

NF EN 13445-2 V1/AC1

DÉCEMBRE 2015

www.afnor.org

Ce document est à usage exclusif et non collectif des clients Normes en ligne. Toute mise en réseau, reproduction et rediffusion, sous quelque forme que ce soit, même partielle, sont strictement interdites.

This document is intended for the exclusive and non collective use of AFNOR Webshop (Standards on line) customers. All network exploitation, reproduction and re-dissemination, even partial, whatever the form (hardcopy or other media), is strictly prohibited.



**DOCUMENT PROTÉGÉ
PAR LE DROIT D'AUTEUR**

Droits de reproduction réservés. Sauf prescription différente, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans accord formel.

Contacteur :
AFNOR – Norm'Info
11, rue Francis de Pressensé
93571 La Plaine Saint-Denis Cedex
Tél : 01 41 62 76 44
Fax : 01 49 17 92 02
E-mail : norminfo@afnor.org

afnor

Normes en ligne

Pour : CERN

Client : 99871000

Commande : N20180410-357344-T

le : 10/04/2018 à 17:38

Diffusé avec l'autorisation de l'éditeur

Distributed under licence of the publisher

French standard

NF EN 13445-2 V1/AC1
1st December 2015

Classification index: E 86-200-2/AC1

ICS: 23.020.30; 77.140.30

Unfired pressure vessels — Part 2: Materials

F : Récipients sous pression non soumis à la flamme — Partie 2 : Matériels
D : Unvefeuerte Druckbehälter — Teil 2: Werkstoffe

Corrigendum AC1

to the approved standard NF EN 13445-2:2014 (V1:December 2014), edited by AFNOR.

Correspondence

This corrigendum reproduces the corrected pages of the issue 2 (2015-07) of the EN 13445-2:2014.

Summary

The concerned corrected page are the following: 5, 7, 11, 17, 21, 22, 23, 24, 25, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81.

Modifications

Corrections

Standards

Standards are designed to serve as a basis in relations between economic, scientific, technical and social partners.

By nature, application of a standard is voluntary. When stipulated in a contract, it is binding on the parties. Legislation may require all or part of a standard to become compulsory.

The standard is a document defined by consensus within a standardisation body involving representatives of all stakeholders. It is submitted for public consultation prior to adoption.

The standard is regularly reviewed to assess its appropriateness over time.

Any standard is considered to be effective as from the date presented on the first page.

Understanding standards

The reader's attention is drawn to the following points:

Only the verbal form **shall** is used to express one or more requirements that shall be satisfied in order to comply with this document. Such requirements may be contained in the body of the standard or in a so-called "normative" annex. For test methods, the use of the imperative corresponds to a requirement.

Expressions involving the verbal form **should** are used to express a possibility that, while preferred, is not actually necessary in order to comply with this document. The verbal form **may** is used to express practical, but not mandatory advice or suggestions, or permission.

Furthermore, this document may provide additional information aimed at making certain elements easier to understand or use, or at clarifying how such elements are applied, but without actually defining a requirement. These elements are presented as **notes or informative annexes**.

Standardisation commission

Acting within a given field of activity, a standardisation commission features the necessary expertise for preparing French standards and defining France's positions in European and international draft standards. The commission may also prepare experimental standards and technical reports.

If you would like to provide feedback on this document, make suggested changes or take part in the document's revision, write to "norminfo@afnor.org".

EN 13445-2:2014 (E)
Issue 2 (2015-07)

Amendments to this new edition may be issued from time to time and then used immediately as alternatives to rules contained herein. It is intended to deliver a new Issue of EN 13445:2014 each year consolidating these Amendments and including other identified corrections. Issue 2 (2015-07) includes the corrected pages listed in Annex Y.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 13445-2:2014 (E)
Issue 2 (2015-07)

