



NSAI
Standards

Irish Standard
I.S. EN ISO 15156-2:2015&LC:2015

Petroleum and natural gas industries -
Materials for use in H₂S-containing
environments in oil and gas production -
Part 2: Cracking-resistant carbon and low
alloy steels, and the use of cast irons
(ISO 15156-2:2015)

I.S. EN ISO 15156-2:2015&LC:2015

Incorporating amendments/corrigenda/National Annexes issued since publication:

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Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN ISO 15156-2:2015&LC:2015 is the adopted Irish version of the European Document EN ISO 15156-2:2015, Petroleum and natural gas industries - Materials for use in H₂S-containing environments in oil and gas production - Part 2: Cracking-resistant carbon and low alloy steels, and the use of cast irons (ISO 15156-2:2015)

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In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

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Correction Notice

Reference: EN ISO 15156-2:2015

Title: Petroleum and natural gas industries - Materials for use in H₂S-containing environments in oil and gas production - Part 2: Cracking-resistant carbon and low alloy steels, and the use of cast irons (ISO 15156-2:2015)

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Please include the following minor editorial correction(s) in the document related to:

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- English
- French
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for the following procedure :

- PQ/UQ
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- 2nd Enquiry
- Parallel Enquiry
- 2nd Parallel Enquiry
- Formal Vote
- 2nd Formal Vote
- Parallel Formal Vote
- 2nd Parallel Formal Vote
- UAP
- TC Approval
- 2nd TC Approval
- Publication
- Parallel Publication

It has been brought to our attention that this document, issued on 2015-09-16, requires modification.

Correction of the ISO/TC reference in the first paragraph in the European foreword.

Please find enclosed the updated English and French version.

We apologise for any inconvenience this may cause.

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EUROPEAN STANDARD

EN ISO 15156-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2015

ICS 75.180.10; 77.060

Supersedes EN ISO 15156-2:2009

English Version

**Petroleum and natural gas industries - Materials for use in
H₂S-containing environments in oil and gas production -
Part 2: Cracking-resistant carbon and low alloy steels, and
the use of cast irons (ISO 15156-2:2015)**

Industries du pétrole et du gaz naturel - Matériaux pour utilisation dans des environnements contenant de l'hydrogène sulfuré (H₂S) dans la production de pétrole et de gaz - Partie 2 : Aciers au carbone et aciers faiblement alliés résistants à la fissuration, et utilisation de fontes (ISO 15156-2:2015)

Erdöl- und Erdgasindustrie - Werkstoffe für den Einsatz in H₂S-haltiger Umgebung bei der Öl- und Gasgewinnung - Teil 2: Gegen Rissbildung beständige unlegierte und niedriglegierte Stähle und Gusseisen (ISO 15156-2:2015)

This European Standard was approved by CEN on 24 August 2015.

CEN 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 CEN member.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN ISO 15156-2:2015) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" in collaboration with Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries" the secretariat of which is held by AFNOR.

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 March 2016, and conflicting national standards shall be withdrawn at the latest by March 2016.

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.

This document supersedes EN ISO 15156-2:2009.

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Endorsement notice

The text of ISO 15156-2:2015 has been approved by CEN as EN ISO 15156-2:2015 without any modification.

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INTERNATIONAL STANDARD

ISO 15156-2

Third edition
2015-09-01

Petroleum and natural gas industries — Materials for use in H₂S- containing environments in oil and gas production —

Part 2:

Cracking-resistant carbon and low- alloy steels, and the use of cast irons

*Industries du pétrole et du gaz naturel — Matériaux pour utilisation
dans des environnements contenant de l'hydrogène sulfuré (H₂S)
dans la production de pétrole et de gaz —*

*Partie 2: Aciers au carbone et aciers faiblement alliés résistants à la
fissuration, et utilisation de fontes*



Reference number
ISO 15156-2:2015(E)

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ISO 15156-2:2015(E)



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ISO 15156-2:2015(E)

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*.

This third edition cancels and replaces the second edition (ISO 15156-2:2009), of which it constitutes a minor revision, specifically by the following:

- replacement in the Scope of the term “conventional elastic design criteria” by the term “load controlled design methods”;
- inclusion in both [7.2.1.1](#) and [A.2.1.1](#) of information that emphasizes the possibilities for the qualification for a specific sour service or range of sour service of carbon and low alloy steels not listed in [Annex A](#);
- replacement of paragraph 6 of [A.2.1.4](#) to improve the guidance on the welding of carbon and low alloy steels not covered elsewhere in this subclause.

