ICS 23.060.40 SLOVENSKÁ TECHNICKÁ NORMA November 2019

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Safety and control devices for burners and appliances burning gaseous and/or liquid fuels - General requirements

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 10/19

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13611

March 2019

ICS 23.060.40 Supersedes EN 13611:2015

English Version

Safety and control devices for burners and appliances burning gaseous and/or liquid fuels - General requirements

Équipements auxiliaires pour brûleurs et appareils utilisant des combustibles gazeux ou liquides - Exigences générales

Sicherheits- und Regeleinrichtungen für Brenner und Brennstoffgeräte für gasförmige und/oder flüssige Brennstoffe - Allgemeine Anforderungen

This European Standard was approved by CEN on 17 June 2018.

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.

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 CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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

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Ref. No. EN 13611:2019 E

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European foreword

This document (EN 13611:2019) has been prepared by Technical Committee CEN/TC 58 “Safety and control devices for burners and appliances burning gaseous or liquid fuels”, 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of an identical text or by endorsement, at the latest by September 2019, and conflicting national standards shall be withdrawn at the latest by September 2019.

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

This document supersedes EN 13611:2015.

It should be noted that the following significant changes compared to the previous edition have been incorporated in this European Standard:

a) Clause 2 “Normative references” has been updated;

b) In Clause 3 “Terms and definitions” the definition for “instructions” was added;

c) In the whole standard the term “installation and operating instructions” was replaced by “instructions”;

d) Annex ZA has been updated with respect to Directive 2009/142/EC relating to appliances burning gaseous fuels (GAD);

e) Annex ZB has been added with respect to Regulation (EU) 2016/426 on appliances burning gaseous fuels (GAR);

f) The Bibliography has been updated.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives.

For relationship with EU Directives, see informative Annex ZA, ZB and ZC, which are an integral part of this document.

Product specific control standards of CEN/TC 58 make use of this standard by adapting this standard and stating “addition”, “modification” or “replacement” in their corresponding clauses.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This standard recognizes the safety level specified by CEN/TC 58 and is regarded as a horizontal standard dealing with the safety, construction and performance of controls for burners and appliances burning gaseous and/or liquid fuels and to their testing.

The general requirements for controls are given in this document, and methods for classification and assessment for new controls and control functions are given in EN 14459:2015 (see Figure 1). EN 126 (see Figure 1) specifies multifunctional controls combining two or more controls and Application Control Functions, one of which is a mechanical control function. The requirements for controls and Application Control Functions are given in the specific control standard (see Figure 1, control functions).

