INTERNATIONAL STANDARD

ISO 12683

First edition
2004-11-01

Mechanically deposited coatings of zinc — Specification and test methods

Dépôts de zinc par voie mécanique (matoplastie) — Spécifications et méthodes de contrôle

Reference number
ISO 12683:2004(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 12683 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/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).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

Contents

Foreword

This document (EN ISO 12683:2004) has been prepared by Technical Committee CEN/TC 262 “Metallic and other inorganic coatings”, the Secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 107 “Metallic and other inorganic coatings”.

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 May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This document specifies the requirements for coatings of zinc that have been mechanically deposited on to fabricated metal articles to protect them from corrosion. It also describes the related test methods.

NOTE Annex A describes the process of applying a metal coating that is called mechanical deposition. In this instance the metal applied is zinc.

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.

EN ISO 1463, *Metallic and oxide coatings - Measurement of coating thickness - Microscopical method (ISO 1463:2003)*

EN ISO 2064:2000, *Metallic and other inorganic coatings - Definitions and conventions concerning the measurement of thickness (ISO 2064:1996)*

EN ISO 2177, *Metallic coatings - Measurement of coating thickness - Coulometric method by anodic dissolution (ISO 2177:2003)*

EN ISO 2178, *Non-magnetic coatings on magnetic substrates - Measurement of coating thickness - Magnetic method (ISO 2178:1982)*

EN ISO 3497, *Metallic coatings - Measurement of coating thickness - X-ray spectrometric methods (ISO 3497:2000)*

EN ISO 9220, *Metallic coatings - Measurement of coating thickness - Scanning electron microscope method (ISO 9220:1988)*

EN ISO 10111, *Metallic and other inorganic coatings - Measurement of mass per unit area - Review of gravimetric and chemical analysis methods (ISO 10111:2000)*

ISO 2079:1981, *Surface treatment and metallic coatings — General classification of terms*

ISO 2080:1981, *Electroplating and related processes — Vocabulary*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptable quality level (AQL) for lot-by-lot inspection*

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

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

ISO 10474, *Steel and steel products — Inspection documents*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 2064:2000, ISO 2079:1981 and ISO 2080:1981 and the following apply

3.1
mechanically deposited coating
coating obtained by compacting metallic powder particles onto correctly prepared metallic substrates in a rotating barrel in the presence of impact media (normally glass beads) and in a suitable chemical environment without the use of an electric current or applied heat

3.2
apparent coating density
product of thickness, determined in accordance with EN ISO 1463, and mass per unit area, determined in accordance with EN ISO 10111

4 Information and requirements to be agreed and documented by the purchaser

4.1 General

The following items to be agreed between the contracting parties, which are specified in the clauses referred to, shall be fully documented. Both the definitive requirements specified in this document and the documented items listed in 4.2 and 4.3 shall be satisfied before a claim of compliance can be made and verified.

4.2 Essential information

The following information shall be given:

a) number of this document;

b) nature of the basis material, its surface condition and roughness;

c) tensile strength of the article and before any requirements for stress relief before coating (see 7.1 and 7.2);

d) service condition number (see 6.1) or the classification code of the coating (see 6.2);

e) any supplementary finish required (see 6.2 and A.3);

f) acceptability and positions of defects on non-significant surfaces (see 8.2);

g) location at which coating thickness shall be measured, any maximum thickness if appropriate, and the test method to be used' (see 8.3);

h) sampling procedure to be adopted (see Clause 9);

i) method for testing adhesion (see 8.4);

j) requirement for an attestation of conformity (see Clause 11);

k) any special requirements for appearance (see 8.1).

4.3 Additional information

The following additional information may be required and, if so, shall be specified by the purchaser:

a) any special post-plating treatment (see A.3);

b) any special packaging requirements for the coated articles;

c) requirement for any test report other than that specified.

5 Substrate

This document specifies no requirement for the condition, finish or surface roughness of the basis metal prior to mechanical zinc plating. However, it should be recognized that the surface roughness of the coated surface will be dependent on the initial roughness of the basis metal, and therefore this shall not be a cause for rejection of the mechanical zinc plated coating.

6 Classification and designation of coatings

6.1 Service condition number

The service condition number shall be used to indicate the severity of the service conditions in accordance with Table 1 (see EN 12500:2000, Annex E).

6.2 Class of zinc coating thickness and type of supplementary treatment

The zinc coatings shall be classified on the basis of thickness and the supplementary treatment required in accordance with Tables 1 and 2.