ISO 15156 consists of the following parts, under the general title *Petroleum and natural gas industries — Materials for use in H₂S-containing environments in oil and gas production*

- *Part 1: General principles for selection of cracking-resistant materials*
- *Part 2: Cracking-resistant carbon and low-alloy steels, and the use of cast irons*
- *Part 3: Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys*

Introduction

The consequences of sudden failures of metallic oil and gas field components, associated with their exposure to H₂S-containing production fluids, led to the preparation of the first edition of NACE MR0175, which was published in 1975 by the National Association of Corrosion Engineers, now known as NACE International.

The original and subsequent editions of NACE MR0175 established limits of H₂S partial pressure above which precautions against sulfide stress-cracking (SSC) were always considered necessary. They also provided guidance for the selection and specification of SSC-resistant materials when the H₂S thresholds were exceeded. In more recent editions, NACE MR0175 has also provided application limits for some corrosion-resistant alloys, in terms of environmental composition and pH, temperature and H₂S partial pressures.

In separate developments, the European Federation of Corrosion issued EFC Publication 16 in 1995 and EFC Publication 17 in 1996. These documents are generally complementary to those of NACE though they differed in scope and detail.

In 2003, the publication of the ISO 15156-series and NACE MR0175/ISO 15156 was completed for the first time. These technically identical documents utilized the above sources to provide requirements and recommendations for materials qualification and selection for application in environments containing wet H₂S in oil and gas production systems. They are complemented by NACE TM0177 and NACE TM0284 test methods.

The revision of this part of ISO 15156 involves a consolidation of all changes agreed and published in the Technical Circular 1, ISO 15156-2:2009/Cir.1:2011(E) and the Technical Circular 2, ISO 15156-2:2009/Cir.2:2014(E), published by the ISO 15156 Maintenance Agency secretariat at DIN.

The changes were developed by and approved by the ballot of, representative groups from within the oil and gas production industry. The great majority of these changes stem from issues raised by document users. A description of the process by which these changes were approved can be found at the ISO 15156 maintenance website: www.iso.org/iso15156maintenance.

When found necessary by oil and gas production industry experts, future interim changes to this part of ISO 15156 will be processed in the same way and will lead to interim updates to this part of ISO 15156 in the form of Technical Corrigenda or Technical Circulars. Document users should be aware that such documents can exist and can impact the validity of the dated references in this part of ISO 15156.

The ISO 15156 Maintenance Agency at DIN was set up after approval by the ISO Technical Management Board given in document 34/2007. This document describes the make up of the agency, which includes experts from NACE, EFC and ISO/TC 67, and the process for approval of amendments. It is available from the ISO 15156 maintenance website and from the ISO/TC 67 Secretariat. The website also provides access to related documents that provide more detail of ISO 15156 maintenance activities.

Petroleum and natural gas industries — Materials for use in H₂S-containing environments in oil and gas production —

Part 2: Cracking-resistant carbon and low-alloy steels, and the use of cast irons

WARNING — Carbon and low-alloy steels and cast irons selected using this part of ISO 15156 are resistant to cracking in defined — H₂S-containing environments in oil and gas production but not necessarily immune to cracking under all service conditions. It is the equipment user's responsibility to select the carbon and low alloy steels and cast irons suitable for the intended service.

1 Scope

This part of ISO 15156 gives requirements and recommendations for the selection and qualification of carbon and low-alloy steels for service in equipment used in oil and natural gas production and natural gas treatment plants in H₂S-containing environments, whose failure can pose a risk to the health and safety of the public and personnel or to the environment. It can be applied to help to avoid costly corrosion damage to the equipment itself. It supplements, but does not replace, the materials requirements of the appropriate design codes, standards or regulations.

This part of ISO 15156 addresses the resistance of these steels to damage that can be caused by sulfide stress-cracking (SSC) and the related phenomena of stress-oriented hydrogen-induced cracking (SOHIC) and soft-zone cracking (SZC).

This part of ISO 15156 also addresses the resistance of these steels to hydrogen-induced cracking (HIC) and its possible development into stepwise cracking (SWC).

This part of ISO 15156 is concerned only with cracking. Loss of material by general (mass loss) or localized corrosion is not addressed.

[Table 1](#) provides a non-exhaustive list of equipment to which this part of ISO 15156 is applicable, including permitted exclusions.

This part of ISO 15156 applies to the qualification and selection of materials for equipment designed and constructed using load controlled design methods. For design utilizing strain-based design methods, see ISO 15156-1:2015, Clause 5.

[Annex A](#) lists SSC-resistant carbon and low alloy steels, and [A.2.4](#) includes requirements for the use of cast irons.

This part of ISO 15156 is not necessarily suitable for application to equipment used in refining or downstream processes and equipment.

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