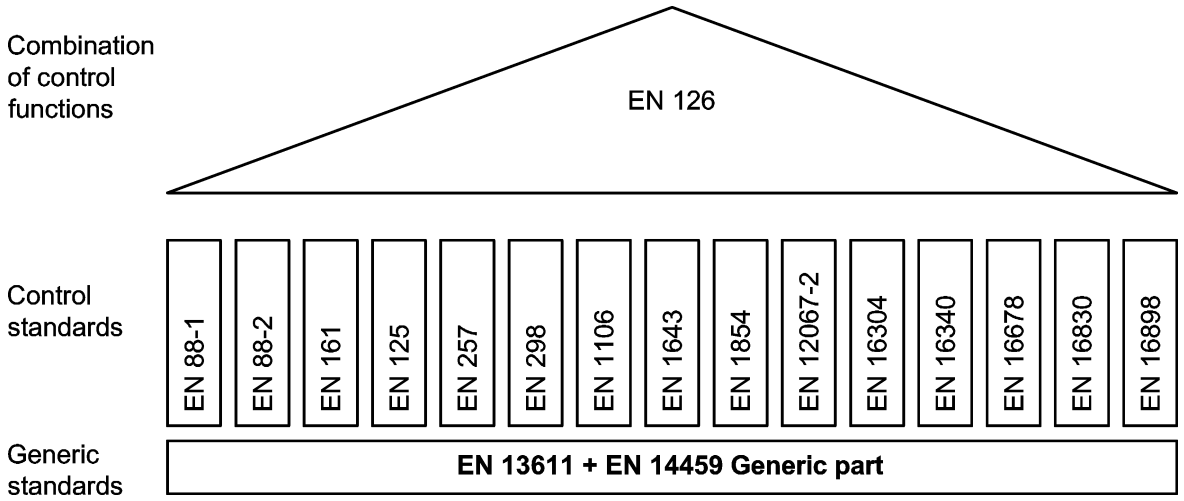

Figure 1 — Interrelation of control standards

This European Standard should be used in conjunction with the specific standard for a specific type of control, (e.g. EN 88-1:2011, EN 88-2:2007, EN 125:2010, EN 126:2012, EN 161:2011+A3:2013, EN 257:2010, EN 298:2012, EN 1106:2010, EN 1643:2014, EN 1854:2010, EN 12067-2:2004, EN 16304:2013 and EN 16340:2014), or for controls for specific applications. This standard can also be applied, so far as reasonable, to controls not mentioned in a specific standard and to controls designed on new principles, in which case additional requirements can be necessary. EN 14459:2015 provides methods for classification and assessment of new control principles.

Primarily in industrial applications it is common practice to rate the safety of a plant based on values describing the likelihood of a dangerous failure. These values are being used to determine Safety Integrity Levels or Performance Levels when the system is being assessed in its entirety.

CEN/TC 58 standards for safety relevant controls do go beyond this approach, because for a certain life time for which the product is specified, designed and tested a dangerous failure is not allowed at all. Failure modes are described and assessed in greater detail.

Measures to prevent from dangerous situations are defined. Field experience over many decades is reflected in the CEN/TC 58 standards. Requirements of these standards can be considered as proven in practice.

To be able to provide values for the parameters that are needed for the determination of a Safety Integrity Level (SIL) or of a Performance Level (PL), Annex J and Annex K of this document specify a possible methodology to derive values for the relevant parameters from the requirements of this

European Standard. Only controls that conform to the relevant CEN/TC 58 control standard can be assessed for SIL or PL classification according to these Annexes.

It cannot be presumed that any Safety Integrity Level or Performance Level assessment alone would imply that requirements of a CEN/TC 58 standard have been met.

1 Scope

This European Standard specifies the general safety, design, construction, and performance requirements and testing of safety, control or regulating devices (hereafter referred to as controls) for burners and appliances burning one or more gaseous fuels or liquid fuels. This European Standard is applicable to controls with declared maximum inlet pressure up to and including 500 kPa and of nominal connection sizes up to and including DN 250.

This European standard specifies general product requirements for the following controls:

— automatic shut-off valves;

— automatic burner control systems;

— flame supervision devices;

— gas/air ratio controls;

— pressure regulators;

— manual taps;

— mechanical thermostats;

— multifunctional controls;

— pressure sensing devices;

— valve proving systems;

— automatic vent valves.

This European standard applies for control functions that are not covered by a specific control standard for burners and appliances burning one or more gaseous fuels or liquid fuels.

This European Standard applies also for safety accessories and pressure accessories with a product of the maximum allowable pressure PS and the volume V of less than 600 000 kPa · dm^3 (6 000 bar · L) or with a product of PS and DN of less than 300 000 kPa (3 000 bar).

This European Standard applies for *AC* and *DC* supplied controls (for controls supplied by stand-alone battery system, battery systems for mobile applications or systems which are intended to be connected to *DC* supply networks controls see Annex I).

This European Standard is applicable to reset functions used for reset from lockout, e.g. due to ignition failure or temperature cut-out in burners and appliances (see Annex M).

This European Standard establishes methodologies for the determination of a Safety Integrity Level (SIL) and the determination of a Performance Level (PL) (see Annex J, Annex K and Annex L).

This European Standard gives guidelines for environmental aspects (see Annex N).

This European Standard does not apply to mechanical controls for use with liquid fuels.

The protection against environmental impact in open air (i.e. capable of withstanding UV radiation, wind, rain, snow, dirt deposits, condensation, ice and hoar frost (see IEV 441-11-05:2005), earthquake and external fire) is not covered by this standard.

