

# Shell boilers —

## Part 2: Materials for pressure parts of boilers and accessories

The European Standard EN 12953-2:2002 has the status of a  
British Standard

ICS 27.060.30; 27.100

# National foreword

This British Standard is the official English language version of EN 12953-2:2002. It partially supersedes BS 2790:1992 which will be withdrawn on publication of BS EN 12953 Parts 1, 2, 3, 4, 5, 6, 8 and 9.

When the reference to this European Standard has been published in the Official Journal of the European Communities (OJ), compliance with it will confer a presumption of conformity with the essential requirements covered by the standard in respect of the Pressure Equipment Directive.

The UK participation in its preparation was entrusted to Technical Committee PVE/16, Shell boilers, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

## Cross-references

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This British Standard, having been prepared under the direction of the Engineering Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 14 June 2002

## Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 10, an inside back cover and a back cover.

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## Amendments issued since publication

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English version

## Shell boilers - Part 2: Materials for pressure parts of boilers and accessories

Chaudières à tubes de fumée - Partie 2: Matériaux des parties sous pression des chaudières et des accessoires

Großwasserraumkessel - Teil 2: Werkstoffe für drucktragende Kesselteile und Zubehör

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## Contents

	page
<b>Foreword</b> .....	3
<b>1 Scope</b> .....	4
<b>2 Normative references</b> .....	4
<b>3 General requirements</b> .....	5
3.1 Selection of materials .....	5
3.2 Material specification .....	5
<b>4 Materials for pressure parts</b> .....	7
4.1 Flat products, tubes and forgings .....	7
4.2 Valves and fittings .....	7
4.3 Welding consumables .....	7
4.4 Acceptance tests .....	7
4.5 Inspection documents .....	8
4.6 Marking .....	8
<b>5 Materials for non-pressure parts</b> .....	8
<b>6 Traceability</b> .....	8
<b>Annex ZA (informative) Clauses of this European Standard addressing essential safety requirements or other provisions of the Pressure Equipment Directive</b> .....	9
<b>Bibliography</b> .....	10

## Foreword

This document EN 12953-2:2002 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 November 2002, and conflicting national standards shall be withdrawn at the latest by November 2002.

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 the Pressure Equipment Directive (PED) [1].

For the relationship with the Pressure Equipment Directive, see annex ZA, which is an integral part of this document.

The European Standard EN 12953 concerning shell boilers 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: Workmanship and construction of pressure parts of the boiler.*
- *Part 5: Inspection during construction, documentation and marking of pressure parts of the boiler.*
- *Part 6: Requirements for equipment for the boiler.*
- *Part 7: Requirements for firing systems for liquid and gaseous fuels for the boiler.*
- *Part 8: Requirements for safeguards against excessive pressure.*
- *Part 9: Requirements for limiting devices of the boiler and accessories.*
- *Part 10: Requirements for boiler feedwater and boiler water quality.*
- *Part 11: Acceptance tests.*
- *Part 12: Requirements for firing systems for solid fuels for the boiler.*
- *Part 13: Operating instructions.*

CR 12953-14, *Shell boilers - Guideline for the involvement of an inspection body independent of the manufacturer.*

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

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

## 1 Scope

This European Standard covers the following materials for pressure parts of shell boilers subjected to internal and external pressure and their integral attachments:

- flat products;
- tubes; and
- forgings.

## 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 1561, *Founding — Grey cast irons.*

EN 1563, *Founding — Spheroidal graphite cast irons.*

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 10204:1991, *Metallic products — Types of inspection documents.*

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

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 10217-1, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties.*

EN 10217-2, *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 10217-5, *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 10222-1, *Steel forgings for pressure purposes — Part 1: General requirements for open die forgings.*

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

EN 10234, *Metallic materials — Tube — Drift expanding test.*

EN 10235, *Metallic materials — Tube — Flanging test.*

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

EN 12953-5:2002, *Shell boilers — Part 5: Inspection during construction, documentation and marking of pressure parts of the boiler.*

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

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

### 3 General requirements

#### 3.1 Selection of materials

The manufacturer of the shell boiler shall select the materials for the manufacture of the boiler so that, when delivered, the material fulfils the requirements specified in the order and the requirements of all parts of this European Standard.

#### 3.2 Material specification

##### 3.2.1 General

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

- a) Harmonized European Standards (see 3.2.2);
- b) European Material Data Sheets<sup>1)</sup> (see 3.2.3);
- c) Particular Material Appraisals (see 3.2.4).

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<sup>1)</sup> EMDS are established on the basis of European Approvals for pressure equipment Materials (EAM).

### 3.2.2 Harmonized European Standards

Steels shall be selected from the grades listed in Table 3.2-1, in accordance with the appropriate European Standards.

**Table 3.2-1 — Permitted grades of EN steels**

Product	Standard	Grade	Group <sup>a</sup>
Flat	EN 10028-2	P235GH P265GH P295GH P355GH	1.1 1.1 1.2 1.2
	EN 10028-3	P275NH P355NH	1.1 1.2
Tube (Seamless)	EN 10216-1 <sup>b</sup>	P195 TR1 or TR2 P235 TR1 or TR2 P265 TR1 or TR2	1.1 1.1 1.1
	EN 10216-2	P195 GH P235 GH P265 GH	1.1 1.1 1.1
Tube (Welded)	EN 10217-1 <sup>b</sup>	P195 TR1 or TR2 P235 TR1 or TR2 P265 TR1 or TR2	1.1 1.1 1.1
	EN 10217-2	P195 GH P235 GH P265 GH	1.1 1.1 1.1
	EN 10217-5	P235 GH P265 GH	1.1 1.1
Forging	EN 10222-2	P245GH P280GH	1.1 1.2

<sup>a</sup> Material group to CR ISO 15608

<sup>b</sup> This material can only be used for smoke tubes (both plain and stay)

### 3.2.3 European Material Data Sheets

European Material Data Sheets (EMDS) shall be applied for types of materials that are not covered in European material standards.

