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Vodocevni kotli in pomožne napeljave - 2. del: Materiali za tlačno obremenjene dele in opremo kotla

Water-tube boilers and auxiliary installations - Part 2: Materials for pressure parts of boilers and accessories

Wasserrohrkessel und Anlagenkomponenten - Teil 2: Werkstoffe für Druck tragende Kesselteile und Zubehör

Chaudières à tubes d'eau et installations auxiliaires - Partie 2 : Matériaux des parties sous pression des chaudières et accessoires

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Water-tube boilers and auxiliary installations - Part 2: Materials for pressure parts of boilers and accessories

Chaudières à tubes d'eau et installations auxiliaires - Partie
2: Matériaux des parties sous pression des chaudières et
accessoires

Wasserrohrkessel und Anlagenkomponenten - Teil 2:
Werkstoffe für drucktragende Kesselteile und Zubehör

This European Standard was approved by CEN on 25 June 2011.

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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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 12952-2:2011) has been prepared by Technical Committee CEN/TC 269 "Shell and water-tube boilers", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by February 2012, and conflicting national standards shall be withdrawn at the latest by February 2012.

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 12952-2:2001.

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 Directive(s).

For relationship with EU Directive 97/23/EC, see informative Annex ZA, which is an integral part of this document.

Annex D provides details of significant technical changes between this European Standard and the previous edition.

The European Standard series EN 12952 concerning water-tube boilers and auxiliary installations consists of the following parts:

- ITC STANDARD PREVIEW**
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- SIST EN 12952-2:2011
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- *Part 1: General;*
 - *Part 2: Materials for pressure parts of boilers and accessories;*
 - *Part 3: Design and calculation for pressure parts;*
 - *Part 4: In-service boiler life expectancy calculations*
 - *Part 5: Workmanship and construction of pressure parts of the boiler;*
 - *Part 6: Inspection during construction, documentation and marking of pressure parts of the boiler;*
 - *Part 7: Requirements for equipment for the boiler;*
 - *Part 8: Requirements for firing systems for liquid and gaseous fuels for the boiler;*
 - *Part 9: Requirements for firing systems for pulverized solid fuels for the boiler;*
 - *Part 10: Requirements for safeguards against excessive pressure;*
 - *Part 11: Requirements for limiting devices of the boiler and accessories;*
 - *Part 12: Requirements for boiler feedwater and boiler water quality;*
 - *Part 13: Requirements for flue gas cleaning systems;*
 - *Part 14: Requirements for flue gas DENOX-systems using liquefied pressurized ammonia and ammonia water solution;*

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- *Part 15: Acceptance tests;*
- *Part 16: Requirements for grate and fluidized-bed firing systems for solid fuels for the boiler;*
- *CR 12952 Part 17: Guideline for the involvement of an inspection body independent of the manufacturer.*

NOTE 1 A Part 18 on operating instructions is currently in preparation.

Although these parts may be obtained separately, it should be recognized that the parts are inter-dependent. As such, the design and manufacture of water-tube boilers requires the application of more than one part in order for the requirements of the European Standard to be satisfactorily fulfilled.

NOTE 2 Part 4 and Part 15 are not applicable during the design, construction and installation stages.

NOTE 3 A "Boiler Helpdesk" has been established in CEN/TC 269 which may be contacted for any questions regarding the application of European Standards series EN 12952 and EN 12953, see the following website: <http://www.boiler-helpdesk.din.de>

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

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1 Scope

This European Standard specifies the requirements for the product forms for use in pressure parts of water-tube boilers and for parts welded on to pressure parts:

- plates;
- wrought seamless tubes;
- electrically welded tubes;
- submerged, plasma and TIG arc-welded tubes;
- forgings;
- castings;
- rolled bars;
- welding consumables;
- fasteners;
- seamless composite tubes.

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2 Normative references

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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.

