SLOVENSKI STANDARD
SIST EN 12952-2:2002

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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 drucktragende Kesselteile und Zubehör

Chaudieres a tubes d'eau et installations auxiliaires - Partie 2: Matériaux des parties sous pression des chaudieres et des 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

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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 Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard 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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of the Pressure Equipment Directive (PED)[1]). For relationship with Pressure Equipment Directive see informative annex ZA, which is an integral Part of this Standard.

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of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

In accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard as their National Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

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 pulverised solid fuels for the boiler
Part 10: Requirements for safeguards against excessive pressure
Part 11: Requirements for limiting devices and safety circuits 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
Part 15: Acceptance tests
Part 16: Requirements for grate and fluidized bed firing systems for solid fuels for the boiler

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

NOTE: Part 4 is not applicable during the design, construction and installation stages.

The annexes A, B and C of this European Standard are normative, the annex ZA is informative.

[1]) Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment; OJEC L181.

1 Scope

This EN 12952-2 covers the requirements for the following materials for use in pressure parts of water-tube boilers and for parts welded on 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.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 440, *Welding consumables – Wire electrodes and deposits for gas shielded metal arc welding of non alloy and fine grain steels – Classification.*

EN 499, *Welding consumables – Covered electrodes for manual metal arc welding of non alloy and fine grain steels – Classification.*

EN 756, *Welding consumables – Wire electrodes and wire-flux combinations for submerged arc welding of non alloy and fine grain steels – Classification.*

EN 758, *Welding consumables – Tubular cored electrodes for metal arc welding with and without a gas shield of non alloy and fine grain steels – Classification.*

EN 759, *Welding consumables – Technical delivery conditions for welding filler metals – Type of product, dimensions, tolerances and marking.*

prEN 764-4:1999, *Pressure equipment – Part 4: Establishment of technical delivery conditions for materials.*

prEN 764-5:1999, *Pressure equipment – Part 5: Compliance and inspection documentation of materials.*

prEN 1092-1:2001, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, PN designated – Part 1: Steel flanges.*

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

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

EN 1599, *Welding consumables – Covered electrodes for manual metal arc welding of creep-resisting steels – Classification.*

EN 1668, *Welding consumables – Rods, wires and deposits for tungsten inert gas welding of non alloy and fine grain steels – Classification.*

prEN 1759-1:2000, *Flanges and their joints – Circular flanges for pipes, valves, fittings and accessories, class designated – Part 1: Steel flanges, NPS ½ to 24.*

EN 10002-1, *Metallic materials – Tensile testing – Part 1: Method of test at ambient temperature.*

EN 10002-5, *Metallic materials – Tensile testing – Part 5: Method of testing at elevated temperature.*

EN 10021, *General technical delivery requirements for steel and iron products.*

EN 10028-1, *Flat products made of steels for pressure purposes – Part 1: General requirements.*

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

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

EN 10045-1, *Metallic materials – Charpy impact test – Part 1: Test method.*

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

EN 10164, *Steel products with improved deformation properties perpendicular to the surface of the product – Technical delivery conditions.*

EN 10204, *Metallic products – Types of inspection documents.*

EN 10213-1, *Technical delivery conditions for steel castings for pressure purposes – Part 1: General.*

EN 10213-2, *Technical delivery conditions for steel castings for pressure purposes – Part 2: Steel grades for use at room temperature and elevated temperatures.*

prEN 10216-1:1995, *Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 1: Non alloy steel tubes with specified room temperature properties.*

prEN 10216-2:1998, *Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 2: Non alloy and alloy steel tubes with specified elevated temperature properties.*

prEN 10216-3:1998, *Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 3: Non alloy and alloy fine grain steel tubes.*

prEN 10216-5:1998, *Seamless steel tubes for pressure purposes – Technical delivery conditions – Part 5: Stainless steel tubes.*

prEN 10217-2:1998, *Welded steel tubes for pressure purposes – Technical delivery conditions – Part 2: Electric welded non alloy and alloy steel tubes with specified elevated temperature properties.*

prEN 10217-3:1998, *Welded steel tubes for pressure purposes – Technical delivery conditions – Part 3: Alloy fine grain steel tubes.*

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

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

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

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

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

EN 10228-2, *Non-destructive testing of steel forgings – Part 2: Penetrant testing.*

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

EN 10236, *Metallic materials – Tube – Ring expanding test.*

EN 10246-6, *Non-destructive testing of steel tubes – Part 6: Automatic full peripheral ultrasonic testing of seamless steel tubes for the detection of transverse imperfections.*

EN 10246-7, *Non-destructive testing of steel tubes – Part 7: Automatic full peripheral ultrasonic testing of seamless and welded (except submerged arc welded) steel tubes for the detection of longitudinal imperfections.*

EN 10253-1, *Butt welding pipe fittings – Part 1: Wrought carbon steel for general use and without specific inspection requirements.*

prEN 10253-2:1999, *Butt welding pipe fittings – Part 2: Wrought carbon and ferritic alloy steel with specific inspection requirements.*

