

**Petroleum and natural gas industries - Steel pipes for  
use as casing or tubing for wells (ISO 11960:2014)**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 11960:2014 sisaldab Euroopa standardi EN ISO 11960:2014 inglisekeelset teksti.	This Estonian standard EVS-EN ISO 11960:2014 consists of the English text of the European standard EN ISO 11960:2014.
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.
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English Version

Petroleum and natural gas industries - Steel pipes for use as  
casing or tubing for wells (ISO 11960:2014)

Industries du pétrole et du gaz naturel - Tubes d'acier  
utilisés comme cuvelage ou tubes de production dans les  
puits (ISO 11960:2014)

Erdöl- und Erdgasindustrie - Stahlrohre zur Verwendung als  
Futter- oder Steigrohre für Bohrungen (ISO 11960:2014)

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

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## Foreword

This document (EN ISO 11960:2014) 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of an identical text or by endorsement, at the latest by July 2014, and conflicting national standards shall be withdrawn at the latest by July 2014.

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### Endorsement notice

The text of ISO 11960:2014 has been approved by CEN as EN ISO 11960:2014 without any modification.

# Contents

Page

Foreword .....	vi
Introduction .....	vii
<b>1 Scope .....</b>	<b>1</b>
<b>2 Conformance .....</b>	<b>2</b>
2.1 Dual referencing of normative references .....	2
2.2 Units of measurement .....	2
<b>3 Normative references .....</b>	<b>2</b>
<b>4 Terms, definitions, symbols and abbreviated terms .....</b>	<b>5</b>
4.1 Terms and definitions .....	5
4.2 Symbols and abbreviated terms .....	9
<b>5 Information to be supplied by the purchaser .....</b>	<b>10</b>
5.1 Grades C90, T95 and C110 .....	10
5.2 Casing .....	10
5.3 Tubing .....	12
5.4 Coupling stock, coupling material and accessory material .....	13
<b>6 Process of manufacture .....</b>	<b>14</b>
6.1 General .....	14
6.2 Heat treatment .....	15
6.3 Straightening .....	15
6.4 Traceability .....	16
6.5 Processes requiring validation .....	17
<b>7 Material requirements .....</b>	<b>17</b>
7.1 Chemical composition .....	17
7.2 Tensile properties .....	17
7.3 Charpy V-notch test — General requirements .....	18
7.4 Charpy V-notch — Absorbed energy requirements for coupling stock, coupling material, coupling blanks and couplings .....	20
7.5 Charpy V-notch — Absorbed energy requirements for pipe .....	21
7.6 Charpy V-notch — Absorbed energy requirements for accessory material .....	23
7.7 Maximum hardness .....	23
7.8 Hardness variation — Grades C90, T95, C110 and Q125 .....	24
7.9 Process control — Grades C90, T95, C110 and Q125 .....	24
7.10 Hardenability — Minimum percentage martensite for quenched and tempered products .....	24
7.11 Grain size — Grades C90, T95 and C110 .....	25
7.12 Surface condition — Grades L80 9Cr and L80 13Cr .....	25
7.13 Flattening — Electric-welded pipe .....	25
7.14 Sulfide stress cracking test — Grades C90, T95 and C110 .....	25
<b>8 Dimensions, masses, tolerances, product ends and defects .....</b>	<b>28</b>
8.1 Labels and sizes .....	28
8.2 Dimensions and masses .....	28
8.3 Diameter .....	29
8.4 Wall thickness .....	29
8.5 Mass .....	30
8.6 Length .....	30
8.7 Casing jointers .....	30
8.8 Height and trim of electric-weld flash .....	30
8.9 Straightness .....	31
8.10 Drift requirements .....	31