EN 757:1997, *Welding consumables — Covered electrodes for manual metal arc welding of high strength steels — Classification*

EN 760:1996, *Welding consumables — Fluxes for submerged arc welding — Classification*

EN 764-4:2002, *Pressure equipment — Part 4: Establishment of technical delivery conditions for metallic materials*

EN 764-5:2002, *Pressure equipment — Part 5: Compliance and inspection documentation of materials*

EN 1092-1:2007, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, PN designated — Part 1: Steel flanges*

EN 1503-1:2000, *Valves — Materials for bodies, bonnets and covers — Part 1: Steels specified in European Standards*

EN 1503-2:2000, *Valves — Materials for bodies, bonnets and covers — Part 2: Steels other than those specified in European Standards*

EN 1600:1997, *Welding consumables — Covered electrodes for manual metal arc welding of stainless and heat resisting steels — Classification*

EN 1759-1:2004, *Flanges and their joints — Circular flanges for pipes, valves, fittings and accessories, class designated — Part 1: Steel flanges, NPS ½ to 24*

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EN 10021, *General technical delivery conditions for steel products*

EN 10028-2:2009, *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

EN 10028-3:2009, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized*

EN 10028-7:2007, *Flat products made of steels for pressure purposes — Part 7: Stainless steels*

EN 10160:1999, *Ultrasonic testing of steel flat product of thickness equal or greater than 6 mm (reflection method)*

EN 10164:2004, *Steel products with improved deformation properties perpendicular to the surface of the product — Technical delivery conditions*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 10213:2007, *Steel castings for pressure purposes*

EN 10216-2, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 10216-3:2002, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 3: Alloy fine grain steel tubes*

EN 10216-5:2004, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 5: Stainless steel tubes*

EN 10217-2:2002, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 2: Electric welded non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 10217-3:2002, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 3: Alloy fine grain steel tubes*

EN 10217-5, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 5: Submerged arc welded non-alloy and alloy steel tubes with specified elevated temperature properties*

EN 10217-7:2005, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 7: Stainless steel tubes*

EN 10222-2:1999, *Steel forgings for pressure purposes — Part 2: Ferritic and martensitic steels with specified elevated temperature properties*

EN 10222-3:1998, *Steel forgings for pressure purposes — Part 3: Nickel steels with specified low temperature properties*

EN 10222-4:1998, *Steel forgings for pressure purposes — Part 4: Weldable fine grain steels with high proof strength*

EN 10222-5:1999, *Steel forgings for pressure purposes — Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels*

EN 10228-1:1999, *Non-destructive testing of steel forgings — Part 1: Magnetic particle inspection*

EN 10228-2:1998, *Non-destructive testing of steel forgings — Part 2: Penetrant testing*

EN 10228-3:1998, *Non-destructive testing of steel forgings — Part 3: Ultrasonic testing of ferritic or martensitic steel forgings*