This European Standard should be used in conjunction with the specific control standard (see Bibliography).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 377:1993,[1)] *Lubricants for applications in appliances and associated controls using combustible gases except those designed for use in industrial processes*

EN 485-2:2016, *Aluminium and aluminium alloys - Sheet, strip and plate - Part 2: Mechanical properties*

EN 549:1994, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 586-2:1994, *Aluminium and aluminium alloys - Forgings - Part 2: Mechanical properties and additional property requirements*

EN 573-3:2013, *Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition and form of products*

EN 751-1:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 1: Anaerobic jointing compounds*

EN 751-2:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds*

EN 751-3:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 3: Unsintered PTFE tapes*

EN 754-2:2016, *Aluminium and aluminium alloys — Cold drawn rod/bar and tube — Part 2: Mechanical properties*

EN 755-2:2016, *Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties*

EN 1057:2006,[2)] *Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN 1563:2018, *Founding - Spheroidal graphite cast irons*

EN 1559-1:2011, *Founding - Technical conditions of delivery - Part 1: General*

EN 1652:1997, *Copper and copper alloys - Plate, sheet, strip and circles for general purposes*

EN 1706:2010, *Aluminium and aluminium alloys - Castings - Chemical composition and mechanical properties*

EN 1759-1:2004, *Flanges and their joint - Circular flanges for pipes, valves, fittings and accessories, Class designated - Part 1: Steel flanges, NPS 1/2 to 24*

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1) As amended by EN 377:1993+A1:1996

2) As amended by EN 1057:2006+A1:2010

EN 1759-3:2003, *Flanges and their joints - Circular flanges for pipes, valves, fittings and accessories, Class designated - Part 3: Copper alloy flanges*

EN 1759-4:2003, *Flanges and their joint - Circular flanges for pipes, valves, fittings and accessories, class designated - Part 4: Aluminium alloy flanges*

EN 1774:1997, *Zinc and zinc alloys - Alloys for foundry purposes - Ingot and liquid*

EN 1982:2017, *Copper and copper alloys - Ingots and castings*

EN 10025-1:2004, *Hot rolled products of structural steels - Part 1: General technical delivery conditions*

EN 10028-2:2017, *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

EN 10028-3:2017, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized*

EN 10028-4:2017, *Flat products made of steels for pressure purposes — Part 4: Nickel alloy steels with specified low temperature properties*

EN 10028-5:2017, *Flat products made of steels for pressure purposes — Part 5: Weldable fine grain steels, thermomechanically rolled*

EN 10028-6:2017, *Flat products made of steels for pressure purposes — Part 6: Weldable fine grain steels, quenched and tempered*

EN 10028-7:2016, *Flat products made of steels for pressure purposes - Part 7: Stainless steels*

EN 10083-2:2006, *Steels for quenching and tempering - Part 2: Technical delivery conditions for non alloy steels*

EN 10083-3:2006, *Steels for quenching and tempering - Part 3: Technical delivery conditions for alloy steels*

EN 10087:1998, *Free-cutting steels - Technical delivery conditions for semi-finished products, hot-rolled bars and rods*

EN 10088-1:2014, *Stainless steels - Part 1: List of stainless steels*

EN 10088-3:2014, *Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

EN 10111:2008, *Continuously hot rolled low carbon steel sheet and strip for cold forming - Technical delivery conditions*

EN 10130:2006, *Cold rolled low carbon steel flat products for cold forming - Technical delivery conditions*

EN 10213:2007,[3)] *Steel castings for pressure purposes*

3) As amended by EN 10213:2007+A1:2016

EN 10216-1:2013, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 1: Non-alloy steel tubes with specified room temperature properties*

EN 10216-5:2013, *Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 5: Stainless steel tubes*

EN 10222-1:2017, *Steel forgings for pressure purposes — Part 1: General requirements for open die forgings*

EN 10222-5:2017, *Steel forgings for pressure purposes — Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels*

EN 10226-1:2004, *Pipe threads where pressure tight joints are made on the threads - Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation*

EN 10226-2:2005, *Pipe threads where pressure tight joints are made on the threads - Part 2: Taper external threads and taper internal threads - Dimensions, tolerances and designation*

EN 10250-1:1999, *Open die steel forgings for general engineering purposes - Part 1: General requirements*

EN 10250-2:1999, *Open die steel forgings for general engineering purposes - Part 2: Non-alloy quality and special steels*

EN 10250-3:1999, *Open die steel forgings for general engineering purposes - Part 3: Alloy special steels*

EN 10250-4:1999, *Open die steel forgings for general engineering purposes - Part 4: Stainless steels*

EN 10255:2004,[4)] *Non-Alloy steel tubes suitable for welding and threading - Technical delivery conditions*