8.11	Tolerances on dimensions and masses.....	32
8.12	Product ends .....	33
8.13	Defects .....	34
8.14	Coupling make-up and thread protection .....	35
9	Couplings .....	36
9.1	General requirements.....	36
9.2	Alternative grades or heat treatments .....	36
9.3	Mechanical properties .....	36
9.4	Dimensions and tolerances .....	37
9.5	Regular couplings.....	37
9.6	Special-clearance couplings — Groups 1, 2 and 3 .....	37
9.7	Combination couplings.....	37
9.8	Reducing couplings — Groups 1, 2 and 3 .....	37
9.9	Seal-ring couplings .....	37
9.10	Special-bevel tubing regular couplings — Groups 1, 2 and 3 .....	38
9.11	Threading.....	38
9.12	Surface inspection.....	38
9.13	Measurement of imperfections.....	39
9.14	Repair and removal of imperfections and defects .....	39
9.15	Thread surface treatment — Grade Q125.....	39
9.16	Couplings and coupling blank protection — Grades C90, T95, C110 and Q125.....	39
10	Inspection and testing.....	39
10.1	Test equipment .....	39
10.2	Lot definition for testing of mechanical properties.....	40
10.3	Testing of chemical composition.....	40
10.4	Tensile tests .....	41
10.5	Flattening test .....	44
10.6	Hardness test .....	45
10.7	Impact test .....	51
10.8	Grain size determination — Grades C90, T95 and C110.....	52
10.9	Hardenability — Grades C90, T95 and C110 .....	53
10.10	Sulfide stress-cracking test — Grades C90, T95 and C110.....	53
10.11	Metallographic evaluation — EW Grades P110 and Q125.....	53
10.12	Hydrostatic tests.....	53
10.13	Dimensional testing.....	55
10.14	Visual inspection .....	58
10.15	Non-destructive examination (NDE) .....	59
11	Marking .....	66
11.1	General.....	66
11.2	Stamp marking requirements .....	67
11.3	Stencil marking requirements .....	68
11.4	Colour identification.....	69
11.5	Thread and end-finish marking — All groups.....	70
11.6	Pipe-threader marking requirements — All groups .....	70
12	Coating and protection .....	71
12.1	Coatings — All groups .....	71
12.2	Thread protectors .....	71
13	Documents .....	72
13.1	Electronic media — All groups.....	72
13.2	Certification — Groups 1, 2 (except Grade C110) and 3.....	72
13.3	Certification requirements — Grades C110 and Q125.....	72
13.4	Retention of records.....	72
14	Minimum facility requirements for various categories of manufacturer .....	72
14.1	Pipe mill .....	72
14.2	Processor .....	73
14.3	Pipe threader .....	73
14.4	Coupling, pup-joint or accessory manufacturer .....	73

<b>Annex A (normative) Supplementary requirements</b>	<b>75</b>
<b>Annex B (normative) Purchaser inspection</b>	<b>92</b>
<b>Annex C (normative) Tables in SI units</b>	<b>93</b>
<b>Annex D (normative) Figures in SI (USC) units</b>	<b>142</b>
<b>Annex E (normative) Tables in USC units</b>	<b>167</b>
<b>Annex F (normative) Use of the API Monogram by Licensees</b>	<b>215</b>
<b>Annex G (informative) Procedures used to convert from USC units to SI units</b>	<b>222</b>
<b>Annex H (normative) Product Specification Levels</b>	<b>234</b>
<b>Annex I (normative) Requirements for thread protector design validation</b>	<b>241</b>
<b>Annex J (informative) Summary of Product Specification Level (PSL) requirements</b>	<b>245</b>
<b>Annex K (normative) Modification of the hydrogen sulfide titration procedures in ANSI-NACE TM0284-2003, Appendix C</b>	<b>252</b>
<b>Annex L (informative) Technical changes from the previous edition</b>	<b>253</b>
<b>Bibliography</b>	<b>262</b>

## Introduction

This International Standard is based on API Spec 5CT.

Users of this International Standard are advised 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 advisable that the vendor identify any variations from this International Standard and provide details.

This International Standard includes requirements 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.

Details of the major changes (additions, modifications and deletions) agreed by the committee, and which affect the performance of the products or the technical requirements applicable to the products, are provided for information in Annex L and are indicated in this International Standard by the use of grey shading for changes in the fourth edition and yellow shading for changes in this edition. Shading is also used to indicate editorial changes. Where deletions, but no other changes, have been made, vertical bars are used in the margin adjacent to the applicable line or at each side of a cell in a table. Where a complete line or paragraph has been deleted, margin bars next to a blank line are used. While efforts have been made to ensure the accuracy of the changes indicated, the user of this International Standard is advised to consider the total technical content and not only the changes identified. *The user is ultimately responsible for recognising any differences between this edition and the previous edition of this International Standard. ISO expressly disclaims any liability or responsibility for loss or damage resulting from inappropriate use of this International Standard on the basis of any inaccuracy in the changes identified.*