- EN 10253-2:2007, *Butt-welding pipe fittings — Part 2: Non alloy and ferritic alloy steels with specific inspection requirements*
- EN 10253-4, *Butt-welding pipe fittings — Part 4: Wrought austenitic and austenitic-ferritic (duplex) stainless steels with specific inspection requirements*
- EN 10254:1999, *Steel closed die forgings — General technical delivery conditions*
- EN 10269:1999, *Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties*
- EN 10273:2007, *Hot rolled weldable steel bars for pressure purposes with specified elevated temperature properties*
- EN 10308:2001, *Non destructive testing — Ultrasonic testing of steel bars*
- EN 10314, *Method for the derivation of minimum values of proof strength of steel at elevated temperatures*
- EN 12074:2000, *Welding consumables — Quality requirements for manufacture, supply and distribution of consumables for welding and allied processes*
- EN 12536:2000, *Welding consumables — Rods for gas welding of non alloy and creep-resisting steels — Classification*
- EN 12952-3:2011, *Water-tube boilers and auxiliary installations — Part 3: Design and calculation for pressure parts*
- EN 12952-5:2011, *Water-tube boilers and auxiliary installations — Part 5: Workmanship and construction of pressure parts of the boiler*
- EN 12952-6:2011, *Water-tube boilers and auxiliary installations — Part 6: Inspection during construction, documentation and marking of pressure parts of the boiler*
- EN 12952-7:2002, *Water-tube boilers and auxiliary installations — Part 7: Requirements for equipment for the boiler*
- EN 12952-12:2003, *Water-tube boilers and auxiliary installations — Part 12: Requirements for boiler feedwater and boiler water quality*
- EN 13479:2004, *Welding consumables — General product standard for filler metals and fluxes for fusion welding of metallic materials*
- EN ISO 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1:2009)*
- EN ISO 544:2011, *Welding consumables — Technical delivery conditions for filler materials and fluxes — Type of product, dimensions, tolerances and markings (ISO 544:2011)*
- EN ISO 636:2008, *Welding consumables — Rods, wires and deposits for tungsten inert gas welding of non-alloy and fine-grain steels — Classification (ISO 636:2004)*
- EN ISO 2560:2009, *Welding consumables — Covered electrodes for manual metal arc welding of non-alloy and fine grain steels — Classification (ISO 2560:2009)*
- EN ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels (ISO 2566-1:1984)*
- EN ISO 2566-2, *Steel — Conversion of elongation values — Part 2: Austenitic steels (ISO 2566-2:1984)*
- EN ISO 3580:2011, *Welding consumables — Covered electrodes for manual metal arc welding of creep-resisting steels — Classification (ISO 3580:2010)*

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EN ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*

EN ISO 6892-2, *Metallic materials — Tensile testing — Part 2: Method of test at elevated temperature (ISO 6892-2:2011)*

EN ISO 8495, *Metallic materials — Tube — Ring-expanding test (ISO 8495:1998)*

EN ISO 10893-10, *Non-destructive testing of steel tubes — Part 10: Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc-welded) steel tubes for the detection of longitudinal and/or transverse imperfections (ISO 10893-10:2011)*

EN ISO 14171:2010, *Welding consumables — Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of non alloy and fine grain steels — Classification (ISO 14171:2010)*

prEN ISO 14174:2010, *Welding consumables — Fluxes for submerged arc welding and electroslag welding — Classification (ISO/DIS 14174:2010)*

EN ISO 14341:2011, *Welding consumables — Wire electrodes and weld deposits for gas shielded metal arc welding of non alloy and fine grain steels — Classification (ISO 14341:2010)*

EN ISO 14343:2009, *Welding consumables — Wire electrodes, strip electrodes, wires and rods for arc welding of stainless and heat resisting steels — Classification (ISO 14343:2009)*

EN ISO 14344:2010, *Welding consumables — Procurement of filler materials and fluxes (ISO 14344:2010)*

EN ISO 16834:2007, *Welding consumables — Wire electrodes, wires, rods and deposits for gas-shielded arc welding of high strength steels — Classification (ISO 16834:2006)*

EN ISO 17632:2008, *Welding consumables — Tubular cored electrodes for gas shielded and non-gas shielded metal arc welding of non-alloy and fine grain steels — Classification (ISO 17632:2004)*

EN ISO 17633:2010, *Welding consumables — Tubular cored electrodes and rods for gas shielded and non-gas shielded metal arc welding of stainless and heat-resisting steels — Classification (ISO 17633:2010)*

EN ISO 17634:2006, *Welding consumables — Tubular cored electrodes for gas shielded metal arc welding of creep-resisting steels — Classification (ISO 17634:2004)*

EN ISO 18276:2006, *Welding consumables — Tubular cored electrodes for gas-shielded and non-gas-shielded metal arc welding of high-strength steels — Classification (ISO 18276:2005)*

EN ISO 21952:2007, *Welding consumables — Wire electrodes, wires, rods and deposits for gas-shielded arc welding of creep-resisting steels — Classification (ISO 21952:2007)*