Table 1 — Minimum coating thickness for mechanical zinc coating

Class	Minimum coating thickness (μm)
Zn 110 M(Fe)	107
Zn 80 M(Fe)	81
Zn 65 M(Fe)	66
Zn 50 M(Fe)	53
Zn 40 M(Fe)	40
Zn 25 M(Fe)	25
Zn 12 M(Fe)	12
Zn 8 M(Fe)	8
Zn 6 M(Fe)	6

Table 2 — Supplementary coating finishing

Type	Description
1	As coated, without supplementary treatment
2	With a yellow, opaque green or black coloured chromate conversion treatment
3	With complementary treatment, as specified by the purchaser

7 Requirements for pretreatments

7.1 Stress relief treatment before coating

When specified by the purchaser, steel parts that have an ultimate tensile strength equal to or greater than 1000 Mpa (31 HRc) and that contain tensile stresses caused by machining, grinding, straightening, or cold forming operations shall be given a stress relief treatment prior to cleaning and metal deposition. The procedures and classes for stress relief heat treatment shall be as specified by the purchaser or the purchaser may specify appropriate procedures and classes from ISO 9587. Stress relief heat treatment shall be carried out before any electrolytic treatments are applied.

7.2 Cleaning

High strength steels, which become embrittled when charged with hydrogen, shall be cleaned before application of the coating in non-electrolytic alkaline, anodic-alkaline processes.

High strength steels that have heavy oxide or scale on them shall be further cleaned using inhibited acid processes to avoid the risk of producing hydrogen embrittlement.

8 Inspection

8.1 Appearance

When examined by the unaided eye or corrected vision the significant surfaces of the coated articles shall be free from any visible defects such as blisters, pits, roughness, cracks or uncoated areas and shall not be stained or discoloured. The acceptability and positions of defects on non-significant surfaces shall be specified by the purchaser. The coatings deposited shall have a uniform silvery appearance, and a matte to medium bright lustre.

NOTE Applied finishes generally perform better in service when the substrate over which they are applied is smooth and free of torn metal, inclusions, pores, and other defects.

A metal finisher can often remove defects through special treatments such as grinding, polishing, abrasive blasting, chemical treatments, and electropolishing. However, these are not in the normal treatment steps preceding application of the finish. When desired they shall be specified by the purchaser.

8.2 Surface defects

Defects and variations in appearance in the coating that arise from surface condition of the substrate (scratches, pores, roll marks, inclusions, etc.) and finishing practices shall not be cause for rejection.

The coating shall be uniform in appearance and substantially free of blisters, pits, nodules, flaking, and other defects that can adversely affect the function of the coating. The coating shall cover all surfaces including roots of threads, thread peaks, corners and edges. The coating shall not be discoloured throughout to an extent that would adversely affect appearance as a functional requirement. However, superficial staining that results from rinsing and variations in colour or lustre shall not be cause for rejection.

NOTE The nature of the mechanical plating process is such that the coatings are generally not as smooth or as bright as some electroplated coatings.

8.3 Thickness

The thickness over the entire significant surface shall be measured in accordance with the following standards within the conventions defined in EN ISO 2064.

The thickness of the coating shall be determined in accordance with EN ISO 2178 (magnetic method), EN ISO 2177 (coulometric method), EN ISO 3497 (X ray spectrometric method) or EN ISO 9220 (microscopical method), as applicable. Other methods may be used if it can be demonstrated that the measurement uncertainty of EN ISO 2178, EN ISO 2177, EN ISO 3497 and EN ISO 9220 is less than 10 % reliable.

The thickness of the coating shall be measured at the significant surface of the product or at such locations as specified.

The thickness of coatings with supplementary finishes (see Table 2) shall be measured before the application of supplementary coating or treatment. The Type 2 chromate conversation coatings shall be removed from the test area before the thickness is measured using a very mild abrasive (such as a paste of levitated alumina or magnesium oxide) rubbed on gently with the finger.

NOTE 1 The process by which Type 2 coatings are produced dissolves a small amount of zinc. For this reason it is essential that the thickness is checked after the application of Type 2 coatings to ensure that it is the required thickness.

The minimum thicknesses shall be in accordance with Table 1.

NOTE 2 With mechanical deposition the coatings generally tend to be thinner at exposed edges and sharp projections, and thicker on flat surfaces and shielded or recessed areas.

NOTE 3 The coating thickness required by this specification is a minimum requirement; that is, the coating thickness has to equal or exceed the specified thickness everywhere on the significant surfaces. Variation in the coating thickness from point to point on a coated article is an inherent characteristic of mechanical deposition processes. Therefore, the coating thickness will have to exceed the specified value at some points to ensure that the thickness equals or exceeds the value at all points. Hence, in most cases the average coating thickness on an article will be greater than the specified value; how much greater is largely determined by the shape of the article and the characteristic of the deposition process.