EN 10254, *Steel closed die forgings – General technical delivery conditions.*

EN 10273, *Hot rolled weldable steel bars for pressure purposes with specified elevated temperature properties.*

EN 12070, *Welding consumables – Wire electrodes, wires and rods for arc welding of creep-resisting steels – Classification.*

EN 12071, *Welding consumables – Tubular cored electrodes for gas shielded metal arc welding of creep-resisting steels – Classification.*

EN 12074, *Welding consumables – Quality requirements for manufacture, supply and distribution of consumables for welding and allied processes.*

EN 12536, *Welding consumables – Rods for gas welding of non alloy and creep-resisting steels – Classification.*

prEN 12952-3:1997, *Water-tube boilers and auxiliary installations – Part 3: Design and calculation for pressure parts.*

prEN 12952-5:2000, *Water-tube boilers and auxiliary installations – Part 5: Workmanship and construction of pressure parts of the boiler.*

prEN 12952-6:1997, *Water-tube boilers – Part 6: Inspection during construction, documentation and marking.*

prEN 12952-7:1998, *Water-tube boilers – Part 7: Requirements for equipment.*

prEN 12952-12:1998, *Water-tube boilers – Part 12: Requirements for feedwater and boiler water quality.*

prEN 13479-1:1999, *Welding consumables – Test methods and quality requirements for conformity evaluation of consumables – Part 1: Primary methods and evaluation.*

ENV 22605-3, *Steel products for pressure purposes – Derivation and verification of elevated temperature properties – Part 3: An alternative procedure for deriving the elevated temperature yield or proof stress properties when data are limited (ISO 2605-3:1985).*

ISO 2566-1, *Steel – Conversion of elongation values – Part 1: Carbon and low alloy steels.*

ISO 2566-2, *Steel – Conversion of elongation values – Part 2: Austenitic steels.*

ISO 3419, *Non alloy and alloy steel butt-welding fittings.*

ISO 5251, *Stainless steel butt-welding fittings.*

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

ISO 7005-1, *Metallic flanges – Part 1: Steel flanges.*

CR ISO 15608, *Welding-Guidelines for a metallic material grouping system (ISO/TR 15608:2000).*

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 and the rules for the fabrication, inspection and testing of the boilers in EN 12952-5 and EN 12952-6 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 using feedwater and boiler water as specified in prEN 12952-12 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.

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 Material Data Sheets (EMDS)

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 prEN 764-4 and apply to materials or treatment conditions and product forms or dimensions not covered in a European material Standard for pressure equipment.

The European approvals for materials for pressure equipment result in European Material Data Sheets.

NOTE: Reference of available European Material Data Sheets is published in the Official Journal of the European Community.

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 EMDS intended for use in a particular pressure equipment;

b) a product specified in a European material Standard or EMDS 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 prEN 764-4 should be considered.

3.4 Consideration of special material properties

When materials are chosen with properties other than those specified in the material specification, or which may influence the life time 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 3.1 as a minimum.

Table 3.1 — Content of specifications for materials for pressure parts

Clauses	EN-Standards	European material data sheets		Particular material appraisals
		unrestricted	restricted	
Scope	X	see prEN 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

[1]) 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 prEN 764-5. They shall provide sufficient evidence of their capability to deliver materials with consistent quality in accordance with the specifications and prEN 764-5.

4 Materials for pressure parts

4.1 Materials covered by harmonized European material 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, EN 10028-3, EN 10213-1, EN 10213-2, prEN 10216-2, prEN 10216-3, prEN 10217-2, prEN 10217-3, EN 10222-2, EN 10222-5, EN 10253-1, EN 10254 and EN 10273. The additional requirements given in this Part shall be taken into account. Harmonized supporting standards are prEN 1092-1, EN 1503-1, EN 1503-2, prEN 1759-1.

4.1.2 Cast iron

Nodular cast iron shall not be used in the construction of pressure parts, except for valves and fittings as indicated in prEN 12952-7, within the design limits specified in EN 12952-3. The use or other types of cast iron shall not be permitted.

4.1.3 Studs, bolts and nuts

Studs, bolts and nuts shall be ordered and delivered in accordance with the requirements of EN 12952-3.

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 from EN 440, EN 499, EN 756, EN 758, EN 759, EN 1599, EN 1668, EN 12070, EN 12071, EN 12074 and EN 12536.

The welding consumables shall be ordered and delivered according to specifications approved in accordance with EN 12074 and prEN 13479-1.

4.1.5 Verification of properties

The properties shall conform to the requirements of the European material Standards. Compliance with the delivery requirements shall be documented in the inspection document.

4.1.6 Requirements for non-destructive examination

The non-destructive examination (NDE) requirement for various forms of material shall be as given below.

a) plates:
NDE in accordance with EN 10160 class S1.

b) tubes – seamless:
Seamless tubes shall be tested in accordance with prEN 10216 (Series) test category II .
For unalloyed seamless tubes with design temperatures below 450 °C and design pressures below 42 bar, it is permitted to perform category 1 in accordance with prEN 10216-2.