### 3.2.4 Particular Material Appraisals

Particular Material Appraisals (PMA) shall be applied for special cases not covered in 3.2.2 and 3.2.3 and not intended for frequent use. A PMA shall be prepared, and it shall be approved.



## 4 Materials for pressure parts

### 4.1 Flat products, tubes and forgings

The material shall be ordered and delivered in accordance with relevant harmonized European Standards given in Table 3.2-1, EMDS or PMA. The additional requirements given in this standard shall be taken into account.

Cylindrical sections (outer shells, furnace tubes, etc.) shall be manufactured from plate or seamless or fusion welded tube. Plates cut from coil or strip shall be permitted, provided that all the requirements for plates in this part are complied with. The welded joint in fusion welded tubes shall be a full penetration weld as detailed in 5.5 of EN 12953-5:2002 and shall be examined.

### 4.2 Valves and fittings

The materials for valves and fittings shall be suitable for their design and operating conditions.

Materials given in Table 4.2-1 shall be permitted for valves up to, and including DN 200 where the operating pressure and temperature does not exceed 13 bar gauge and 220 °C respectively.

**Table 4.2-1 — Grades of cast iron**

Material	Standard	Grades
Grey (lamellar)	EN 1561	EN-GJL-200 and 250
Spheroidal graphite	EN 1563	EN-GJS-350 and 400

However, the use of grey cast iron shall not be permitted for main stop valves on steam boilers, and in other cases where shock loads can be expected.

### 4.3 Welding consumables

The welding consumables (electrodes, filler wires, filler rods, fluxes, or powder) shall be selected so that the mechanical properties and corrosion resistance of the weld metal are compatible with the base materials.

The welding consumables shall be ordered and delivered in accordance with EN 12074 and prEN 13479-1

NOTE The supplementary methods and evaluation of welding consumables will be specified in Work Item 00121250 of CEN/TC 121 [2].

### 4.4 Acceptance tests

#### 4.4.1 General

Acceptance tests shall be carried out in accordance with the general rules given in the appropriate European Standard for the material.

#### 4.4.2 Plates

The number, selection and preparation of samples and test pieces shall be in accordance with EN 10028-1.

#### 4.4.3 Tubes

The number, selection and preparation of samples and test pieces shall be in accordance with the product standards given in Table 3.2-1.

Additionally, when tubes are to be expanded or swaged, a drift expansion test to EN 10234 or flanging test to EN 10235 shall be carried out.

NOTE Impact tests on smoke tubes are not required.

#### 4.4.4 Forgings

The number, selection and preparation of samples and test pieces shall be in accordance with EN 10222-1.

#### 4.5 Inspection documents

Compliance with the delivery requirements shall be documented. The type of inspection document to be supplied shall be 3.1.B from EN 10204:1991.

#### 4.6 Marking

For reasons of traceability, each individual product shall be individually marked, or if delivered in bundles or boxes, marked with a label secured to the bundle or box.

The marking shall specify the following as a minimum:

- the name or symbol of the manufacturer;
- the material grade or material number;
- the cast number;
- the stamp of the material manufacturer's inspector;
- the sample or batch number, or any other number by which the test sample can be identified and correlated with the relevant inspection document;
- the heat treatment condition, if relevant.

Marking shall be carried out in accordance with the relevant European material standards, EMDS or PMA.

### 5 Materials for non-pressure parts

For non-pressure parts welded to a pressure part of the shell boiler, the material shall be compatible with the pressure part material, corresponding to a specification which can be identified, and shall have a maximum carbon content in the ladle analysis of 0,24 %.

### 6 Traceability

Manufacturers and stockists of materials for pressure parts, including welding consumables, shall operate a system that provides full traceability. The system shall be demonstrable for approval on demand.

## Annex ZA (informative)

### Clauses of this European Standard addressing essential safety requirements or other provisions of the Pressure Equipment Directive

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 safety requirements of the Pressure Equipment Directive 97/23/EC with regard to materials for pressure parts of boilers and accessories.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this European Standard.

The following clauses of this European Standard given in Table ZA.1 are likely to support essential safety requirements of the Pressure Equipment Directive 97/23/EC:

**Table ZA.1 — Comparison between EN 12953-2 and the Pressure Equipment Directive 97/23/EC and EN 12953-2 with respect to materials for pressure parts of boilers and accessories for shell boilers**

EN 12953-2 harmonized clauses	Content	Pressure Equipment Directive 97/23/EC Annex I article
4.4, 4.5, 6	traceability	3.1.5
3.2.2, 4.2	materials for pressure purposes	4.1
3.2.3	technical documentation EMDS	4.2b
3.2.4	technical documentation	4.2b

Compliance with the clauses of this standard provides on means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

## Bibliography

- [1] Directive 97/23/EC of the European Parliament and of the Council on 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment; OJEC,L 181.
- [2] WI 00121250, *Welding consumables — Test methods and quality requirements for conformity evaluation of consumables — Part 2: Supplementary methods and evaluation.*



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