8.4 Adhesion

Adhesion of the zinc deposit to the basis metal shall be tested in a manner that is consistent with the service requirements of the coated article. The ability to separate the coating from the substrate by peeling, as distinct from flaking caused by rupture of the deposit or of the basis metal, shall be evidence of failure. Adhesion shall be determined in accordance with one of the following methods:

— **Bend test:** the part shall be plastically deformed to rupture, if possible, as specified.

— **Scrape test:** the surface of the coated article shall be scraped or sheared with a sharp edge, knife or razor blade through the coating down to the basis metal and shall be examined under 4X magnification.

NOTE There is no satisfactory test for evaluating the adhesion of mechanically deposited coatings. Those given above are widely used; however, other tests may prove more applicable in specific cases. Various qualitative methods are discussed in EN ISO 2819.

8.5 Corrosion resistance in accelerated salt spray test

When tested in accordance with the neutral salt spray test (NSS) in accordance with ISO 9227, each class of coating shall withstand the minimum period specified in Table 3 for duration of exposure (measured in hours) before first significant corrosion.

NOTE If samples with Type 2 supplementary coating chromate film (see Table 3) are to be examined both for white corrosion and for rust, separate samples may be used to determine the end point for white corrosion and for rust. This allows uninterrupted exposure for the longer of the two test periods required without having to wash specimens for examination, in accordance with ISO 9227.

Parts with Type 2 supplementary coating chromate film shall be aged at room temperature for 24 h before salt spray testing.

Parts with a complementary treatment Type 3 (waxes, dyes, etc.) shall not be used as samples for corrosion testing to assess conformity with the requirements.

Table 3 — Minimum time exposure in accelerated salt spray test (ISO 9227)

Class	Supplementary coating finishing type	First significant corrosion (h)	
		White rust	Red rust
Zn 110 M(Fe)	1	No requirement	500
	2	72	500
Zn 80 M(Fe)	1	No requirement	400
	2	72	400
Zn 65 M(Fe)	1	No requirement	350
	2	72	350
Zn 50 M(Fe)	1	No requirement	300
	2	72	300
Zn 40 M(Fe)	1	No requirement	250
	2	72	250
Zn 25 M(Fe)	1	No requirement	192
	2	72	192
Zn 12 M(Fe)	1	No requirement	72
	2	48	144
Zn 8 M(Fe)	1	No requirement	48
	2	48	96
Zn 6 M(Fe)	1	No requirement	24
	2	24	48

The presence of white (zinc) or red (ferrous/ferric) corrosion products visible to the unaided eye, or with corrected vision, at normal reading distance at the end of the test periods specified in Table 3 shall constitute failure except when those corrosion products are at the edges of specimens. Slight 'wisps' of white corrosion, as opposed to obvious accumulations, shall be deemed acceptable.

On parts with Type 2 supplementary coatings, the greater number of hours for either white corrosion products or rust shall apply. For example, for Class Zn 8 M(Fe) Type 2, if no white corrosion products appear after 48 h, the test shall be continued for 96 h. Similarly, for Zn 25 M(Fe) Type 2 if no white corrosion products appear before 72 h, the test shall be continued for a total of 192 h.

NOTE 1 Mechanical deposition is exclusively a barrel-finishing process. It is recognized that mechanical deposition on parts may therefore produce surfaces that have a different characteristic from those on parts that are finished exclusively by racking. Similarly, corrosion testing of actual parts may produce different results from those on test panels.

Salt spray requirements that are appropriate to indicate the technical quality with which a process is carried out may be impractical for acceptance of actual parts. In such a case the purchaser shall indicate his requirements on the purchase order.

NOTE 2 In many instances, there is no direct relation between the results of an accelerated corrosion test and the resistance to corrosion in other media because several factors that influence the progress of corrosion, such as the formation of protective films, vary greatly with the conditions encountered. The results obtained in the test should not, therefore, be regarded as a direct guide to the relative corrosion resistance of these materials in service.

8.6 Absence of hydrogen embrittlement

NOTE A major advantage of mechanical deposition is that it does not produce hydrogen embrittlement in hardened steel during the coating process. However, pronounced embrittlement can be produced in certain cleaning processes. The mild degree of embrittlement that might result from following proper procedures and using the cleaning methods specified in 7.2 is normally self-relieving within 24 h at room temperature.

