SLOVENSKI STANDARD
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Fosfatne prevleke na kovinah - Metoda za določitev zahtev

Phosphate conversion coatings of metals - Method of specifying requirements

Phosphatierüberzüge auf Metallen - Verfahren für die Festlegung von Anforderungen

Couches de conversion phosphatées des métaux - Méthode de spécifications des exigences

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EUROPEAN STANDARD
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English version

Phosphate conversion coatings of metals - Method of specifying requirements

Couches de conversion phosphatées des métaux - Méthode de spécifications des exigences

Phosphatierüberzüge auf Metallen - Verfahren für die Festlegung von Anforderungen

This European Standard was approved by CEN on 1 March 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.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Contents

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of an identical text or by endorsement, at the latest by October 2000, and conflicting national standards shall be withdrawn at the latest by October 2000.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.

1 Scope

This European Standard specifies a method of specifying requirements for phosphate conversion coatings, intended primarily for application to ferrous metals, aluminium, zinc, cadmium and their alloys (see annex A).

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).

EN ISO 3892, *Conversion coatings on metallic materials — Determination of coating mass per unit area — Gravimetric methods (ISO 3892 :1980).*

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 Information to be supplied by the purchaser

The following information shall be supplied by the purchaser:

a) the coating designation (see clause 4);

b) any necessary heat treatment for parts that might be subject to failure from the effects of hydrogen induced during the preparation or phosphating processes (see notes 1 and 2);

c) sampling methods, acceptance levels or any other inspection requirements, if different from those given in ISO 4519 (see clause 5);

d) the surface preparation prior to phosphate conversion coating (see A.2);

e) the surface appearance (see 6.1);

f) corrosion resistance (see 6.3);

g) the nature, condition and finish of the basis metal, if any of these could affect the serviceability and/or the appearance of the coating.

NOTE 1 Heat treatment procedures and classes are specified in ISO 9587 for stress relieving before processsing and in ISO 9588 for embrittlement relief after processing, but other conditions may be specified by the purchaser provided that they can be shown to be effective.

NOTE 2 Heat treatment in accordance with the recommended conditions can never guarantee complete freedom from hydrogen embrittlement and tests should be specified whenever possible. Freedom from failure of test samples will enable a degree of confidence in the procedure to be demonstrated depending on the size of the sample tested.

4 Coating types and designation

4.1 Coating types

The conversion coating shall be described in accordance with table 1.

NOTE Annex B provides guidance on coating type, purpose, end use and mass per unit area.

Table 1 — Principle types of phosphate conversion coatings

Coating type	Symbol
Zinc phosphate	Znph
Zinc-calcium phosphate	ZnCaph
Manganese phosphate	Mnph
Iron phosphate (produced by alkali-metal phosphate treatment)	Feph
NOTE Other coating types exist including zinc phosphate modified with iron and/or nickel and/or manganese. The modifying metal will normally be present in the form of a double salt such as $Zn_2Me(PO_4)_2 \cdot 4H_2O$, where Me represents Fe(II), Ni or Mn. Zn remains the main metal constituent of these coatings which, to avoid confusion, have not been given separate symbols. It should also be noted that metal from the substrate material will often be incorporated in the conversion coating.	

4.2 Conversion coating designation

The conversion coating designation shall comprise the following:

a) the number of this European Standard;

b) a hyphen;

c) the basis metal code, e.g. its chemical symbol (or that of the principal constituent of an alloy) (see note 1);

d) a solidus;

e) a symbol describing the type of coating (see table 1);

f) a solidus;

g) a symbol indicating the function of the conversion coating, as follows: r = adhesion and/or corrosion protection; z = to facilitate cold forming; g = to facilitate sliding action; e = electrical insulation;

h) a solidus;

i) a number indicating the coating mass per unit area, in grams per square metre, with a tolerance of ± 30 %.

If the phosphate conversion coating has to be after-treated, the designation shall also comprise the following:

a) a solidus;

b) a symbol indicating any after-treatment of the conversion coating, as specified in table C.1 (see note 2).

NOTE 1 It is recommended that the chemical symbol is followed by the standard designation of the basis metal.

