chemical symbol (or the symbol of the primary alloy components) (see Note 1);
- d) followed by a solidus(/);
- e) a symbol describing the type of coating;

- f) solidus (/);
- g) a symbol, which indicates the function of the conversion coating as follows:
- r = adhesion promoter and/or corrosion protection
 - z = Simplification of cold forming
 - g = Reduction of friction
 - e = electrical insulation
- h) solidus (/);
- i) a symbol, which indicates the surface-related mass per square metre with a measurement uncertainty of +/- 30 %.

If the phosphate coating must receive a secondary treatment, the designation needs the following information:

- a) solidus (/)
- b) a symbol, which defines the conversion coating (see table 1). Repeat this process, if necessary.

It is recommended to let follow up the chemical symbol with the standard name of the basic material.

6 Requirements

6.1 Appearance

Zinc phosphate, zinc calcium phosphate and manganese phosphate coatings shall evenly cover the metal surface and may not show any white stains, corrosion products or fingerprints.

NOTE Slight fluctuations in appearance of phosphate coatings because of contact with the frames, properties of the base material or through minor contact inside the drum, do not constitute any reason for claim.

6.2 Coating mass per unit area

The coating mass is measured in accordance with procedures specified in EN ISO 3892.

6.3 Corrosion resistance

Untreated phosphate coatings do not provide a corrosion protection. A suitable after treatment can effect a temporary protection. Table 2 gives symbols which shall be used by the customer when post treatments are determined.

Table 2 — Symbols for post treatments

Symbol	Type of treatment
T1	Application of varnishes or organic coatings Application of inorganic or non-film-forming organic sealants
T2	Application of inorganic or organic sealants
T3	Dyeing
T4	Application of grease or oil or other lubricants
T5	Application of wax
T6	Application of soap

The corrosion resistance of the after treated components shall be verified in accordance to the corrosion test specified by the customer. If there is no test method prescribed, the components shall be tested according to the setting in ISO 9227 description neutral salt spray test (NSS) (see Annex B). The test duration shall be agreed between the contractual parties. The minimum testing periods specified by the Customer shall be reached before the first arrival of corrosion.

EXAMPLE A coating of zincphosphate type Znph, which has been applied on a ferrous material to prevent corrosion, with an area related mass of $3 \text{ g/m}^2 \pm 0,9 \text{ g/m}^2$ and a after treatment with a sealing (T2) and a painting (T1), has the following designation:

Phosphate coating ISO 9717 Fe//Znph/r/3/T2/T1

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