Springs and other high strength parts subject to flexure shall be quarantined for a minimum of 48 h at room temperature after coating before being loaded, flexed or used. Such high-strength steel parts shall be free of hydrogen embrittlement. When specified in the purchase order, freedom from embrittlement shall be determined in accordance with ISO 10587.

9 Sampling

A random sample shall be selected from the inspection lot in accordance with ISO 2859-1. The articles in the sample shall be inspected for conformity with the requirements of this document and the lot shall be classified as conforming or nonconforming to each requirement in accordance with the criteria of the sampling plans.

An inspection lot shall be defined as a collection of coated articles that are of the same kind, that have been produced to the same specifications, that have been coated by a single supplier at one time or at approximately the same time under essentially identical conditions, and that are submitted for acceptance or rejection as a group. In no case shall the lot exceed 1 week of production volume.

If separate test specimens are to be used to represent the coated articles in a test, the specimens shall be of the same nature, size and number, and be processed in accordance with 8.4.

NOTE Test specimens may be used to represent the coated articles in a test if the articles are of a size, shape, or material that is not suitable for the test, or if it is preferred not to submit articles to a destructive test because, for example, the articles are expensive or available in limited number.

If test specimens are to be used, their number, the material from which they shall be made, and their shape and size shall be as specified by the purchaser.

The test specimen shall duplicate those characteristics of the article that influence the property being tested, and it shall be processed with the article through the process steps that influence the property.

The test specimen used to represent an article in an adhesion, corrosion resistance or appearance test shall be made of the same material and shall be in the same metallurgical condition as the article it represents, and it shall be placed in the production lot of, and be processed along with, the article it represents.

A test specimen used to represent an article in a coating thickness test shall be introduced into the process at the point where the coating, or coatings, are applied and it shall be carried through all steps that might influence the coating thickness.

When a test specimen is used as a coated article in a thickness test, the specimen will not necessarily have the same thickness distribution as the article unless the specimen and the article are of the same general size and shape. Therefore, before coated articles may be accepted on the basis of a thickness test performed on the representative test specimens, the relationship between the thickness on the specimen and the thickness on the part shall be established. The criterion of acceptance shall be that thickness on the specimen corresponds to the required thickness on the article.

10 Rejection

Rejected parts that are accepted for recoating shall have the metallic coating removed by a non-embrittling process prior to recoating.

11 Attestation of conformity

11.1 General

If requested in the order, the supplier or producer shall provide an attestation of conformity to this document and to the requirements in the order and/or a report on the results of the tests carried out.

11.2 Normal conditions

The supplier shall provide a certificate of conformity to the order in accordance with type 2.1 of ISO 10474.

11.3 Specific conditions

If requested in the order another type of test report may be provided in accordance with ISO 10474. The type of this document shall be defined in the order.

Annex A
(informative)

Additional information

A.1 Coating application process

Mechanical deposition of zinc coatings generally consists of steps a) to g) (in the sequence given).

a) Surface preparation: Surface preparation of the parts to be coated using a chemical procedure (see 7.2) in order to proceed to stage b) and to obtain an adequately degreased and descaled surface condition.

b) Deposition of a thin coating of copper: Deposition of a thin coating of copper by immersion in an appropriate chemical solution without the use of electric current.

c) Promoter, which aids uniform deposition of the metal powder.

d) Coating: Treatment of the parts by tumbling in a container (see 3.1) in the presence of:

— impact media, e.g. glass beads or other substances that are essentially chemically inert to the deposition process;

NOTE The impact media aid the provision of mechanical forces to drive the metal powder on to the substrate parts.

— liquid medium, which usually consists of water and special acidic products to avoid the formation of oxide and to maintain sufficient acidity until the deposition process is complete;

— 'promoter' or 'accelerator', which aids uniform deposition of the metal powder; and

— the metal zinc in powder form (see Annex B).

e) Separation: Separation of the parts from the solid and liquid media.

f) Rinsing

g) Drying

A.2 Coating corrosion resistance characteristics in outdoor environments

Mechanical deposition greatly reduces the risk of hydrogen embrittlement and is suitable for coating bores and recesses in many parts that cannot be conveniently electroplated. Zinc coatings are usually applied to provide corrosion resistance. The performance of a zinc coating depends largely on coating weight, the supplementary treatment, if any, and the type of environment to which it is exposed. All classes of zinc thickness provide suitable alternatives to other available coating processes. The data given in Table A.1 are based on widespread testing and may be used to compare the behaviour of zinc in various atmospheres. The values are only indicative, because individual studies in various parts of the world have resulted in figures that vary widely from these averages.

