NSAI
Standards

Irish Standard
I.S. EN 16866:2017

Metallic and other inorganic coatings - Simultaneous thickness and electrode potential determination of individual layers in multilayer nickel deposits (STEP test)

I.S. EN 16866:2017

Incorporating amendments/corrigenda/National Annexes issued since publication:

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This document is based on:	*Published:*
EN 16866:2017	2017-11-08

This document was published
under the authority of the NSAI
and comes into effect on:

2017-11-26

ICS number:

25.220.40

NOTE: If blank see CEN/CENELEC cover page

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National Foreword

I.S. EN 16866:2017 is the adopted Irish version of the European Document EN 16866:2017, Metallic and other inorganic coatings - Simultaneous thickness and electrode potential determination of individual layers in multilayer nickel deposits (STEP test)

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 16866

November 2017

ICS 25.220.40

English Version

Metallic and other inorganic coatings - Simultaneous thickness and electrode potential determination of individual layers in multilayer nickel deposits (STEP test)

Revêtements métalliques et autres revêtements inorganiques - Détermination simultanée de l'épaisseur et du potentiel d'électrode de couches individuelles dans des dépôts de nickel multicouches (essai STEP)

Metallische und andere anorganische Überzüge - Schichtpotentialmessung von galvanischen Mehrfach-Nickelschichtsystemen (STEP-Test)

This European Standard was approved by CEN on 11 September 2017.

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Ref. No. EN 16866:2017 E

Contents

European foreword

This document (EN 16866:2017) has been prepared by Technical Committee CEN/TC 262 “Metallic and other inorganic coatings, including for corrosion protection and corrosion testing of metals and alloys”, 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of an identical text or by endorsement, at the latest by May 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

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Introduction

STEP test is an abbreviation for the term "Simultaneous Thickness and Electrode Potential determination".

The STEP test can be used to measure, in one single operating step, the parameters (thickness of the individual nickel layers and the potential differences among them) relevant for the course of corrosion in a multilayer nickel system and, provided the suitable instruments be applied, to document them as well.

The test is a modification of the well-known coulometric method for the measurement of the coating thickness. This method takes advantage of the fact that, following the anodic dissolution of a nickel coating, a potential jump takes place whose magnitude can be measured against a reference electrode.

Although, nowadays, the STEP test has been incorporated into a number of company standards, particularly in the automobile industry, so far no uniform and generally acknowledged potential difference values are available. At present, values between 80 mV and 150 mV are assumed for double nickel layers, with the semi-bright nickel layer always being nobler than the bright one.

Likewise no obligatory numerical values are available, so far, regarding the potential difference between bright nickel layers and existing special nickel layers (e.g. in the case of micro-porous chromium plating). According to the current practical experience, the potential difference is larger than approximately 20 mV, with the bright nickel layer always having to be less noble than the special nickel layer.

1 Scope

This European Standard applies to the measurement of the thickness of the individual nickel layers in electroplated multilayer nickel coatings and to the measurement of the potential differences between the individual nickel layers in electroplated multilayer nickel coatings.

The measurement of coatings or layer systems other than electroplated multilayer nickel coatings is outside the scope of this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

EN ISO 3696, *Water for analytical laboratory use - Specification and test methods (ISO 3696)*

3 Test equipment

3.1 Construction of the measuring cell

Figure 1 shows two examples of the typical schematic construction of a measuring cell used for the simultaneous determination of layer thicknesses and potential differences in multilayer nickel systems. The cells differ with regard to the implementation of the reference electrode. In Figure 1 a), the reference electrode is a silver wire coated with silver chloride and positioned at the edge of the cell; in Figure 1 b), it is a silver ring coated with silver chloride and positioned at the bottom of the cell. With regard to measurement uncertainty, both variants provide the same result for the measurement of the potential difference and (following calibration) the measurement of the layer thickness, independent of the concrete implementation of the reference electrode.

NOTE 1 The silver ring used as the reference electrode in Figure 1 b) is of advantage insofar as the adjustment of the silver wire, which would otherwise be required, becomes unnecessary, leading to results that are more exact and more reproducible.

NOTE 2 The circulated volume of electrolyte solution is typically some 0,1 ml per second.