EN ISO 24598:2007, *Welding consumables — Solid wire electrodes, tubular cored electrodes and electrode/flux combinations for submerged arc welding of creep-resisting steels — Classification (ISO 24598:2007)*

EN ISO 26304:2009, *Welding consumables — Solid wire electrodes, tubular cored electrodes and electrode-flux combinations for submerged arc welding of high strength steels — Classification (ISO 26304:2008, including Cor 1:2009)*

ISO 3581:2003, *Welding consumables — Covered electrodes for manual metal arc welding of stainless and heat-resisting steels — Classification*

ISO 6303, *Pressure vessel steels not included in ISO 2604, Parts 1 to 6 — Derivation of long-time stress rupture properties*

ISO 18275:2011, *Welding consumables — Covered electrodes for manual metal arc welding of high-strength steels — Classification*

CEN ISO/TR 15608:2005, *Welding — Guidelines for a metallic materials grouping system (ISO/TR 15608:2005)*

3 General requirements

3.1 Selection of materials with regard to service conditions

The manufacturer of the water-tube boilers shall select the material (including welding consumables) for the manufacture of the boilers so that, when the delivered material (including welding consumables) complies with the requirements specified in the material order and when the design rules in EN 12952-3:2011 and the rules for the fabrication, inspection and testing of the boilers in EN 12952-5:2011 and EN 12952-6:2011 are observed, the boilers can be operated without hazard under the service conditions (pressures, temperatures, environments, etc.) for the life time provided in the order for the boiler.

The materials specified in Clause 4 which satisfy the elongation and impact energy requirements of 4.2.5.3 and 4.2.5.4 respectively shall not be considered prone to brittle fracture during manufacture and subsequent operation in accordance with the provisions of this European Standard. It is also considered that for operation within the parameters specified in EN 12952-3:2011 using feedwater and boiler water as specified in EN 12952-12:2003 the selected materials will not be significantly affected by ageing or chemical attack.

3.2 Selection of materials with regard to fabrication

The selection of the materials of construction for pressure parts of water-tube boilers and to parts welded on pressure parts shall take into account the suitability of the material with regard to fabrication, e.g. cold and hot forming, weldability, expanding, and heat treatment.

NOTE The rules for forming or post weld heat treatment are included in EN 12952-5:2011.

3.3 Material specification

3.3.1 General

The selection and order of materials for pressure parts shall be based on one of the following material specifications for pressure equipment in the form of:

- a) harmonized European material Standards;
- b) European approval of material (EAM);
- c) particular material appraisals.

3.3.2 European Standards

Materials in accordance with harmonized European Standards shall be selected for types, treatment conditions and dimensions of products frequently used in Europe.

NOTE Materials in accordance with European Standards are given in Annex A.

3.3.3 European approvals for materials

European approvals for materials are intended for repeated use. They are established in accordance with EN 764-4:2002 and apply to materials or treatment conditions and product forms or dimensions not covered in a European material Standard for pressure equipment. Additionally to the requirements of EN 764-4:2002 the requirements of this European Standard shall be met.

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NOTE Reference of available European approvals for materials is published in the Official Journal of the European Union.

3.3.4 Particular material appraisals

Particular material appraisals apply for individual cases as for example:

- a) a material or a product form or a thickness not covered by a European material Standard or EAM intended for use in a particular pressure equipment;
- b) a product specified in a European material Standard or EAM for materials for pressure equipment is intended in an exceptional case for service conditions outside its specified range of application.

Where relevant to the pressure equipment under consideration the requirements given in EN 764-4:2002 should be considered. Additionally to the requirements of EN 764-4:2002 the requirements of this European Standard shall be met.

3.4 Consideration of special materials properties

When materials are chosen with properties other than those specified in the material specification, or which may influence the lifetime or the safe service behaviour of the water-tube boiler, they shall be taken into account when selecting the material and its dimensions.

NOTE Examples are the scaling or ageing behaviour of the material.

3.5 Contents of material specification

The different types of specifications for materials for water-tube boilers include the clauses given in Table 3.5-1 as a minimum.