Table A.1 — Coating resistance characteristics in outdoor environments

Atmosphere	Mean corrosion rate of mechanically deposited coatings (μm/year)
Industrial or marine	6.5
Urban non-industrial or marine	1,7
Suburban	1,5
Rural	0,9
Indoor dry	Considerably less than 0,6

A.3 Specific supplementary coating types

A.3.1 Coating Type 1

Coating Type 1 (plain zinc) is useful for lowest cost protection where early formation of white corrosion products is not detrimental. It is also used for higher temperature applications up to 120 °C where effectiveness of chromates is greatly reduced.

A.3.2 Coating Type 2

Coating Type 2 (coloured chromates) chromates that have a colour (yellow, olive drab, bronze, etc.) (see Table A.2) are used to delay the appearance of white corrosion products on the plated article, or to provide a colour desired by a customer for a specific purpose.

Table A.2 — Classification of chromate conversion coating Type 2

Designation	Type	Typical appearance
A[a]	Clear	Transparent, clear to bluish
B[a]	Bleached	Transparent with slight iridescence
C	Iridescent	Yellow iridescent
D	Opaque	Olive-green, shading to brown or bronze
E	Black	Black with slight iridescence
NOTE The specificity of the mechanically deposited coating gives a coloration that is different and duller than that obtained on electroplated parts.		
[a] Weaker performance to white rust corrosion.		

A.3.3 Coating Type 3

A complementary treatment such as waxes, dyes, etc., can be applied after coating Types 1 or 2 (see Table 3) for a specific purpose.

A.4 Relationship between coating weight and thickness

The density of deposits obtained by mechanical deposition differs from that of deposits obtained by hot-dip galvanizing. Therefore for equal masses of the two types of deposit the thicknesses will differ.

Because of the differences in density and chemical nature of coatings and differences in corroding environments as well as in corrosion tests, it should be recognized that Tables 4 and A.3 are not intended to provide any information about corrosion resistance.

Table A.3 — Correlation between minimum thickness, minimum mass and class of zinc coating

Minimum thickness of zinc coating (μm)	Class	Minimum mass of zinc coating (average of specimens tested) (g/m^2)
107	110	610
81	80	458
66	65	381
53	50	305

Annex B
(normative)

Zinc dust/powder specification

The zinc dust/powder that is convenient to use for mechanically deposited coatings can be obtained from various suppliers. In order to obtain a good efficiency of deposit and a coating that performs well against corrosion, it is essential to use a zinc dust/powder that is free from oxides and chemical or other impurities, and that has a specific homogeneous granular distribution. (See Table B.1.)

Table B.1 — Chemical characteristics of zinc dust/powder

Constituent	Quantity
Zinc total	99,0 % minimum
Zinc metal (Zn)	96,5 % minimum
Lead (Pb)	0,05 % maximum
Iron (Fe)	0,005 % maximum
Other elements	Trace amounts
NOTE The dust/powder should be fluid.	

Tables B.2 and B.3 provide an indication of the granular characteristics of a zinc dust/powder. The zinc dusts/powders in most common use are those described in Table B.2.

Table B.2 — Granular quality specified for zinc coatings up to 25 µm thick

Form	Particles essentially spherical
Particle size	5 µm to 7 µm mean diameter (Fisher sub-sieve sizer)
Granular distribution (Coulter counter)	2 % maximum of particles less than 2 µm 98 % minimum of particles less than 20 µm
Sieving	99,7 % minimum with sieve of 325 mesh

Table B.3 — Granular quality specified for zinc coatings greater than 25 µm thick

Form	Particles essentially spherical
Particle size	8 µm to 17 µm mean diameter
Granular distribution (by sieving)	100 mesh: trace amounts 325 mesh: 3 % to 4 %

Bibliography

[1] EN 12500:2000, *Protection of metallic materials against corrosion — Corrosion likelihood in atmospheric environment — Classification, determination and estimation of corrosivity of atmospheric environments*

[2] EN ISO 2819 *Metallic coatings on metallic substrates - Electrodeposited and chemically deposited coatings - Review of methods available for testing adhesion (ISO 2819:1980)*

[3] EN ISO 3543, *Metallic and non-metallic coatings — Measurement of thickness — Beta backscatter method (ISO 3543:2000).*

[4] EN ISO 3882, *Metallic and other inorganic coatings - Review of methods of measurement of thickness (ISO 3882:2003)*

[5] EN ISO 8565, *Metals and alloys — Atmospheric corrosion testing — General requirements for field tests (ISO 8565 1992).*

[6] EN 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 10289:1999)*

ICS 25.220.40

Price based on 13 pages