- EN 10217-6:2002, EN 10217-6:2002/A1:2005, *Welded steel tubes for pressure purposes — Technical delivery conditions — Part 6: Submerged arc welded non-alloy steel tubes with specified low temperature properties*
- EN 10222-3:1998, *Steel forgings for pressure purposes — Part 3: Nickel steels with specified low temperature properties*
- EN 10222-4:1998, EN 10222-4:1998/A1:2001, *Steel forgings for pressures purposes — Part 4: Weldable fine grain steels with high proof strength*
- EN 10269:1999, EN 10269:1999/A1:2006, *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 12074:2000, *Welding consumables — Quality requirements for manufacture, supply and distribution of consumables for welding and allied processes*
- EN 13445-1:2014, *Unfired pressure vessels — Part 1: General*
- EN 13445-3:2014, *Unfired pressure vessels — Part 3: Design*
- EN 13445-4:2014, *Unfired pressure vessels — Part 4: Fabrication*
- EN 13445-5:2014, *Unfired pressure vessels — Part 5: Inspection and testing*
- EN 13479:2004, *Welding consumables — General product standard for filler metals and fluxes for fusion welding of metallic materials*
- EN ISO 148-1:2010, *Metallic materials — Charpy pendulum impact test — Part 1: Test method (ISO 148-1:2010)*
- EN ISO 204:2009, *Metallic materials — Uniaxial creep testing in tension — Method of test (ISO 204:2009)*
- EN ISO 898-1:2013, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread (ISO 898-1:2013)*
- EN ISO 898-2:2012, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes — Coarse thread and fine pitch thread (ISO 898-2:2012)*
- EN ISO 2566-1:1999, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels (ISO 2566-1:1984)*
- EN ISO 2566-2:1999, *Steel — Conversion of elongation values — Part 2: Austenitic steels (ISO 2566-2:1984)*
- EN ISO 3506-1:2009, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 1: Bolts, screws and studs (ISO 3506-1:2009)*
- EN ISO 3506-2:2009, *Mechanical properties of corrosion-resistant stainless-steel fasteners — Part 2: Nuts (ISO 3506-2:2009)*
- EN ISO 6892-1:2009, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2009)*
- CEN ISO/TR 15608:2000, *Welding — Guidelines for a metallic material grouping system (ISO/CR 15608:2000)*

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

4.1 General

4.1.1 Materials to be used for pressure-bearing parts shall meet the general requirements of 4.1 and the special provisions of 4.2, if applicable. Materials for pressure bearing parts shall be ordered complying with the technical delivery conditions in 4.3.

Marking of materials for pressure-bearing parts shall be performed in accordance with 4.4.

Materials shall be selected to be compatible with anticipated fabrication steps and to be suitable for the internal fluid and external environment. Both normal operating conditions and transient conditions occurring during fabrication transport, testing and operation shall be taken into account when specifying the materials.

NOTE 1 The requirements of 4.1 and 4.2 should also be fulfilled when technical delivery conditions are developed for European material standards, European approval of materials or particular material appraisals.

NOTE 2 When technical delivery conditions for pressure-bearing parts are developed, the structure and requirements of EN 764-4:2002 should be met. Exceptions should be technically justified.

The materials shall be grouped in accordance with CEN ISO/CR 15608:2000 to relate manufacturing and inspection requirements to generic material types.

NOTE 3 Materials have been allocated into these groups in accordance with their chemical composition and properties in view of manufacture and heat treatment after welding.

4.1.2 Materials for pressure-bearing parts compliant with the requirements of this European Standard shall be accompanied by inspection documents in accordance with EN 10204:2004. Certificate of specific control (3.1 or 3.2 certificate) shall be required for all steels if Design by Analysis – Direct Route according to Annex B of EN 13445-3:2014 is used.

NOTE The type of inspection document should be in accordance with EN 764-5:2002 and include a declaration of compliance to the material specification.

4.1.3 The materials shall be free from surface and internal defects which can impair their intended usability.

4.1.4 Steels shall have a specified minimum elongation after fracture measured on a gauge length

$$L_0 = 5,65 \sqrt{S_0} \quad (4.1-1)$$

where

S_0 is the original cross sectional area within the gauge length.