# Petroleum and natural gas industries — Steel pipes for use as casing or tubing for wells

## 1 Scope

**1.1** This International Standard specifies the technical delivery conditions for steel pipes (casing, tubing and pup joints), coupling stock, coupling material and accessory material and establishes requirements for three Product Specification Levels (PSL-1, PSL-2, PSL-3). The requirements for PSL-1 are the basis of this International Standard. The requirements that define different levels of standard technical requirements for PSL-2 and PSL-3, for all Grades except H-40, L-80 9Cr and C110, are contained in Annex H.

For pipes covered by this International Standard, the sizes, masses and wall thicknesses, as well as, grades and applicable end-finishes are listed in Tables C.1 and C.2 and Tables E.1 and E.2.

By agreement between the purchaser and manufacturer, this International Standard can also be applied to other plain-end pipe sizes and wall thicknesses.

This International Standard is applicable to the following connections in accordance with API Spec 5B:

- short round thread casing (SC);
- long round thread casing (LC);
- buttress thread casing (BC);
- non-upset tubing (NU);
- external upset tubing (EU);
- integral tubing (IJ).

For such connections, this International Standard specifies the technical delivery conditions for couplings and thread protection. Supplementary requirements that can optionally be agreed for enhanced leak resistance connections (LC) are given in A.11 SR22.

This International Standard can also be applied to tubulars with connections not covered by ISO/API standards.

**1.2** The four groups of products to which this International Standard is applicable include the following grades of pipe:

- Group 1: All casing and tubing in Grades H, J, K, N and R;
- Group 2: All casing and tubing in Grades C, L, M and T;
- Group 3: All casing and tubing in Grade P;
- Group 4: All casing in Grade Q.

**1.3** Casing sizes larger than Label 1: 4-1/2 but smaller than Label 1: 10-3/4 can be specified by the purchaser to be used in tubing service, see Tables C.1, C.23, C.27 and C.28 or Tables E.1, E.23, E.27 and E.28.

**1.4** Supplementary requirements that can optionally be agreed between purchaser and manufacturer for non-destructive examination, fully machined coupling blanks, upset casing, electric-welded casing, tubing and pup joints, impact testing, seal ring couplings, test certificates, tensile testing and sulfide stress cracking testing are given in Annex A.

**1.5** This International Standard is not applicable to threading requirements.

**NOTE** Dimensional requirements on threads and thread gauges, stipulations on gauging practice, gauge specifications, as well as, instruments and methods for inspection of threads are given in API Spec 5B.

## **2 Conformance**

### **2.1 Dual referencing of normative references**

In the interests of world-wide application of this International Standard, ISO/TC 67 has decided, after detailed technical analysis, that certain normative documents listed in Clause 3 and prepared by ISO/TC 67 or other 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 will lead to technical results different 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) 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 the SI, a comma is used as the decimal separator and a space as the thousands separator. For data expressed in the USC system, 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 units in parentheses.

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

Figures are contained in Annex D 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 80000-1, *Quantities and units — Part 1: General*

ISO 643, *Steels — Micrographic determination of the apparent grain size*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6506-2, *Metallic materials — Brinell hardness test — Part 2: Verification and calibration of testing machines*

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 6508-2, *Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines and indenters*

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

ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

ISO 8501-1, *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 9513, *Metallic materials — Calibration of extensometer systems used in uniaxial testing*

ISO/TR 9769, *Steel and iron — Review of available methods of analysis*

ISO/TR 10400, *Petroleum and natural gas industries — Formulae and calculations for casing, tubing, drill pipe and line pipe*

ISO 10893-2, *Non-destructive testing of steel tubes — Part 2: Automated eddy current testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of imperfections*

ISO 10893-3, *Non-destructive testing of steel tubes — Part 3: Automated full peripheral flux leakage testing of seamless and welded (except submerged arc-welded) ferromagnetic steel tubes for the detection of longitudinal and/or transversal imperfections*

ISO 10893-5, *Non-destructive testing of steel tubes — Part 5: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections*

