INTERNATIONAL STANDARD

ISO 2082

Fourth edition
2017-07

Metallic and other inorganic coatings — Electroplated coatings of cadmium with supplementary treatments on iron or steel

Revêtements métalliques et autres revêtements inorganiques — Dépôts électrolytiques de cadmium avec traitements supplémentaires sur fer ou acier

Reference number
ISO 2082:2017(E)

© ISO 2017



COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, 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
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Normative references ... **1**

3 Terms, definitions, abbreviated terms and symbols ... **2**
3.1 Terms and definitions ... 2
3.2 Abbreviated terms ... 2
3.3 Symbols ... 2

4 Information to be supplied by the purchaser to the electroplater ... **3**
4.1 Essential information ... 3
4.2 Additional information ... 3

5 Designation ... **3**
5.1 General ... 3
5.2 Designation specification ... 4
5.3 Designation of the basis material ... 5
5.4 Designation of heat treatment requirements ... 5

6 Requirements ... **5**
6.1 Appearance ... 5
6.2 Thickness ... 5
6.3 Conversion coatings and other supplementary treatments ... 6
6.4 Adhesion of cadmium and chromate coatings ... 6
6.5 Accelerated corrosion testing ... 6
6.5.1 Neutral salt spray test ... 6
6.5.2 Corrosion rating ... 7
6.6 Stress relief heat treatment before cleaning and metal deposition ... 7
6.7 Hydrogen-embrittlement-relief heat treatment after electroplating ... 7
6.8 Sampling ... 8

Annex A (normative) **Designation of supplementary treatments** ... **9**

Annex B (normative) **Measurement of average thickness of coating on small articles** ... **11**

Annex C (informative) **Additional information on corrosion resistance, rinsing and drying, processing parts in bulk and dyeing of chromate conversion coatings** ... **12**

Bibliography ... **13**

© ISO 2017 – All rights reserved

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 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.

This document was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 262, *Metallic and other inorganic coatings, including for corrosion protection and corrosion testing of metals and alloys*, in collaboration with ISO Technical Committee TC 107, *Metallic and other inorganic coatings*, Subcommittee SC 3, *Electrodeposited coatings and related finishes*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This fourth edition cancels and replaces the third edition (ISO 2082:2008), which has been technically revised.

© ISO 2017 – All rights reserved

Introduction

Electrodeposits of cadmium are used to protect iron and steel from corrosion. Cadmium is anodic and corrodes sacrificially, thus protecting ferrous basis metals even when exposed through pores or pits in the cadmium. Electrodeposited cadmium coatings have traditionally been applied to iron or steel from alkaline cyanide solutions, but in recent years, environmental concerns and regulations have led to increased use of acid sulfate, neutral chloride and acid fluoborate cadmium solutions.

Because the appearance and serviceability of electroplated cadmium coatings are influenced by the surface condition of the basis metal, agreement should be reached between the interested parties that the surface of the basis metal is satisfactory for electroplating.

Although concerns have been raised about the use of cadmium due to safety and environmental effects, there are critical applications, often aerospace-related, where the unique properties of electrodeposited cadmium coatings, for example, their corrosion resistance, intrinsic lubricity, ductility, electrical conductivity and low contact resistance, make continued use of cadmium coatings necessary.

The corrosion resistance of electroplated cadmium coatings and their tendency to tarnish when handled can be improved by applying chromate conversion and other supplementary coatings.

Chemical conversion coatings that do not contain hexavalent chromium are commercially available and their use is becoming more and more popular. The appearance of these substitutes may be different from those produced with hexavalent chromium. Due to the REACH Regulations, however, the use of hexavalent chromium compounds will be banned in Europe from September 2017 except where specifically authorized. Other conversion coatings that are chromium-free are also available. Substitutes are required to satisfy the corrosion requirements given in this document.

© ISO 2017 – All rights reserved

Metallic and other inorganic coatings — Electroplated coatings of cadmium with supplementary treatments on iron or steel

DANGER — Cadmium vapour is highly toxic by inhalation. During heat treatment, all precautions should be taken to ensure that no person is exposed to it. Attention is also drawn to the danger arising from welding, soldering or heating and other operations, in which the possibility that cadmium will be vaporised exists. Because of its toxicity, cadmium should not be employed as a coating for any article that will come in contact with food or beverages or containers in contact with these items or any household goods.

1 Scope

This document specifies the requirements of electroplated coatings of cadmium with supplementary treatments on iron and steel. It includes information that is to be supplied by the purchaser to the electroplater, and describes coating requirements, including those for heat treatment before and after electroplating.

It is not applicable to coatings applied

— to sheet, strip or wire in the non-fabricated form,

— to close-coiled springs, or

— for purposes other than protective, intrinsic lubricity, ductility, electrical conductivity and low contact resistance use.

This document does not specify requirements for the surface condition of the basis metal prior to electrodeposition with cadmium.

The coating thickness that can be applied to threaded components can be limited by dimensional requirements, including class or fit.

Additional information on corrosion resistance, rinsing and drying, processing parts in bulk and dyeing of chromate conversion coatings is given in Annex C.

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 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 2177, *Metallic coatings — Measurement of coating thickness — Coulometric method by anodic dissolution*

ISO 2178, *Non-magnetic coatings on magnetic substrates — Measurement of coating thickness — Magnetic method*

© ISO 2017 – All rights reserved

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

ISO 3497, *Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods*

ISO 3543, *Metallic and non-metallic coatings — Measurement of thickness — Beta backscatter method*

ISO 3613, *Metallic and other inorganic coatings — Chromate conversion coatings on zinc, cadmium, aluminium-zinc alloys and zinc-aluminium alloys — Test methods*

ISO 4518, *Metallic coatings — Measurement of coating thickness — Profilometric method*

ISO 4519:1980, *Electrodeposited metallic coatings and related finishes — Sampling procedures for inspection by attributes*

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

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 10289, *Methods for corrosion testing of metallic and other inorganic coatings on metallic substrates — Rating of test specimens and manufactured articles subjected to corrosion tests*

ISO 10587, *Metallic and other inorganic coatings — Test for residual embrittlement in both metallic-coated and uncoated externally-threaded articles and rods — Inclined wedge method*

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

3 Terms, definitions, abbreviated terms and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 2064 and ISO 2080 apply.

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

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

— ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Abbreviated terms

ER hydrogen-embrittlement-relief heat treatment

SR stress relief heat treatment

T2 organic sealant

3.3 Symbols

Cd chemical symbol for cadmium

Fe chemical symbol for iron

© ISO 2017 – All rights reserved