Irish Standard
I.S. EN ISO 7539-11:2014

Corrosion of metals and alloys - Stress corrosion cracking - Part 11: Guidelines for testing the resistance of metals and alloys to hydrogen embrittlement and hydrogen-assisted cracking (ISO 7539-11:2013)

I.S. EN ISO 7539-11:2014

Incorporating amendments/corrigenda/National Annexes issued since publication:

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This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

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This document is based on:	*Published:*
EN ISO 7539-11:2014	2014-12-17

This document was published under the authority of the NSAI and comes into effect on:	ICS number:
2015-01-30	77.060
	NOTE: If blank see CEN/CENELEC cover page

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Údarás um Chaighdeáin Náisiúnta na hÉireann

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 7539-11

December 2014

ICS 77.060

English Version

Corrosion of metals and alloys - Stress corrosion cracking - Part 11: Guidelines for testing the resistance of metals and alloys to hydrogen embrittlement and hydrogen-assisted cracking (ISO 7539-11:2013)

Corrosion des métaux et alliages - Essai de corrosion sous contrainte - Partie 11: Lignes directrices pour les essais de résistance des métaux et alliages à la fragilisation par l'hydrogène et la fissuration assistée sous hydrogène (ISO 7539-11:2013)

Korrosion der Metalle und Legierungen - Prüfung der Spannungsrisskorrosion - Teil 11: Leitfaden für die Prüfung der Resistenz von Metallen und Legierungen gegen Wasserstoffversprödung und wasserstoffverursachte Brüche (ISO 7539-11:2013)

This European Standard was approved by CEN on 16 December 2014.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN ISO 7539-11:2014 E

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Foreword

The text of ISO 7539-11:2013 has been prepared by Technical Committee ISO/TC 156 “Corrosion of metals and alloys” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 7539-11:2014 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 June 2015, and conflicting national standards shall be withdrawn at the latest by June 2015.

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

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Endorsement notice

The text of ISO 7539-11:2013 has been approved by CEN as EN ISO 7539-11:2014 without any modification.

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INTERNATIONAL STANDARD

ISO 7539-11

First edition
2013-04-15

Corrosion of metals and alloys — Stress corrosion cracking —

Part 11: Guidelines for testing the resistance of metals and alloys to hydrogen embrittlement and hydrogen-assisted cracking

Corrosion des métaux et alliages — Essai de corrosion sous contrainte —

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Reference number
ISO 7539-11:2013(E)

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Published in Switzerland

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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC 156, *Corrosion of metals and alloys*.

ISO 7539 consists of the following parts, under the general title *Corrosion of metals and alloys — Stress corrosion testing*:

Part 1: General guidance on testing procedures

Part 2: Preparation and use of bent-beam specimens

Part 3: Preparation and use of U-bend specimens

Part 4: Preparation and use of uniaxially loaded tension specimens

Part 5: Preparation and use of C-ring specimens

Part 6: Preparation and use of pre-cracked specimens for tests under constant load or constant displacement

Part 7: Method for slow strain rate testing

Part 8: Preparation and use of specimens to evaluate weldments

Part 9: Preparation and use of pre-cracked specimens for tests under rising load or rising displacement

Part 11: Guidelines for testing the resistance of metals and alloys to hydrogen embrittlement and hydrogen assisted cracking

Corrosion of metals and alloys — Stress corrosion cracking —

Part 11: Guidelines for testing the resistance of metals and alloys to hydrogen embrittlement and hydrogen-assisted cracking

1 Scope

This part of ISO 7539 gives guidance on the key features that should be accounted for in designing and conducting tests to evaluate the resistance of a metal or its alloy to hydrogen embrittlement and hydrogen-assisted cracking.

NOTE Particular methods of testing are not treated in detail in this document. These are described in other International Standards to which reference is given.

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.

ISO 7539-7, *Corrosion of metals and alloys — Stress corrosion testing — Part 7: Method for slow strain rate testing*

ISO 17081, *Method of measurement of hydrogen permeation and determination of hydrogen uptake and transport in metals by an electrochemical technique*

3 Factors to be considered in hydrogen embrittlement and hydrogen-assisted cracking testing

3.1 Dynamic plastic straining

3.1.1 Surface films such as passive oxide films, and sulphide films in the case of exposure of carbon steel to H_2S environments, for example, can markedly reduce hydrogen uptake. Film rupture will enhance ingress locally, which means that dynamic plastic straining and the strain rate can be particularly important. In that context, there is then usually no relationship between hydrogen uptake as measured in a permeation experiment and the cracking response since uptake is local at the film rupture sites. A possible exception is when there is a significant sub-surface region of susceptibility associated with residual stress or microchemistry as might possibly be found in welds. Here, detailed characterization of the weld should be conducted prior to testing.

3.1.2 Dynamic plastic straining may be induced under static load if there is significant creep, as in some duplex stainless steels.

3.1.3 In testing of alloys that are actively corroding, there is often a correlation between cracking and the measured bulk hydrogen uptake. Dynamic plastic straining may have only a relatively minor role in hydrogen uptake in that case.

3.1.4 In all alloys, dynamic plastic straining and the strain rate may be important in dislocation transport of hydrogen. The mobility of hydrogen atoms and trapping at dislocations means that dislocations can