NOTE 2 This can be repeated if more after-treatments are required.

EXAMPLE

Designation of a zinc phosphate type coating (Znph) applied to ferrous metal (Fe) to give corrosion protection (r) at a mass per unit area of 3 g/m² ± 0,9 g/m² (3) and for which the after-treatments are sealing (T2) and painting (T1)

Phosphate conversion coating EN 12476-Fe/Znph/r/3/T2/T1

5 Sampling

Sampling shall either be in accordance with ISO 4519 or as specified by the purchaser (see 3, c)).

6 Coating requirements

6.1 Appearance

Zinc phosphate, zinc calcium phosphate and manganese phosphate coatings shall cover the metal surface evenly and shall not exhibit any white patches, corrosion products or finger marks.

NOTE Slight fluctuations in the appearance of phosphate coatings, which may be caused by differences in the structure of the substrate, by contact with the supports or by contact with other components whilst in the phosphating drum, should not give grounds for complaint.

6.2 Coating mass per unit area

The coating mass per unit area shall be determined in accordance with the appropriate method specified in EN ISO 3892.

NOTE For quality assurance purposes, instruments which are available and which give a direct reading of coating mass per unit area may be used. It is, however, essential that they be calibrated against standard coatings having a coating mass per unit area of the same order as those being inspected.

6.3 Corrosion resistance

When the function of the phosphate conversion coating is corrosion resistance, an after-treatment is always required. The corrosion resistance shall be determined by subjecting the after-treated parts to the accelerated corrosion test specified by the purchaser (see 3, f)). If no test is specified, the parts shall be tested in accordance with the neutral salt spray (NSS) test described in ISO 9227 (see annex D). Minimum exposure times specified by the purchaser shall be attained by the test parts before the first evidence of corrosion appears.

Annex A
(informative)

Guidance

A.1 General

Phosphate conversion coatings are produced by treatment with solutions, the main constituents of which are the appropriate dihydrogen orthophosphates shown in table A.1. 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;

c) processing conditions for phosphating.

All phosphate conversion coatings are more or less porous but can be substantially sealed by appropriate after-treatment.

The main types of phosphate conversion coatings and their characteristics are summarized in table A.1.

A.2 Surface preparation

A.2.1 Before processing, all scale, rust, grease, oil, finger prints and foreign matter should be removed from the surface to be coated by a method, or combination of methods, suitable for the particular phosphating process concerned, i.e. methods that give rise to a coarse crystalline structure may not be desirable. To avoid a phosphate conversion coating of a coarse grain size or excessive coating mass per unit area, the use of strong alkalis or acids for cleaning should be minimized. If the conditions of the components require such cleaning prior to phosphating, a neutralizing rinse should be used. The cleaned component should be adequately rinsed in cold or hot water to remove any residues from the cleaning process that might affect the composition of the bath solution or the quality of the coating. A conditioning rinse may be used immediately prior to phosphating to favour the formation of fine grain coatings without further rinsing. Materials based on titanium salts are currently used and are widely available from proprietary sources. It is also possible to incorporate such materials in mildly alkaline spray cleaners, thus obviating the need for a separate conditioning rinse. However, in this case rinsing before phosphating is essential.

Certain phosphating processes combine surface preparation with phosphating.

A.2.2 Where acid pickling has been employed, it may be necessary to follow the use of pickling solutions containing wetting agents or inhibitors, by dipping in an acid solution without wetting agent or inhibitor or in a suitable alkaline solution in order to remove absorbed films.

A.3 Methods of application

Phosphating is usually carried out by immersing the component in a coating bath (with agitation of the solution if necessary), or by copious application or spraying of the component with the coating solution. Roller application may however be used in the case of galvanized or ungalvanized steel strip. The phosphated components are then rinsed with water, dried and after-treated according to their intended end use. Full details of the process conditions may, of course, be obtained from the appropriate operating instructions.

Sludge is formed as a normal by-product of the phosphating reaction. The sludge does not usually interfere with processing but forms of agitation, which cause sludge to be deposited on the component, should be avoided.