

Determination of certain substances in electrotechnical products - Part 7-1: Determination of the presence of hexavalent chromium (Cr(VI)) in colorless and colored corrosion-protected coatings on metals by the colorimetric method

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 62321-7-1:2015 sisaldab Euroopa standardi EN 62321-7-1:2015 ingliskeelset teksti.	This Estonian standard EVS-EN 62321-7-1:2015 consists of the English text of the European standard EN 62321-7-1:2015.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 18.12.2015.	Date of Availability of the European standard is 18.12.2015.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 13.020, 43.040.10

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:

Aru 10, 10317 Tallinn, Eesti; koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Aru 10, 10317 Tallinn, Estonia; homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

ICS 13.020; 43.040.10

English Version

Determination of certain substances in electrotechnical products
- Part 7-1: Determination of the presence of hexavalent
chromium (Cr(VI)) in colorless and colored corrosion-protected
coatings on metals by the colorimetric method
(IEC 62321-7-1:2015)

Détermination de certaines substances dans les produits
électrotechniques - Partie 7-1: Chrome hexavalent -
Présence de chrome hexavalent (Cr(VI)) dans les
revêtements incolores et colorés de protection anticorrosion
appliqués sur les métaux à l'aide de la méthode
colorimétrique
(IEC 62321-7-1:2015)

Verfahren zur Bestimmung von bestimmten Substanzen in
Produkten der Elektrotechnik - Teil 7-1: Bestimmung des
Vorliegens von sechswertigem Chrom (Cr(VI)) in farblosen
und farbigen Korrosionsschutzüberzügen auf Metallen
durch das kolorimetrische Verfahren
(IEC 62321-7-1:2015)

This European Standard was approved by CENELEC on 2015-10-21. CENELEC 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 CEN-CENELEC Management Centre or to any CENELEC 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 CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 111/380/FDIS, future edition 1 of IEC 62321-7-1, prepared by IEC/TC 111 "Environmental standardization for electrical and electronic products and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62321-7-1:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-07-21
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-10-21

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62321-7-1:2015 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

ISO 3613	NOTE	Harmonized as EN ISO 3613.
ISO 648	NOTE	Harmonized as EN ISO 648.
DIN EN 15205:2007	NOTE	Harmonized as EN 15205:2006..

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms, definitions and abbreviations	7
3.1 Terms and definitions.....	7
3.2 Abbreviations.....	7
4 Reagents.....	7
4.1 General.....	7
4.2 Reagents	7
5 Apparatus.....	7
5.1 General.....	7
5.2 Apparatus	7
6 Sampling	8
7 Boiling water extraction procedure.....	8
8 Calibration.....	11
8.1 Permanent calibration instruments.....	11
8.2 Traditional calibration instruments	11
9 Calculation	11
10 Precision	12
11 Quality assurance and control	12
11.1 Colorimetric instrument performance verification.....	12
11.2 Limits of detection (LOD) and limits of quantification (LOQ).....	12
12 Test report.....	13
Annex A (informative) International inter-laboratory study on corrosion-protected coatings – Data overview	16
Bibliography.....	18
Figure 1 – Screw body and screw head measurements.....	9
Figure A.1 – Concentration of chromium VI based on surface area for all samples.....	16
Figure A.2 – Concentration of chromium VI based on surface area – Expanded view between 0 µg/cm ² to 1 µg/cm ²	17
Table 1 – Comparison to standard solution and interpretation of results.....	11
Table 2 – Student’s <i>t</i> values used for calculation of method detection limit (LOD or MDL = <i>t</i> -statistic × standard deviation (sn-1)).....	13
Table 3 – Reporting table.....	14
Table 4 – Example of a completed reporting table.....	15

INTRODUCTION

The widespread use of electrotechnical products has drawn increased attention to their impact on the environment. In many countries this has resulted in the adaptation of regulations affecting wastes, substances and energy use of electrotechnical products.

The use of certain substances (e.g. lead (Pb), cadmium (Cd) and polybrominated diphenylethers (PBDE's)) in electrotechnical products is a source of concern in current and proposed regional legislation.

The purpose of the IEC 62321 series is therefore to provide test methods that will allow the electrotechnical industry to determine the levels of certain substances of concern in electrotechnical products on a consistent global basis.

WARNING – Persons using this International Standard should be familiar with normal laboratory practice. This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

DETERMINATION OF CERTAIN SUBSTANCES IN ELECTROTECHNICAL PRODUCTS –

Part 7-1: Hexavalent chromium – Presence of hexavalent chromium (Cr(VI)) in colourless and coloured corrosion-protected coatings on metals by the colorimetric method

1 Scope

This part of IEC 62321 describes a boiling water extraction procedure intended to provide a qualitative determination of the presence of hexavalent chromium (Cr(VI)) in colourless and coloured corrosion-protection coatings on metallic samples.

Due to its highly reactive nature, the concentration of Cr(VI) in a corrosion-protection coating can change drastically with time and storage conditions. Since storage conditions prior to sample submission are not often known or provided with the samples, this procedure determines the presence of Cr(VI) based on the levels detected in the coatings at the time of testing. For testing of freshly coated samples, a minimum waiting period of 5 days (after the coating process) is necessary to ensure the coatings have stabilized. This waiting period allows potential post-process oxidation of Cr(III) to Cr(VI) to occur prior to testing.

The presence of Cr(VI) is determined by the mass of Cr(VI) per surface area of the coating, in $\mu\text{g}/\text{cm}^2$. This approach is preferred since corrosion-protection coating weights are often difficult to measure accurately after production. From a coating technology perspective, the industry as a whole has transitioned to either using the non-Cr(VI) based chemistries – where little to no Cr(VI) should be present – or using the traditional Cr(VI) based chemistries – where significant levels of Cr(VI) are present and can be detected reliably. Given this industry shift, the presence or absence of Cr(VI) is often sufficient for compliance testing purposes.

In this procedure, when Cr(VI) in a sample is detected below the $0,10 \mu\text{g}/\text{cm}^2$ LOQ (limit of quantification), the sample is considered to be negative for Cr(VI). Since Cr(VI) may not be uniformly distributed in the coating even within the same sample batch, a “grey zone” between $0,10 \mu\text{g}/\text{cm}^2$ and $0,13 \mu\text{g}/\text{cm}^2$ has been established as “inconclusive” to reduce inconsistent results due to unavoidable coating variations. In this case, additional testing may be necessary to confirm the presence of Cr(VI). When Cr(VI) is detected above $0,13 \mu\text{g}/\text{cm}^2$, the sample is considered to be positive for the presence of Cr(VI) in the coating layer.

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.

IEC 62321-1, *Determination of certain substances in electrotechnical products – Part 1: Introduction and overview*

IEC 62321-2, *Determination of certain substances in electrotechnical products – Part 2: Disassembly, disjointment and mechanical sample preparation*

ISO 78-2, *Chemistry – Layouts for standards – Part 2: Methods of chemical analysis*

ISO 3696, *Water for analytical laboratory use – Specification and test methods*