ISO 10893-10, *Non-destructive testing of steel tubes — Part 10: Automated full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections*

ISO 10893-11, *Non-destructive testing of steel tubes — Part 11: Automatic ultrasonic testing of the weld seam of welded steel tubes for the detection of longitudinal and/or transverse imperfections*

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

ISO 13678, *Petroleum and natural gas industries — Evaluation and testing of thread compounds for use with casing, tubing, line pipe and drill stem elements*

ISO 15156-2, *Petroleum and natural gas industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production — Part 2: Cracking-resistant carbon and low-alloy steels, and the use of cast irons*

ISO/IEC 17011, *Conformity assessment — General requirements for accreditation bodies accrediting conformity assessment bodies*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ANSI/NACE TM0177-2005, *Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H<sub>2</sub>S Environments*

ANSI/NACE TM0284-2003, *Evaluation of Pipeline and Pressure Vessel Steels for Resistance to Hydrogen-Induced Cracking*

ANSI/NACE MR0175/ISO 15156, *Petroleum and natural gas industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production*

API RP 5A3, *Recommended Practice on Thread Compounds for Casing, Tubing, Line Pipe, and Drill Stem Elements*

API TR 5C3, *Technical Report on Equations and Calculations for Casing, Tubing, and Line Pipe Used as Casing or Tubing; and Performance Properties Tables for Casing and Tubing*

API Spec 5B, *Specification for Threading, Gauging and Thread Inspection of Casing, Tubing, and Line Pipe Threads*

ASNT SNT-TC-1A, *Recommended Practice No. SNT-TC-1A — Non-Destructive Testing*

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

ASTM A751, *Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products*

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

ASTM B117, *Standard Practice for Operating Salt Spray (Fog) Apparatus*

ASTM E4, *Standard Practices for Force Verification of Testing Machines*

ASTM E10, *Standard Test Method for Brinell Hardness of Metallic Materials*

ASTM E18, *Standard Test Methods for Rockwell Hardness 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 E83, *Standard Practice for Verification and Classification of Extensometer Systems*

ASTM E112, *Standard Test Methods for Determining Average Grain Size*

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

ASTM E273, *Standard Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing*

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

ASTM E543, *Standard Specification for Agencies Performing Nondestructive Testing*

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

ASTM E709, *Standard Guide for Magnetic Particle Testing*

IADC/SPE 11396, B.A. Dale, M.C. Moyer, T.W. Sampson, *A Test Program for the Evaluation of Oilfield Thread Protectors*, IADC/SPE Drilling Conference, New Orleans, LA, 20-23 February 1983

MIL-STD-810c, *Military Standard: Environmental Test Methods*, 10 March 1975

## 4 Terms, definitions, symbols and abbreviated terms

### 4.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ASTM A941 for heat treatment operations and the following apply.

#### 4.1.1

##### **accessory material**

seamless casing or tubing, or seamless thick-walled tubes or mechanical tubes, or bar stock or hot forgings used for the manufacture of accessories

#### 4.1.2

##### **API threads**

threads as specified in API Spec 5B

#### 4.1.3

##### **arc burn**

localised point of surface melting caused by arcing between an electrode or ground (earth) and the product surface

Note 1 to entry: Contact marks, which are intermittent marks adjacent to the weld line of EW pipe resulting from electrical contact between the electrodes supplying the welding current and the pipe surface, or contact marks resulting from the use of a spectrometer for the detection of steel chemical composition, are not arc burns.

#### 4.1.4

##### **carload**

quantity of product loaded on a railway car for shipment from the product-making facilities

#### 4.1.5

##### **casing**

pipe run from the surface and intended to line the walls of a drilled well

#### 4.1.6

##### **connection**

threaded assembly of tubular components

#### 4.1.7

##### **controlled cooling**

cooling from an elevated temperature in a pre-determined manner to avoid hardening, cracking or internal damage, or to produce a desired microstructure or mechanical properties

#### 4.1.8

##### **coupling**

internally threaded cylinder for joining two lengths of threaded pipe

#### 4.1.9

##### **coupling blank**

unthreaded material used to produce an individual coupling

#### 4.1.10

##### **coupling material**

thick-walled seamless tube used to manufacture coupling blanks