The minimum elongation after fracture in any direction shall be ≥ 14 %;

However, lower elongation values may also be applied (e.g. for fasteners or castings), provided that appropriate measures are taken to compensate for these lower values and the specific requirements are verifiable.

NOTE Examples for compensation:

- application of higher safety factors in design;
- performance of burst tests to demonstrate ductile material behaviour.

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 CEN ISO/CR 15608:2000)

Group	Sub-group	Type of steel
1		Steels with a specified minimum yield strength $R_{eH} \leq 460$ MPa ^a and with analysis in %: C $\leq 0,25$ Si $\leq 0,60$ Mn $\leq 1,70$ Mo $\leq 0,70^b$ S $\leq 0,045$ P $\leq 0,045$ Cu $\leq 0,40^b$ Ni $\leq 0,5^b$ Cr $\leq 0,3$ (0,4 for castings) ^b Nb $\leq 0,05$ V $\leq 0,12^b$ Ti $\leq 0,05$
	1.1	Steels with a specified minimum yield strength $R_{eH} \leq 275$ MPa
	1.2	Steels with a specified minimum yield strength 275 MPa $< R_{eH} \leq 360$ MPa
	1.3	Normalised fine grain steels with a specified minimum yield strength $R_{eH} > 360$ MPa
	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 $R_{eH} > 360$ MPa
	2.1	Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength 360 MPa $< R_{eH} \leq 460$ MPa
	2.2	Thermomechanically treated fine grain steels and cast steels with a specified minimum yield strength $R_{eH} > 460$ MPa
3		Quenched and tempered steels and precipitation hardened steels except stainless steels with a specified minimum yield strength $R_{eH} > 360$ MPa
	3.1	Quenched and tempered steels with a specified minimum yield strength 360 MPa $< R_{eH} \leq 690$ MPa
	3.2	Quenched and tempered steels with a specified minimum yield strength $R_{eH} > 690$ MPa
	3.3	Precipitation hardened steels except stainless steels

NOTE Requirements for austenitic-ferritic steels are only given in B.2.3 (method 2).

Where test pieces of at least 5 mm wide can not be obtained the material need not be subject to impact testing.

Values of the design reference temperature T_R shall be calculated from the metal temperature T_M using the values of the temperature adjustment T_S given in Table B.2–12.

B.2.2.2 Ferritic steels

Tables B.2–2 to B.2–5 list ferritic steels taken from harmonised European material standards with specified impact properties below $-10\text{ }^\circ\text{C}$.

The tabulated value of T_R is based on the impact test temperature T_{KV} for $KV = 27\text{ J}$.

Table B.2–2 — General requirements for prevention of brittle fracture — Reference thicknesses for plates and strips

Plates and Strips								
No. as per Table E.2-1	European Standard	Grade	Material No.	Max. reference thickness e_B mm		Design reference temperature T_R $^\circ\text{C}$	Material group to CEN ISO/CR 15608:2000	Remarks
				AW	PWHT			
1	EN 10028-2:2009	P235GH	1.0345	35	200	- 20	1.1	
2		P265GH	1.0425	35	200			
3		P295GH	1.0481	35	110		1.2	
4		P355GH	1.0473	35	70			
29	EN 10028-3:2009	P275NH	1.0487	35	200	- 20	1.1	
30		P275NL1	1.0488	35	200	- 40		
31		P275NL2	1.1104	35	200	- 50		
32		P355N	1.0562	35	70	- 20	1.2	
33		P355NH	1.0565	35	70	- 20		
34		P355NL1	1.0566	35	70	- 40		
35		P355NL2	1.1106	35	70	- 50		
39	EN 10028-4:2009	11MnNi5-3	1.6212	35	80	- 60	9.1	
40		13MnNi6-3	1.6217	35	70	- 60		
41		15NiMn6	1.6228	35	70	- 80		
50	EN 10028-5:2009	P355M	1.8821	35	-	- 20	1.2	a)
51		P355ML1	1.8832	35	-	- 40		a)
52		P355ML2	1.8833	35	-	- 50		a)
53		P420M	1.8824	35	-	- 20	2.1	a)
54		P420ML1	1.8835	35	-	- 40		a)
55		P420ML2	1.8828	35	-	- 50		a)
59	EN 10028-6:2009	P355Q	1.8866	35	70	- 20	1.2	
60		P355QH	1.8867	35	70	- 20		
61		P355QL1	1.8868	35	70	- 40		
62		P355QL2	1.8869	35	70	- 60		

