

BS EN ISO 9717:2013



BSI Standards Publication

Metallic and other inorganic coatings — Phosphate conversion coating of metals

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National foreword

This British Standard is the UK implementation of EN ISO 9717:2013. It is identical to ISO 9717:2010. It supersedes BS ISO 9717:2010 and BS EN 12476:2000, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee STI/33, Electrodeposited and related coatings.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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English Version

**Metallic and other inorganic coatings - Phosphate conversion
coating of metals (ISO 9717:2010)**

Revêtements métalliques et autres revêtements
inorganiques - Couches de conversion au phosphate sur
métaux (ISO 9717:2010)

Metallische und andere anorganische Überzüge -
Phosphatüberzüge auf Metallen (ISO 9717:2010)

This European Standard was approved by CEN on 28 March 2013.

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Foreword

The text of ISO 9717:2010 has been prepared by Technical Committee ISO/TC 107 “Metallic and other inorganic coatings” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 9717:2013 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of an identical text or by endorsement, at the latest by October 2013, and conflicting national standards shall be withdrawn at the latest by October 2013.

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Endorsement notice

The text of ISO 9717:2010 has been approved by CEN as EN ISO 9717:2013 without any modification.

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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.

Metallic and other inorganic coatings — Phosphate conversion coating of metals

WARNING — This International Standard may not be compliant with some countries' health, safety and environmental legislations and calls for the use of substances and/or procedures that may be injurious to health if adequate safety measures are not taken. This International Standard does not address any health hazards, safety or environmental matters and legislations associated with its use. It is the responsibility of the producers, purchasers and/or user of this International Standard to establish appropriate health, safety and environmentally acceptable practices and take appropriate actions to comply with any national, regional and/or international rules and regulations. Compliance with this International Standard does not in itself confer immunity from legal obligations.

1 Scope

This International Standard specifies requirements for the processing of ferrous metals, aluminium, zinc, cadmium and their alloys to produce coatings consisting essentially of inorganic phosphates, which are intended to be used in conjunction with supplementary treatments for the protection of the basis metal against corrosion and to provide anti-wear properties to sliding surfaces, adhesion to organic finishes and ease of cold-forming operations.

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 1463, *Metallic and oxide coatings — Measurement of coating thickness — Microscopical method*

ISO 2064, *Metallic and other inorganic coatings — Definitions and conventions concerning the measurement of thickness*

ISO 2080, *Metallic and other inorganic coatings — Surface treatment, metallic and other inorganic coatings — Vocabulary*

ISO 2819, *Metallic coatings on metallic substrates — Electrodeposited and chemically deposited coatings — Review of methods available for testing adhesion*

ISO 2859 (all parts), *Sampling procedures for inspection by attributes*

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 9587, *Metallic and other inorganic coatings — Pretreatment of iron or steel to reduce the risk of hydrogen embrittlement*

ISO 9588, *Metallic and other inorganic coatings — Post-coating treatments of iron or steel to reduce the risk of hydrogen embrittlement*

ISO 15724, *Metallic and other inorganic coatings — Electrochemical measurement of diffusible hydrogen in steels — Barnacle electrode method*

ISO 27831-1, *Metallic and other inorganic coatings — Cleaning and preparation of metal surfaces — Part 1: Ferrous metals and alloys*

ISO 27831-2, *Metallic and other inorganic coatings — Cleaning and preparation of metal surfaces — Part 2: Non-ferrous metals and alloys*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1463, ISO 2064, ISO 2080, ISO 2819, ISO 9587 and ISO 9588 and the following apply.

3.1
free acid of a phosphating solution
number of millilitres of 0,4 % mass fraction of sodium hydroxide solution required to neutralize 10 ml of the phosphating solution to pH 4, using methyl orange or an equivalent indicator system

3.2
pointage
measure of the total acidity of a phosphating solution, i.e. the number of millilitres of 0,4 % mass fraction of sodium hydroxide solution required to neutralize 10 ml of the phosphating solution to pH 10 using phenolphthalein as an indicator

3.3
accelerated process
process where the processing solution is of the metal phosphate/phosphoric acid type containing additions such as oxidizing agents, e.g. nitroguanidine, nitrate, nitrite, or chlorate, which accelerate the coating formation

3.4
unaccelerated process
process where the processing solution is of the plain metal phosphate/phosphoric acid type and no accelerating agents are employed

3.5
sealing
application of a supplementary coating to the phosphate surface immediately after phosphating, rinsing and drying, to form a complete protective or lubrication system