EN 10272:2016, *Stainless steel bars for pressure purposes*

EN 10277-3:2008, *Bright steel products - Technical delivery conditions - Part 3: Free-cutting steels*

EN 10293:2015, *Steel castings - Steel castings for general engineering uses*

EN 10297-1:2003, *Seamless circular steel tubes for mechanical and general engineering purposes - Technical delivery conditions - Part 1: Non-alloy and alloy steel tubes*

EN 10305-1:2016, *Steel tubes for precision applications - Technical delivery conditions - Part 1: Seamless cold drawn tubes*

EN 10305-4:2016, *Steel tubes for precision applications - Technical delivery conditions - Part 4: Seamless cold drawn tubes for hydraulic and pneumatic power systems*

EN 10346:2015, *Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions*

EN 12163:2016, *Copper and copper alloys - Rod for general purposes*

EN 12164:2016, *Copper and copper alloys - Rod for free machining purposes*

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4) As amended by EN 10255:2004+A1:2007

EN 12165:2016, *Copper and copper alloys - Wrought and unwrought forging stock*

EN 12167:2016, *Copper and copper alloys - Profiles and bars for general purposes*

EN 12186:2014, *Gas infrastructure - Gas pressure regulating stations for transmission and distribution - Functional requirements*

EN 12279:2000, *Gas supply systems - Gas pressure regulating installations on service lines - Functional requirements*

EN 12516-1:2014, *Industrial valves - Shell design strength - Part 1: Tabulation method for steel valve shells*

EN 13445-4:2014, *Unfired pressure vessels - Part 4: Fabrication*

EN 13555:2014, *Flanges and their joints - Gasket parameters and test procedures relevant to the design rules for gasketed circular flange connections*

EN 13906-1:2013, *Cylindrical helical springs made from round wire and bar - Calculation and design - Part 1 : Compression springs*

EN 13906-2:2013, *Cylindrical helical springs made from round wire and bar - Calculation and design - Part 2: Extension springs*

EN 50159:2010, *Railway applications - Communication, signalling and processing systems - Safety-related communication in transmission systems*

EN 60068-2-6:2008, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)(IEC 60068-2-6:2007)*

EN 60384-14:2013, *Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains (IEC 60384-14:2010)*

EN 60384-16:2005, *Fixed capacitors for use in electronic equipment - Part 16: Sectional specification: Fixed metallized polypropylene film dielectric d.c. capacitors (IEC 60384-16:2005)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code)(IEC 60529:1989)*

EN 60730-1:2016, *Automatic electrical controls - Part 1: General requirements (IEC 60730-1:2013)*

EN 60747-5-2:2001, *Discrete semiconductor devices and integrated circuits - Part 5-2: Optoelectronic devices - Essential ratings and characteristics (IEC 60747-5-2:1997)*

EN 60947-5-1:2004, *Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices(IEC 60947-5-1:2003)*

EN 61000-4-29:2000, *Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests(IEC 61000-4-29:2000)*

EN 61508-2:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems (IEC 61508-2:2010)*

EN 61508-3:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements (IEC 61508-3:2010)*

EN 61508-4:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 4: Definitions and abbreviations (IEC 61508-4:2010)*

EN 61508-6:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3 (IEC 61508-6:2010)*

EN 61508-7:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 7: Overview of techniques and measures (IEC 61508-3:2010)*

EN 61558-2-6:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers (IEC 61558-2-6:2009)*

EN 61558-2-16:2009, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V - Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units (IEC 61558-2-16:2009)*

EN 61643-11:2012, *Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods (IEC 61643-11:2011, modified)*

EN 61810-1:2015, *Electromechanical elementary relays - Part 1: General and safety requirements (IEC 61810-1:2015)*

EN 62061:2005, *Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005)*

EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

EN ISO 898-1:2013, *Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs with specified property classes - Coarse thread and fine pitch thread (ISO 898-1:2013)*

EN ISO 898-2:2012, *Mechanical properties of fasteners made of carbon steel and alloy steel - Part 2: Nuts with specified property classes - Coarse thread and fine pitch thread (ISO 898-2:2012)*

EN ISO 3506-1:2009, *Mechanical properties of corrosion-resistant stainless steel fasteners - Part 1: Bolts, screws and studs (ISO 3506-1:2009)*