a) TMCP steels shall not be Post Weld Heat Treated

If the planned component thickness is greater than that given in Table B.2-2 alternative Charpy toughness requirements are provided in chapter B.2.3.1.

EN 13445-2:2014 (E)
Issue 2 (2015-07)

Table B.2-3 — General requirements for prevention of brittle fracture — Reference thicknesses for seamless and welded tubes

Seamless and welded tubes								
No. as per Table E.2-1	European Standard	Grade	Material No.	Max. reference thickness e_B mm		Design reference temperature T_R °C	Material group to CEN ISO/CR 15608:2000	Remarks
				AW	PWHT			
231	EN 10216-3:2013	P275NL1	1.0488	35	100	- 40	1.1	a)
232		P275NL2	1.1104	35	100	- 50		a)
233		P355N	1.0562	35	70	- 20	1.2	
234		P355NH	1.0565	35	70	- 20		
235		P355NL1	1.0566	35	70	- 40		
236		P355NL2	1.1106	35	70	- 50		
248	EN 10216-4:2013	P215NL	1.0451	10	10	- 40	1.1	a)
249		P255QL	1.0452	35	40	- 40		a)
250		P265NL	1.0453	25	25	- 40		a)
251		26CrMo4-2	1.7219	15	40	- 60	5.1	a)
252		11MnNi5-3	1.6212	35	40	- 60	9.1	a)
253		13MnNi6-3	1.6217	35	40	- 60	9.1	a)
306	EN 10217-3:2004	P275NL1	1.0488	35	40	- 40	1.1	a)
307		P275NL2	1.1104	35	40	- 50		a)
308		P355N	1.0562	35	40	- 20	1.2	a)
309		P355NH	1.0565	35	40	- 20		a)
310		P355NL1	1.0566	35	40	- 40		a)
311		P355NL2	1.1106	35	40	- 50		a)
316	EN 10217-4:2004	P215NL	1.0451	10	10	- 40	1.1	a)
317		P265NL	1.0453	16	16	- 40	1.1	a)
321	EN 10217-6:2004	P215NL	1.0451	10	10	- 40	1.1	a)
322		P265NL	1.0453	25	25	- 40	1.1	a)

a) Thickness limitation results from wall thickness limitation in the European material standards and in the European component standards respectively.

Table B.2-4 — General requirements for prevention of brittle fracture with reference thickness for bars

Bars								
No. as per Table E.2-1	European Standard	Grade	Material No.	Max. reference thickness e_B		Design reference temperature T_R (°C)	Material group to CEN ISO/CR 15608:2000	Remarks
				AW	PWHT			
147	EN 10273:2007	P275NH	1.0487	35	75	- 20	1.1	
148		P355NH	1.0565	35	55		1.2	
150		P355QH	1.8867	35	55		1.2	

Table B.2-5 — General requirements for prevention of brittle fracture with reference thickness for forgings

Forgings								
No. as per Table E.2-1	European Standard	Grade	Material No.	Max. ref.. thickness e_B		Design reference temperature T_R (°C)	Material group to CEN ISO/CR 15608:2000	Remarks
				AW	PWHT			
367	EN 10222-3:1998	13MnNi6-3	1.6217	35	70	- 60	9.1	
369		15NiMn6	1.6228	35	50	- 80	9.1	
378	EN 10222-4:1998	P285QH	1.0478	35	85	- 20	1.2	
380		P355QH	1.0571	35	60	- 20	1.2	
382		P420QH	1.8936	35	50	- 20	3.1	

B.2.2.3 Ni –alloyed steels (Ni > 1,5 %)

Table B.2-6 lists Ni alloyed steels up to and including 5 % Nickel taken from harmonised European material standards.

