



SLOVENSKI STANDARD
SIST EN 13445-4:2009/A1:2012
01-januar-2012

Neogrevane tlačne posode - 4. del: Proizvodnja - Dopolnilo A1

Unfired pressure vessels - Part 4: Fabrication

Unbefeuerte Druckbehälter - Teil 4: Herstellung

Réipients sous pression non soumis à la flamme - Partie 4: Fabrication

Ta slovenski standard je istoveten z: EN 13445-4:2009/A1:2011

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ICS:

23.020.30	Tlačne posode, plinske jeklenke	Pressure vessels, gas cylinders
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SIST EN 13445-4:2009/A1:2012 **en,fr,de**

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 13445-4:2009/A1

December 2011

ICS 23.020.30

English Version

Unfired pressure vessels - Part 4: Fabrication

Réipients sous pression non soumis à la flamme - Partie
4: Fabrication

Unbefeuerte Druckbehälter - Teil 4: Herstellung

This amendment A1 modifies the European Standard EN 13445-4:2009; it was approved by CEN on 15 October 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant 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 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-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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 United Kingdom.

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

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Contents

Page

Foreword.....	3
1 Table 10.1-1	4
2 Clause 8.2	8
3 Clause 10.1	8
4 Clause 10.5.1	8
5 Clause 10.5.1	8
6 Clause 10.5.2	8
7 Clause 10.5.3	9
8 Clause 10.8	9

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Foreword

This document (EN 13445-4:2009/A1:2011) 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 13445-4:2009 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2012, and conflicting national standards shall be withdrawn at the latest by June 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 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(s), see informative Annex ZA, which is an integral part of this document.

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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EN 13445-4:2009/A1:2011 (E)

1 Table 10.1-1

New Table 10.1-1 Post weld heat treatment

Delete the existing table and substitute the following

Material Group	Material ¹⁾	Temperature (°C)	Nominal thickness (mm) ²⁾	Holding time (min)	P _{crit} (see Clause 10.1)
1.1	Unalloyed steel with R _{eH} ≤ 275 MPa	550-600	≤ 35 ³⁾ > 35 ≤ 90 > 90	30 e _n - 5 40+0,5*e _n	17,5
1.2	Unalloyed steel with R _{eH} > 275 ≤ 360 MPa				
	• delivery condition M	530-580			17,3
	• delivery condition QT	550-600 ⁴⁾			17,5
	• delivery condition N (except 16Mo3)	550-600	≤ 35 ³⁾	30	17,5
	• 16Mo3, 18MnMo4-5, 18Mo5	550-620	> 35 ≤ 90	e _n - 5	17,5
1.3	Normalized fine grain steels with R _{eH} > 360 MPa	550-600	> 90	40 + 0,5 * e _n	17,3
2.1	Thermo-mechanically treated fine grain steels with 360 MPa < R _{eH} ≤ 460 MPa	530-580			17,3
3.1	Quenched and tempered steels with R _{eH} > 360 ≤ 690 MPa				
	• 15NiCuMoNb5-6-4 NT and QT	580-620 ⁴⁾	≤ 15	30	17,5
	• 20MnMoNi4-5 ⁵⁾	550-620 ⁴⁾	> 15 ≤ 60	2 * e _n	17,5
	• R _{eH} > 360 ≤ 500 MPa ³⁾	530-580 ⁴⁾	> 60	120	-
	• R _{eH} > 500 ≤ 690 MPa		6)		
4.1	Low vanadium alloyed Cr-Mo-(Ni) steels with Mo ≤ 0,7 % , V ≤ 0,1 % , Cr ≤ 0,3% and Ni ≤ 0,7 %				
	• 18MnMoNi5-5	580-640 ⁴⁾	≤ 15 ⁵⁾ > 15 ≤ 60 > 60	30 2 * e _n 120	-
	• 15MnCrMoNiV5-3		6)		

Material Group	Material ¹⁾	Temperature (°C)	Nominal thickness (mm) ²⁾	Holding time (min)	P _{crit} (see Clause 10.1)	
5.1	Cr-Mo-steels with 0,75 % < Cr ≤ 1,5 % and Mo ≤ 0,7 % and free of V	7)				
	• 25CrMo4, 26CrMo4-2					
	• 13CrMoSi5-5	620-680 ⁴⁾ 8)	≤ 15	30	18,7	
	• All others		> 15 ≤ 60	2 * e _n	18,5	
		> 60	60 + e _n			
5.2	Cr-Mo-steels with 1,5 % < Cr ≤ 3,5 % and 0,7% < Mo ≤ 1,2 % and free of V	7)				
	• 10CrMo9-10, 11CrMo9-10 ⁹⁾					
		660-720 ⁴⁾	≤ 15	30	19,2	
			> 15 ≤ 60	2 * e _n	19,3	
• 12CrMo9-10	660-720 ⁴⁾ 10)	≤ 125	2,4 * e _n			
		> 125	225+0,6*e _n			
5.3	Cr-Mo-steels with 3,5 % < Cr ≤ 7 % and 0,4 % < Mo ≤ 0,7 % and free of V	7)				
	• X11CrMo5, X12CrMo5					
	• X16CrMo5-1	680-750	≤ 15	30	19,5	
		700-750	> 15 ≤ 60	2 * e _n	-	
			> 60	60 + e _n		
5.4	Cr-Mo-steels with 7 % ≤ Cr ≤ 10 % and 0,7 % < Mo ≤ 1,2 % and free of V	7)				
		740-780	≤ 12	30	-	
			> 12 ≤ 60	2,5 * e _n		
			> 60	90 + e _n		
6.1	High vanadium Cr-Mo-(Ni) with 0,3 % < Cr ≤ 0,75 % and Mo ≤ 0,7 % and V ≤ 0,35 %	680-730	all	90 + e _n (180 minimum)	-	

EN 13445-4:2009/A1:2011 (E)

Material Group	Material ¹⁾	Temperature (°C)	Nominal thickness (mm) ²⁾	Holding time (min)	P _{crit} (see Clause 10.1)
6.2	High vanadium Cr-Mo-(Ni) with 0,75 % < Cr ≤ 3,5 % and 0,7 % < Mo ≤ 1,2 % and V ≤ 0,35 %	690–710 ⁴⁾	≤ 125	2,4 * e _n	19,4
	> 125		225 + 0,6 * e _n		
6.3	High vanadium Cr-Mo-(Ni) with 3,5 % < Cr ≤ 7,0 % and Mo ≤ 0,7 % and 0,45 % < V ≤ 0,55 %	6)			
6.4	High vanadium Cr-Mo-(Ni) with 7,0% < Cr ≤ 10 % and 0,7 % < Mo ≤ 1,2 %	730–780 ¹¹⁾	≤ 30	60	20,5
			> 30 ≤ 60	120	
	> 60	2 * e _n			
	X20CrMoV11-1	730–770 ¹¹⁾	≤ 12	30	-
			> 12 ≤ 60	2,5 * e _n	
			> 60	90 + e _n	
8.1	Austenitic stainless steels with Cr ≤ 19 %	Generally not applicable ⁶⁾			
8.2	Austenitic stainless steels with Cr > 19 %				
9.1	Ni alloyed steels with Ni ≤ 3,0 %	530–580	≤ 35 ³⁾	30	-
9.2	Ni alloyed steels with 3,0 % < Ni ≤ 8,0 % ^{4) 12)}		> 35 ≤ 90	e _n – 5	
			> 90	40 + 0,5 * e _n	
9.3	Ni alloyed steels with 8,0 % < Ni ≤ 10 %	7)			
10.1	Austenitic ferritic stainless steels with Cr ≤ 24 %	Generally not applicable ⁶⁾			
10.2	Austenitic ferritic stainless steels with Cr > 24 %				
1)	Heat treatment conditions of base material: M = thermomechanically rolled; N = normalised; NT = normalised and tempered; QT = quenched and tempered				
2)	Nominal thickness e _n is that required by 10.2.2.				
3)	For thickness ≤ 35 mm post weld heat treatment is optional and normally only necessary in special cases (e.g. to reduce the danger of stress corrosion cracking or hydrogen-induced				

Material Group	Material ¹⁾	Temperature (°C)	Nominal thickness (mm) ²⁾	Holding time (min)	P _{crit} (see Clause 10.1)
	cracking (sour gas)).				
4)	If higher temperatures are used, conditions given in clause 10.5.3 apply.				
5)	For thickness ≤ 15 mm PWHT is optional.				
6)	If PWHT is considered necessary, the PWHT time and temperature shall take into account recommendations from the material manufacturer as well as the welding consumable manufacturer to achieve the required material properties.				
7)	Normally welded with austenitic filler metal; in view of possible carbon diffusion PWHT should be avoided.				
8)	No post weld heat treatment is required if all the following conditions are fulfilled: <ul style="list-style-type: none"> – tubes with nominal diameter < 120 mm; – nominal wall thickness < 13 mm 				
9)	No post weld heat treatment required if all the following conditions are fulfilled: <ul style="list-style-type: none"> – tubes with nominal diameter < 120 mm – nominal wall thickness < 13 mm – design temperature > 480 °C 				
10)	In case of intermediate stress relieving (ISR): 630 °C – 650 °C				
11)	Intermediate cooling of the weld below the M _f temperature (typically 90 °C – 100 °C) should take place before PWHT to ensure full transformation into martensite.				
12)	After the welding of the 3,5 % Ni steels with a thickness over 35 mm, it is permitted to weld, without new heat treatment, components that are not subject to pressure provided the following conditions are met: <ul style="list-style-type: none"> – the weld dimensions (weld thickness or corner joint throat) are less or equal to 12 mm; – a preheat temperature of minimum 100 °C is applied during the welding operation. 				