3.6
supplementary coating
covering material, usually of an organic nature

EXAMPLES oil, grease, lacquer, varnish, paint or dry lubricant

4 Information to be supplied by the purchaser to the processor

4.1 Essential information

When ordering articles to be phosphated in accordance with this International Standard, the purchaser shall provide the following information in writing, in, for example, the contract or purchase order, or on engineering drawings:

- a) a reference to this International Standard, ISO 9717:2010, and the designation (see Clause 5);
- b) the nominal composition, specification, nature and metallurgical condition of the basis metal, if they are likely to affect the serviceability and/or the appearance of the coating;
- c) the significant surfaces, to be indicated on drawings of the parts or by providing suitably marked specimens;
- d) the coating classification code (see 5.4);
- e) the coating mass per unit area, or the coating thickness with any tolerance limit required, and the relevant test method (see 6.4);
- f) tensile strength of parts and the requirements of heat treatment before and/or after the phosphating process (see 6.5 and 6.6);
- g) the surface preparation required prior to phosphate conversion coating (see 6.1);
- h) the surface appearance (see 6.1);
- i) the requirements for, and type of, supplementary treatments, e.g. staining, oil, grease, organic coatings, etc. (see 6.7);
- j) the requirement for a quality-evaluation test for controlling the quality and continuity of the coating, test method to be used and minimum exposure time (see 6.9);
- k) the sampling methods, acceptance levels and/or any other inspection requirements (see Clause 7).

4.2 Additional information

The following additional information shall also be provided by the purchaser, when appropriate:

- a) for creviced items, the phosphate process and/or nature of accelerator employed;
- b) for high-strength steels, details of any special process requirements;
- c) the properties of the coating, such as surface profile and crystal size;
- d) any other requirements, such as cascaded process in rinsing or whether removal of supplementary coatings is needed prior to examination of corroded test specimens (see 6.3.1, 6.8, 6.9 and Annex F).

5 Designation

5.1 General

The designation shall appear on engineering drawings, in the purchase order, in the contract or in the detailed product specification.

The designation specifies, in the following order, the basis metal, the specific alloy (optional), stress-relief requirements, the thickness (or mass) and composition of the phosphate coating, heat treatment to reduce susceptibility to hydrogen embrittlement, and treatments for, including the type of, supplementary coating.

5.2 Designation specifications

The coating designation specifies the basis metal and the types and thickness of coatings appropriate for each service condition number and comprises the following:

- a) the term, "Phosphate conversion coating", the number of this International Standard, ISO 9717, followed by a hyphen;
- b) the chemical symbol for the basis metal (or for the principal metal if an alloy) followed by a solidus (/) as follows:
 - Fe for iron or steel;
 - Zn for zinc or zinc alloys;
 - Al for aluminium or aluminium alloys;
 - Cd for cadmium;
- c) the designation SR (see 5.3), if necessary, followed by a solidus;
- d) a symbol describing the type of coating;
- e) a number indicating the coating mass per unit area, in grams per square metre, followed by a solidus;
- f) a symbol indicating additional treatments for supplementary coating of the phosphate layer followed by a solidus (see Table E.1);
- g) the designation ER (see 5.3), if necessary, followed by a solidus;
- h) a symbol indicating any additional treatments for supplementary coating of the phosphate layer.

Solidi (/) shall be used to separate data fields in the designation corresponding to the different sequential processing steps. Double separators or solidi indicate that a step in the process either is not required or has been omitted.

If supplementary treatments other than, or in addition to, sealing are used, the designation shall be Fe/ZnMeph25/X/Y, where ZnMeph represents appropriate metal phosphate if zinc remains as the main metal constituent of the coating or phosphate of a double salt with, for example, 25 g/m² coating mass per unit area, and X and Y represent the supplementary coating codes given in Table F.1.

It is recommended that the specific alloy be identified by its standard designation following the chemical symbol of the basis metal; for example, its UNS number, or the national or regional equivalent, may be placed between the symbols < >. For example, Fe<G43400> is the UNS designation for one high-strength steel. (See Reference [6] in the Bibliography).

5.3 Designation of heat treatment requirements

The heat treatment requirements shall be in brackets and designated as follows:

- a) the letters SR, for stress-relief heat treatment prior to electroplating, and/or the letters ER, for hydrogen-embrittlement-relief heat treatment after electroplating;
- b) in parenthesis, the minimum temperature, in degrees Celsius;