EN ISO 8434-1:2018, *Metallic tube connections for fluid power and general use - Part 1: 24° cone connectors (ISO 8434-1:2018)*

EN ISO 9606-1:2017, *Qualification testing of welders - Fusion welding - Part 1: Steels (ISO 9606-1:2012 including Cor 1:2012 and Cor 2:2013)*

EN ISO 9606-2:2004, *Qualification test of welders - Fusion welding - Part 2: Aluminium and aluminium alloys (ISO 9606-2:2004)*

EN ISO 9606-3:1999, *Approval testing of welders - Fusion welding - Part 3: Copper and copper alloys (ISO 9606-3:1999)*

EN ISO 9606-4:1999, *Approval testing of welders - Fusion welding - Part 4: Nickel and nickel alloys (ISO 9606-4:1999)*

EN ISO 9712:2012, *Non-destructive testing - Qualification and certification of NDT personnel (ISO 9712:2012)*

EN ISO 13849-1:2015, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)*

EN ISO 14732:2013, *Welding personnel - Qualification testing of welding operators and weld setters for mechanized and automatic welding of metallic materials (ISO 14732:2013)*

EN ISO 15607:2003, *Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607:2003)*

EN ISO 15609-1:2004, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1:2004)*

EN ISO 15610:2003, *Specification and qualification of welding procedures for metallic materials - Qualification based on tested welding consumables (ISO 15610:2003)*

EN ISO 15611:2003, *Specification and qualification of welding procedures for metallic materials - Qualification based on previous welding experience (ISO 15611:2003)*

EN ISO 15612:2018, *Specification and qualification of welding procedures for metallic materials - Qualification by adoption of a standard welding procedure (ISO 15612:2018)*

EN ISO 15613:2004, *Specification and qualification of welding procedures for metallic materials - Qualification based on pre-production welding test (ISO 15613:2004)*

EN ISO 15614-1:2017, *Specification and qualification of welding procedures for metallic materials — Welding procedure test — Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2017)*

EN ISO 15614-2:2005, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 2: Arc welding of aluminium and its alloys (ISO 15614-2:2005)*

EN ISO 17637:2016, *Non-destructive testing of welds — Visual testing of fusion-welded joints (ISO 17637:2016)*

ISO 37:2017, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 262:1998, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts*

ISO 301:2006, *Zinc alloy ingots intended for castings*

ISO 815-1:2014, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 1083:2018, *Spheroidal graphite cast irons - Classification*

ISO 1817:2015, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 7637-2:2011, *Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only*

ISO 7637-3:2016, *Road vehicles — Electrical disturbances from conduction and coupling — Part 3: Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines*

ISO 23529:2016, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

API SPEC 5L:2012 *+ ERTA:2015,* Specification for Line Pipe

ASTM A 106/A 106 *M:2015,* Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A 193/A 193M:2013, *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications*

ASTM A 194/A 194Ma:2016, *Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both*

ASTM A 213/A 213Mc:2015, *Standard Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes*

ASTM A 269/A 269Ma:2015, *Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service*

ASTM A 312/A 312*Ma:2016*, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes

ASTM A 320/A 320Ma:2015, *Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service*

ASTM A 333/A 333M:2016, *Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature Service*

ASTM A 395/A 395M:1999, *Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures*

ASTM A 420/A 420M:2016, *Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service*

ASTM A 536:1984, *Standard Specification for Ductile Iron Castings*

ASTM A 874/A 874M:1998, *Standard Specification for Ferritic Ductile Iron Castings Suitable for Low-Temperature Service*

ASTM B 85/B 85M:2014, *Standard Specification for Aluminum-Alloy Die Castings*

ASTM B 283/B 283Ma:2016, *Standard Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed)*

ASTM B 584:2014, *Standard Specification for Copper Alloy Sand Castings for General Applications*

ASTM F 593:2013, *Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs*

ASTM F 594:2009, *Standard Specification for Stainless Steel Nuts*

MSS SP-55:2011, *Quality Standard for Steel Castings for Valves, Flanges, Fittings, and Other Piping Components — Visual Method for Evaluation of Surface Irregularities (ANSI-approved American National Standard)*

SAE J429:2014, *Mechanical and Material Requirements for Externally Threaded Fasteners*

SAE J995:2012, *Mechanical and Material Requirements for Steel Nuts*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN