SLOVENSKI STANDARD
SIST EN 13445-2:2002/A3:2009

01-april-2009

Neogrevane tlaļne posode - 2. del: Materiali

Unfired pressure vessels - Part 2: Materials

Unbefeuerte Druckbehälter - Teil 2: Werkstoffe

Récipients sous pression non soumis à la flamme - Partie 2: Matériaux

Ta slovenski standard je istoveten z: **EN 13445-2:2002/A3:2009**

ICS:

23.020.30	Tlaļne posode, plinske jeklenke	Pressure vessels, gas cylinders

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English Version

Unfired pressure vessels - Part 2: Materials

Récipients sous pression non soumis à la flamme - Partie 2: Matériaux

Unbefeuerte Druckbehälter - Teil 2: Werkstoffe

This amendment A3 modifies the European Standard EN 13445-2:2002; it was approved by CEN on 9 October 2008.

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This amendment 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 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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Contents

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Foreword

This document (EN 13445-2:2002/A3:2009) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

This Amendment to the European Standard EN 13445-2:2002 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2009, and conflicting national standards shall be withdrawn at the latest by July 2009.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EC Directive(s).

For relationship with EC Directive(s), see informative Annex ZA, which is an integral part of this document.

This document includes the text of the amendment itself. The corrected pages of EN 13445-2 will be delivered as issue 35 of the standard.

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, 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.

2 Normative references

Delete the following references from Clause 2 and move to the Bibliography:

EN 10028-1:2007, *Flat products made of steels for pressure purposes — Part 1: General requirements*

EN 10028-2:2003, *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

EN 10028-3:2003, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized*

EN 10028-4:2003, *Flat products made of steels for pressure purposes — Part 4: Nickel alloy steels with specified low temperature properties*

EN 10028-5:2003, *Flat products made of steels for pressure purposes — Part 5: Weldable fine grain steels, thermomechanically rolled*

EN 10028-6:2003, *Flat products made of steels for pressure purposes — Part 6: Weldable fine grain steels, quenched and tempered*

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

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

EN 10216-1:2002, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties*

EN 10216-2:2002, *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 10216-4:2002, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 4: Non-alloy and alloy steel tubes with specified low temperature properties*

EN 10216-5:2002, *Seamless steel tubes for pressure purposes — Technical delivery conditions — Part 5: Stainless steel tubes*

EN 10217-1:2002, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 1: Non-alloy steel tubes with specified room temperature properties*

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 10217-4:2002, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 4: Electric welded non-alloy steel tubes with specified low temperature properties*

EN 10217-5:2002, *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 10217-6:2002, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 6: Submerged arc welded non-alloy steel tubes with specified low temperature properties*

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

EN 10222-1:1998, *Steel forgings for pressure purposes — Part 1: General requirements for open die forgings*

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 pressures 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 10269:1999, *Steels and nickel alloys for fasteners with specified elevated and/or low temperature properties*

EN 10272:2007, *Stainless steel bars for pressure purposes*

EN 10273:2007, *Hot rolled weldable steel bars for pressure purposes with specified elevated temperature properties*

4 Requirements for materials to be used for pressure-bearing parts

The text of clause 4.3.1 shall be changed to read as follows:

4.3.1 European Standards

The European Standards for plates, strips, bars, tubes, forgings and castings for pressure purposes shall be used.

NOTE 1 Table E.2-1 provides an overview on materials for pressure purposes specified in harmonised standards.

NOTE 2 Table E.1-1 contains an informative summary of European Materials Standards referred to and of European Standards covering components of pressure-bearing parts.

Special provisions due to fabrication and operation shall be taken into account, if appropriate.

The text of Annex A shall be rewritten as follows (see next pages):

Annex A
(normative)

Grouping system for steels for pressure equipment

Steels shall be grouped as shown in Table A-1. The figures given in group 1 are referring to the ladle analysis of the materials. The figures given in group 4 to 10 are based on the element content used in the designation of the alloys.

Table A-1 — Grouping system for steels (extract from CR ISO 15608:2000)

Group	Sub-group	Type of steel
1		Steels with a specified minimum yield strength $R_{eH} \leq 460$ N/mm^2 [a] and with analysis in %: C ≤ 0,25 Si ≤ 0,60 Mn ≤ 1,70 Mo ≤ 0,70[b] S ≤ 0,045 P ≤ 0,045 Cu ≤ 0,40[b] Ni ≤ 0,5[b] Cr ≤ 0,3 (0,4 for castings)[b] Nb ≤ 0,05 V ≤ 0,12[b] Ti ≤ 0,05
	1.1	Steels with a specified minimum yield strength $R_{eH} \leq 275$ N/mm^2
	1.2	Steels with a specified minimum yield strength 275 N/mm^2 < $R_{eH} \leq 360$ N/mm^2
	1.3	Normalised fine grain steels with a specified minimum yield strength $R_{eH} > 360$ N/mm^2
	1.4	Steels with improved atmospheric corrosion resistance whose analysis may exceed the requirements for the single elements as indicated under 1
2		Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength $R_{eH} > 360$ N/mm^2
	2.1	Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength 360 N/mm^2 < $R_{eH} \leq 460$ N/mm^2
	2.2	Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength $R_{eH} > 460$ N/mm^2
3		Quenched and tempered steels and precipitation hardened steels except stainless steels with a specified minimum yield strength $R_{eH} > 360$ N/mm^2
	3.1	Quenched and tempered steels with a specified minimum yield strength 360 N/mm^2 < $R_{eH} \leq 690$ N/mm^2
	3.2	Quenched and tempered steels with a specified minimum yield strength $R_{eH} > 690$ N/mm^2
	3.3	Precipitation hardened steels except stainless steels

Table A-1 (*concluded*)

Group	Sub-group	Type of steel
4		Low vanadium alloyed Cr-Mo-(Ni) steels with Mo ≤ 0,7 % and V ≤ 0,1 %
	4.1	Steels with Cr ≤ 0,3 % and Ni ≤ 0,7 %
	4.2	Steels with Cr ≤ 0,7 % and Ni ≤ 1,5 %
5		Cr-Mo steels free of vanadium with C ≤ 0,35 %[c]
	5.1	Steels with 0,75 % ≤ Cr ≤ 1,5 % and Mo ≤ 0,7 %
	5.2	Steels with 1,5 % < Cr ≤ 3,5 % and 0,7 < Mo ≤ 1,2 %
	5.3	Steels with 3,5 % < Cr ≤ 7,0 % and 0,4 < Mo ≤ 0,7 %
	5.4	Steels with 7,0 % < Cr ≤ 10 % and 0,7 < Mo ≤ 1,2 %
6		High vanadium alloyed Cr-Mo-(Ni) steels
	6.1	Steels with 0,3 % ≤ Cr ≤ 0,75 %, Mo ≤ 0,7 % and V ≤ 0,35 %
	6.2	Steels with 0,75 % < Cr ≤ 3,5 %, 0,7 % < Mo ≤ 1,2 % and V ≤ 0,35 %
	6.3	Steels with 3,5 % < Cr ≤ 7,0 %, Mo ≤ 0,7 % and 0,45 % ≤ V ≤ 0,55 %
	6.4	Steels with 7,0 % < Cr ≤ 12,5 %, 0,7 % < Mo ≤ 1,2 % and V ≤ 0,35 %
7		Ferritic, martensitic or precipitation hardened stainless steels with C ≤ 0,35 % and 10,5 % ≤ Cr ≤ 30 %
	7.1	Ferritic stainless steels
	7.2	Martensitic stainless steels
	7.3	Precipitation hardened stainless steels
8		Austenitic steels
	8.1	Austenitic stainless steels with Cr ≤ 19 %
	8.2	Austenitic stainless steels with Cr > 19 %
	8.3	Manganese austenitic stainless steels with 4 % < Mn ≤ 12 %
9		Nickel alloyed steels with Ni ≤ 10 %
	9.1	Nickel alloyed steels with Ni ≤ 3 %
	9.2	Nickel alloyed steels with 3 % < Ni ≤ 8 %
	9.3	Nickel alloyed steels with 8 % < Ni ≤ 10 %
10		Austenitic ferritic stainless steels (duplex)
	10.1	Austenitic ferritic stainless steels with Cr ≤ 24 %
	10.2	Austenitic ferritic stainless steels with Cr > 24 %

[a] In accordance with the specification of the steel product standards, R_{eH} may be replaced by $R_{p0,2}$ or $R_{t0.5}$.

[b] A higher value is accepted provided that Cr + Mo + Ni + Cu + V ≤ 0,75 %.

[c] "Free of vanadium" means not deliberately added to the material.

The text of Annex E shall be rewritten as follows (see next pages):

Annex E
(informative)

European steels for pressure purposes

E.1 European Standards for steels and steel components for pressure purposes

Table E.1-1 contains an informative summary on European Standards for steels and steel components for pressure purposes.

Table E.1-1 — European Standards for steels and steel components for pressure purposes

Product form	General requirements	Room temperature grades [a]	Elevated temperature grades	Fine grain steels			Low temperature grades	Stainless steels
				Normalised	Thermo-mechanically treated	Quenched and tempered		
Plate and strip	EN 10028-1	—	EN 10028-2	EN 10028-3	EN 10028-5	EN 10028-6	EN 10028-4	EN 10028-7
Rolled bar	—	—	EN 10273	—	—	—	—	EN 10272
Seamless tube	—	EN 10216-1	EN 10216-2	EN 10216-3	—	EN 10216-3	EN 10216-4	EN 10216-5
Electric welded tube	—	EN 10217-1	EN 10217-2	EN 10217-3	—	—	EN 10217-4	—
Submerged arc welded tube	—	EN 10217-1	EN 10217-5	EN 10217-3	—	—	EN 10217-6	—
Fusion welded tube	—	—	—	—	—	—	—	EN 10217-7
Fitting	—	EN 10253-2	EN 10253-2	EN 10253-2	EN 10253-2	EN 10253-2	EN 10253-2	EN 10253-4
Forging including forged bars	EN 10222-1	—	EN 10222-2	EN 10222-4	—	—	EN 10222-3	EN 10222-5
Casting	EN 10213	—	EN 10213	—	—	—	EN 10213	EN 10213
Steel for fastener	—	—	EN 10269	—	—	—	EN 10269	EN 10269

[a] room temperature values are given in all standards of this table

E.2 European standardised steels grouped according to product forms

The references in this table do not include the date of the standard, but they are dated references as given in clause Bibliography.

Table E.2-1 — European standardised steels grouped according to product forms

1	2	3	4	5	6	7	8		9	10
No	Product form	European Standard	Material description	Grade	Material number	Heat treatment [g]	Thickness mm		Material group to CR ISO 15608	Notes
							min.	max.		
1	plate and strip	EN 10028-2	elevated temperature properties	P235GH	1.0345	N	0	250	1.1	
2	plate and strip	EN 10028-2	elevated temperature properties	P265GH	1.0425	N	0	250	1.1	
3	plate and strip	EN 10028-2	elevated temperature properties	P295GH	1.0481	N	0	250	1.2	
4	plate and strip	EN 10028-2	elevated temperature properties	P355GH	1.0473	N	0	250	1.2	
5	plate and strip	EN 10028-2	elevated temperature properties	16Mo3	1.5415	N, NT	0	250	1.2	e
6	plate and strip	EN 10028-2	elevated temperature properties	18MnMo4-5	1.5414	NT	0	150	1.2	
7	plate and strip	EN 10028-2	elevated temperature properties	18MnMo4-5	1.5414	QT	150	250	1.2	
8	plate and strip	EN 10028-2	elevated temperature properties	20MnMoNi4-5	1.6311	QT	0	250	3.1	
9	plate and strip	EN 10028-2	elevated temperature properties	15NiCuMoNb5-6-4	1.6368	NT	0	100	3.1	
10	plate and strip	EN 10028-2	elevated temperature properties	15NiCuMoNb5-6-4	1.6368	NT, QT	100	150	3.1	
11	plate and strip	EN 10028-2	elevated temperature properties	15NiCuMoNb5-6-4	1.6368	QT	150	200	3.1	
12	plate and strip	EN 10028-2	elevated temperature properties	13CrMo4-5	1.7335	NT	0	100	5.1	
13	plate and strip	EN 10028-2	elevated temperature properties	13CrMo4-5	1.7335	NT,QT	100	150	5.1	
14	plate and strip	EN 10028-2	elevated temperature properties	13CrMo4-5	1.7335	QT	150	250	5.1	
15	plate and strip	EN 10028-2	elevated temperature properties	13CrMoSi5-5	1.7336	NT, QT	0	100	5.1	
16	plate and strip	EN 10028-2	elevated temperature properties	13CrMoSi5-5	1.7336	QT	100	250	5.1	
17	plate and strip	EN 10028-2	elevated temperature properties	10CrMo9-10	1.7380	NT	0	60	5.2	
18	plate and strip	EN 10028-2	elevated temperature properties	10CrMo9-10	1.7380	NT,QT	60	100	5.2	

Table E.2-1 (*continued*)

1	2	3	4	5	6	7	8		9	10
No	Product form	European Standard	Material description	Grade	Material number	Heat treatment [g]	Thickness mm		Material group to CR ISO 15608	Notes
19	plate and strip	EN 10028-2	elevated temperature properties	10CrMo9-10	1.7380	QT	100	250	5.2	
20	plate and strip	EN 10028-2	elevated temperature properties	12CrMo9-10	1.7375	NT,QT	0	250	5.2	
21	plate and strip	EN 10028-2	elevated temperature properties	X12CrMo5	1.7362	NT	0	150	5.3	
22	plate and strip	EN 10028-2	elevated temperature properties	X12CrMo5	1.7362	QT	150	250	5.3	
23	plate and strip	EN 10028-2	elevated temperature properties	13CrMoV9-10	1.7703	NT	0	150	6.2	
24	plate and strip	EN 10028-2	elevated temperature properties	13CrMoV9-10	1.7703	QT	150	250	6.2	
25	plate and strip	EN 10028-2	elevated temperature properties	12CrMoV12-10	1.7767	NT	0	150	6.2	
26	plate and strip	EN 10028-2	elevated temperature properties	12CrMoV12-10	1.7767	QT	150	250	6.2	
27	plate and strip	EN 10028-2	elevated temperature properties	X10CrMoVNb9-1	1.4903	NT	0	150	6.4	
28	plate and strip	EN 10028-2	elevated temperature properties	X10CrMoVNb9-1	1.4903	QT	150	250	6.4	
29	plate and strip	EN 10028-3	fine grain steel normalised	P275NH	1.0487	N	0	250	1.1	
30	plate and strip	EN 10028-3	fine grain steel normalised	P275NL1	1.0488	N	0	250	1.1	
31	plate and strip	EN 10028-3	fine grain steel normalised	P275NL2	1.1104	N	0	250	1.1	
32	plate and strip	EN 10028-3	fine grain steel normalised	P355N	1.0562	N	0	250	1.2	
33	plate and strip	EN 10028-3	fine grain steel normalised	P355NH	1.0565	N	0	250	1.2	
34	plate and strip	EN 10028-3	fine grain steel normalised	P355NL1	1.0566	N	0	250	1.2	
35	plate and strip	EN 10028-3	fine grain steel normalised	P355NL2	1.1106	N	0	250	1.2	
36	plate and strip	EN 10028-3	fine grain steel normalised	P460NH	1.8935	N	0	100	1.3	
37	plate and strip	EN 10028-3	fine grain steel normalised	P460NL1	1.8915	N	0	100	1.3	
38	plate and strip	EN 10028-3	fine grain steel normalised	P460NL2	1.8918	N	0	100	1.3	