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Table 3.5-1 — Content of specifications for materials for pressure parts

Clauses	EN standards	European material data sheets		Particular material appraisals
		Unrestricted ^a	restricted	
Scope	X	see EN 764-4		
References	X			
Definitions	(X)			
Requirements	X			
Inspection	X			
Marking	X			
Guidelines for processing the material etc. (welding, heat treatment, forming, flame-cutting)	Z			
Restrictions on application	Z			
X = in all cases (X) = if necessary Z = the relevant guidelines for fabrication and the restrictions on application are, where necessary, given in EN 12952-5				
^a If applicable by reference to a European Standard for pressure purposes.				

3.6 Compliance and inspection documentation of materials

Manufacturers and stockists of materials for pressure parts including welding consumables shall follow the requirements in accordance with EN 764-5. They shall provide sufficient evidence of their capability to deliver materials with consistent quality in accordance with the specifications and EN 764-5.

4 Material for pressure parts

4.1 Materials covered by harmonized European product Standards for pressure purposes

4.1.1 Flat products, forgings, castings, tubes, fittings, flanges and valve bodies

The material shall be ordered and delivered in accordance with Annex A and the relevant European Standards EN 10028-2:2009, EN 10028-3:2009, EN 10028-7:2007, EN 10213:2007, EN 10216-2:2002+A2:2007, EN 10216-3:2002, EN 10216-5:2004, EN 10217-2:2002, EN 10217-3:2002, EN 10217-7:2005, EN 10222-2:1999, EN 10222-5:1999, EN 10253-2:2007, EN 10254:1999 and EN 10273:2007. The additional requirements given in this clause shall be taken into account. Harmonized supporting standards are EN 1092-1:2007, EN 1503-1:2000, EN 1503-2:2000, EN 1759-1:2004.

In case EN 12952-3:2011 requires Z35 quality in 10.3.1 for flat ends machined from a plate, this should be determined in accordance with EN 10164:2004.

4.1.2 Cast iron

Spheroidal graphite cast iron shall not be used in the construction of pressure parts, except for valves and fittings as indicated in EN 12952-7:2002, within the design limits specified in EN 12952-3:2011. The use of other types of cast iron is not permitted.

4.1.3 Studs, bolts and nuts

Requirements for studs, bolts and nuts shall be in accordance with EN 10269:1999.

4.1.4 Welding consumables

The welding consumables (electrodes, filler wires, filler rods, fluxes, fusible inserts) shall be selected so that the mechanical properties of the weld metal are compatible with the relevant requirements of the base materials.

The welding consumables are classified or specified, respectively, in accordance with the following standards: EN 757:1997, EN 760:1996, EN 1600:1997, EN 12074:2000, EN 12536:2000, EN 13479:2004, EN ISO 544:2011, EN ISO 636:2008, EN ISO 2560:2009, EN ISO 3580:2011, EN ISO 14171:2010, prEN ISO 14174:2010, EN ISO 14341:2008, EN ISO 14343:2009, EN ISO 14344:2010, EN ISO 16834:2007, EN ISO 17632:2008, EN ISO 17633:2006, EN ISO 17634:2006, EN ISO 18276:2006, EN ISO 21952:2007, EN ISO 24598:2007, EN ISO 26304:2009, ISO 3581:2003, ISO 18275:2011.

Technical delivery conditions for welding consumables and additives used for welding of pressure parts and their structural attachments shall comply with EN 12074:2000 or EN ISO 544:2011.

NOTE Equivalent national/international provisions are admissible, provided they meet the same criteria concerning the requirements for the manufacturing, delivery, distribution, test procedures and evaluation of welding consumables and additives regarding the requirements for the quality management system.

4.1.5 Requirements for plates used for heads

Plates which are to be used in the manufacture of heads shall represent the quality class Z35 in accordance with EN 10164:2004 (see EN 12952-3:2011, 10.3.1).