
**Petroleum and natural gas industries —
Corrosion-resistant alloy seamless tubes
for use as casing, tubing and coupling
stock — Technical delivery conditions**

*Industries du pétrole et du gaz naturel — Tubes sans soudure en acier
allié résistant à la corrosion utilisés comme tubes de cuvelage, tubes de
production et tubes-ébauches pour manchons — Conditions techniques
de livraison*



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.

This document is a preview generated by EVS



COPYRIGHT PROTECTED DOCUMENT

© ISO 2010

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

Page

Foreword	v
Introduction.....	vi
1 Scope.....	1
2 Conformance	2
2.1 Dual normative references	2
2.2 Units of measurement.....	2
3 Normative references.....	2
4 Terms, abbreviated terms, symbols and definitions	4
4.1 Terms and definitions.....	4
4.2 Symbols.....	7
4.3 Abbreviated terms	7
5 Information to be supplied by the purchaser	8
6 Manufacturing process.....	9
6.1 Manufacturing of corrosion-resistant alloys	9
6.2 Product manufacturing process.....	9
6.3 Pipe end sizing	10
6.4 Straightening	10
6.5 Process requiring validation	10
6.6 Traceability.....	10
7 Material requirements	11
7.1 Chemical composition	11
7.2 Tensile properties.....	11
7.3 Hardness properties.....	11
7.4 Charpy V-notch test properties — General requirements.....	11
7.5 Charpy V-notch — Absorbed energy requirements for coupling stock — All grades	12
7.6 Charpy V-notch — Absorbed energy requirements for pipe — All grades	13
7.7 Flattening requirements.....	14
7.8 Corrosion properties.....	15
7.9 Microstructure properties.....	15
7.10 Surface condition	15
7.11 Defects.....	15
7.12 Hydrostatic test	16
8 Dimensions, masses and tolerances	16
8.1 Outside diameter, wall thickness and mass	16
8.2 Length.....	17
8.3 Tolerances.....	17
8.4 Product ends.....	17
9 Inspection and testing	17
9.1 Test equipment.....	17
9.2 Type and frequency of tests.....	18
9.3 Testing of chemical composition	18
9.4 Testing of mechanical characteristics	19
9.5 Tensile test.....	19
9.6 Hardness test.....	20
9.7 Impact or flattening test.....	20
9.8 Microstructural examination	23
9.9 Dimensional testing	23

9.10	Drift test	24
9.11	Length	24
9.12	Straightness	24
9.13	Mass determination	24
9.14	Hydrostatic test	25
9.15	Visual inspection	25
9.16	Non-destructive examination	26
10	Surface treatment	31
10.1	Group 1	31
10.2	Groups 2, 3 and 4	31
11	Marking	31
11.1	General	31
11.2	Marking on the product	32
11.3	Date of manufacture	33
12	Surface protection — Group 1	33
13	Documents	33
13.1	Electronic media	33
13.2	Retention of records	34
13.3	Test certificates	34
14	Handling, packaging and storage	35
14.1	General	35
14.2	Handling	35
14.3	Packaging	35
14.4	Storage	35
Annex A (normative)	Tables in SI units	36
Annex B (normative)	Figures in SI (USC) Units	56
Annex C (normative)	Tables in USC units	61
Annex D (normative)	Purchaser inspection	81
Annex E (normative)	Cleanliness requirements	82
Annex F (informative)	Use of the API Monogram by Licensees	84
Annex G (normative)	Product specification level 2 (PSL-2)	87
Bibliography	89

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 13680 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 5, *Casing, tubing and drill pipe*.

This third edition cancels and replaces the second edition (ISO 13680:2008), of which it constitutes a minor revision, with changes to 4.1.2; 4.1.14; 4.1.16; 4.1.19; 5.2 p) and 5.2 q); 6.1; 6.5; 6.6; 7.2; 7.7; 7.11.1 and 7.11.2; 9.3.3; 9.8.2; 9.8.3; 9.16.7; 9.16.13; 9.16.14; 11.2.4; 13.3; and Tables A.1, A.27, A.28, C.2, C.15, C.18, C.27 and C.28.

It is the intent of ISO/TC 67 that the second and third edition of ISO 13680 both be applicable, at the option of the purchaser, for a period of six months from the first day of the calendar quarter immediately following the date of publication of this third edition, after which period the second edition will no longer be applicable.

Introduction

It is necessary that users of this International Standard be aware that further or differing requirements can be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is the responsibility of the vendor to identify any variations from this International Standard and provide details.

This International Standard includes provisions of various nature. These are identified by the use of certain verbal forms:

SHALL is used to indicate that a provision is MANDATORY;

SHOULD is used to indicate that a provision is not mandatory, but RECOMMENDED as good practice;

MAY is used to indicate that a provision is OPTIONAL.

This document is a preview generated by EVS

Petroleum and natural gas industries — Corrosion-resistant alloy seamless tubes for use as casing, tubing and coupling stock — Technical delivery conditions

WARNING — It is the purchaser's responsibility to specify the product specification level (PSL), corrosion-resistant alloy (CRA) group, category, grade, delivery conditions and any other requirements in addition to those specified herewith to ensure that the product is adequate for the intended service environment. ISO 15156 (all parts) or NACE MR0175/ISO 15156 should be considered when making specific requirements for H₂S-containing environment; see Annex G.

1 Scope

This International Standard specifies the technical delivery conditions for corrosion-resistant alloy seamless tubulars for casing, tubing and coupling stock for two product specification levels:

- PSL-1, which is the basis of this International Standard;
- PSL-2, which provides additional requirements for a product that is intended to be both corrosion resistant and cracking resistant for the environments and qualification method specified in ISO 15156-3 and Annex G of this International Standard.

At the option of the manufacturer, PSL-2 products can be provided in lieu of PSL-1.

NOTE 1 The corrosion-resistant alloys included in this International Standard are special alloys in accordance with ISO 4948-1 and ISO 4948-2.

This International Standard is applicable to the following four groups of product:

- a) group 1, which is composed of stainless alloys with a martensitic or martensitic/ferritic structure;
- b) group 2, which is composed of stainless alloys with a ferritic-austenitic structure, such as duplex and super-duplex stainless alloy;
- c) group 3, which is composed of stainless alloys with an austenitic structure (iron base);
- d) group 4, which is composed of nickel-based alloys with an austenitic structure (nickel base).

This International Standard contains no provisions relating to the connection of individual lengths of pipe.

NOTE 2 The connection or joining method can influence the corrosion performance of the materials specified in this International Standard.

NOTE 3 It is necessary to recognize that not all PSL-1 categories and grades can be made cracking resistant in accordance with ISO 15156-3 and are, therefore, not included in PSL-2.

2 Conformance

2.1 Dual normative references

In the interests of worldwide application of this International Standard, ISO/TC 67 has decided, after detailed technical analysis, that certain of the normative documents listed in Clause 3 and prepared by ISO/TC 67 or another ISO Technical Committee are interchangeable in the context of the relevant requirement with the relevant document prepared by the American Petroleum Institute (API), the American Society for Testing and Materials (ASTM) or the American National Standards Institute (ANSI). These latter documents are cited in the running text following the ISO reference and preceded by “or”, for example “ISO XXXX or API YYYY”.

Application of an alternative normative document cited in this manner can lead to technical results that differ from the use of the preceding ISO reference. However, both results are acceptable and these documents are, thus, considered interchangeable in practice.

2.2 Units of measurement

In this International Standard, data are expressed in both the International System (SI) of units and the United States Customary (USC) or other system of units. For a specific order item, it is intended that only one system of units be used, without combining data expressed in the other system.

Products manufactured to specifications expressed in either of these unit systems shall be considered equivalent and totally interchangeable. Consequently, compliance with the requirements of this International Standard as expressed in one system provides compliance with requirements expressed in the other system.

For data expressed in SI units, a comma is used as the decimal separator and a space as the thousands separator.

For data expressed in USC units, a dot (on the line) is used as the decimal separator and a space as the thousands separator.

In the text, data in SI units are followed by data in USC or other units in parentheses.

Separate tables for data expressed in SI units and USC units are given in Annex A and Annex C, respectively.

Figures are contained in Annex B and express data in both SI and USC units.

3 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.

ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing*

ISO 404, *Steel and steel products — General technical delivery requirements*

ISO 525, *Bonded abrasive products — General requirements*

ISO 783, *Metallic materials — Tensile testing at elevated temperature*

ISO 4885, *Ferrous products — Heat treatments — Vocabulary*

ISO 4948-1, *Steels — Classification — Part 1: Classification of steels into unalloyed and alloy steels based on chemical composition*

ISO 4948-2, *Steels — Classification — Part 2: Classification of unalloyed and alloy steels according to main quality classes and main property or application characteristics*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

ISO 6929, *Steel products — Definitions and classification*

ISO 8501-1:2007, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

ISO 9303, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Full peripheral ultrasonic testing for the detection of longitudinal imperfections*

ISO 9304, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Eddy current testing for the detection of imperfections*

ISO 9305, *Seamless steel tubes for pressure purposes — Full peripheral ultrasonic testing for the detection of transverse imperfections*

ISO 9402, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of longitudinal imperfections*

ISO 9598, *Seamless steel tubes for pressure purposes — Full peripheral magnetic transducer/flux leakage testing of ferromagnetic steel tubes for the detection of transverse imperfections*

ISO 10124, *Seamless and welded (except submerged arc-welded) steel tubes for pressure purposes — Ultrasonic testing for the detection of laminar imperfections*

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

ISO 10543, *Seamless and hot-stretch-reduced welded steel tubes for pressure purposes — Full peripheral ultrasonic thickness testing*

ISO 11484, *Steel products — Employer's qualification system for non-destructive testing (NDT) personnel*

ISO 11496, *Seamless and welded steel tubes for pressure purposes — Ultrasonic testing of tube ends for the detection of laminar imperfections*

ISO 12095, *Seamless and welded steel tubes for pressure purposes — Liquid penetrant testing*

ISO 13665, *Seamless and welded steel tubes for pressure purposes — Magnetic particle inspection of the tube body for the detection of surface imperfections*

ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition*

ISO 15156-3:2009¹⁾, *Petroleum and natural gas industries — Materials for use in H₂S-containing environments in oil and gas production — Part 3: Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys*

1) Cancelled and replaced ISO 15156-3:2003.

ISO 80000-1, *Quantities and units — Part 1: General*

ASNT SNT-TC-1A, *Recommended Practice — Non-Destructive Testing*

ASTM A370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*

ASTM A604/A604M, *Standard Practice for Macroetch Testing of Consumable Electrode Remelted Steel Bars and Billets*

ASTM A941, *Standard Terminology Relating to Steel, Stainless Steel, Related Alloys and Ferroalloys*

ASTM E18, *Standard Test Methods for Rockwell Hardness of Metallic Materials*

ASTM E21, *Standard Test Methods for Elevated Temperature Tension Tests of Metallic Materials*

ASTM E23, *Standard Test Methods for Notched Bar Impact Testing of Metallic Materials*

ASTM E29, *Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications*

ASTM E45-05e3, *Standard Test Methods for Determining the Inclusion Content of Steel*

ASTM E165, *Standard Practice for Liquid Penetrant Examination for General Industry*

ASTM E213, *Standard Practice for Ultrasonic Testing of Metal Pipe and Tubing*

ASTM E309, *Standard Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation*

ASTM E340, *Standard Test Method for Macroetching Metals and Alloys*

ASTM E381, *Standard Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings*

ASTM E562, *Standard Test Method for Determining Volume Fraction by Systematic Manual Point Count*

ASTM E570, *Standard Practice for Flux Leakage Examination of Ferromagnetic Steel Tubular Products*

ASTM E709, *Standard Guide for Magnetic Particle Testing*

NACE MR0175/ISO 15156, *Petroleum and Natural Gas Industries — Materials for Use in H₂S-containing Environments in Oil and Gas Production*

4 Terms, abbreviated terms, symbols and definitions

4.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 377, ISO 404, ISO 4885, ISO 4948-1, ISO 4948-2, ISO 6929, ISO 10474, ASTM A941 and the following apply.

4.1.1

casing

pipe intended to line the walls of a drilled well