Table B.2-7 lists Ni alloyed steels with 9 % Nickel taken from harmonised European material standards.

The tabulated value of T_R is based on the impact test temperature T_{KV} for $KV = 27$ J.

EN 13445-2:2014 (E)
Issue 2 (2015-07)

Table B.2-6 — General requirements for prevention of brittle fracture with reference thickness for Ni-alloyed steels with 1,5 % < Ni ≤ 5 %

Ni-alloyed steel, 1,5 % < Ni ^a ≤ 5 %									
No. as per Table E.2-1	European Standard	Grade	Material No.	Max. reference thickness		Design reference temperature <i>T_R</i> (°C)	Material group to CEN ISO/CR 15608:2000	Remarks	
				AW	<i>e_B</i> PWHT				
plates and strips									
42	10028-4:2009	12Ni14	1.5637	35	80	- 100	9.2	b)	
43		X12Ni5	1.5680	35	80	- 120			
seamless tubes									
254	EN 10216-4:2013	12Ni14	1.5637	25	—	- 100	9.2	b)	
255		12Ni14		35	40	- 90		b)	
256		X12Ni5	1.5680	25	—	- 120			
257		X12Ni5		35	40	- 110			
forgings									
370	EN 10222-3:1998	12Ni14	1.5637	35	—	- 100	9.2	b)	
371		12Ni14		35	50				b)
372		12Ni14		35	70				b)
373		X12Ni5	1.5680	35	—	- 120			
374		X12Ni5		35	50				
a) Nickel content is nominal. b) If used at - 105 °C (e. g. ethylene application), then 27 J shall be guaranteed at this temperature. NOTE Thickness limitation result from wall thickness limitation in European material standards.									

Table B.2-7 — General requirements for prevention of brittle fracture with reference thickness for Ni-alloyed steels with 9 % Ni

9 % - Ni ^a alloys								
No. as per Table E.2-1	European Standard	Grade	Material No.	Max. reference thickness		Design reference temperature T_R (°C)	Material group to CEN ISO/CR 15608:2000	Remarks
				AW	ϵ_B PWHT			
plates and strips								
44	10028-4:2009	X8Ni9	1.5662	— ^{b)}		-196	9.3	
48		X7Ni9	1.5663					
seamless tubes								
258	EN 10216-4:2013	X10Ni9	1.5682	— ^{b)}		-196	9.3	
Forgings								
375	EN 10222-3:1998	X8Ni9	1.5662	— ^{b)}		-196	9.3	
<p>a) Nickel content is nominal.</p> <p>b) Materials can be used to maximum thickness permitted in harmonised European material standards.</p>								

B.2.2.4 Bolts and nuts

For other bolts and nuts than given in Table B.2-8 a specified impact energy of minimum 40 J is required at $T_{KV} = RT$ for $T_M = \geq -10$ °C (where RT means Room Temperature).

If T_M is lower than -10 °C, specified impact energy of minimum 40 J is required at $T_{KV} \leq T_M$.

Except bolting material made from austenitic stainless steels specified in Table B.2-9 and B.2-10, bolting material with a design temperature below -160 °C shall be impact tested at -196 °C.

Table B.2-8 — General requirements for prevention of brittle fracture with reference thickness for nuts and bolts for $T_M \geq -10$ °C

European Standard	Type of material ^{a)}	Thickness limitation	Impact test KV for $T_M \geq -10$ °C	Test temperature / value
EN 10269:1999	All steels	According to EN 10269:1999	According to EN 10269:1999, Table 4	According to EN 10269:1999, Table 4
EN ISO 898-1:2013	5.6	$M \leq 39$	$M \geq 16$	RT ^{b)} / 40 J
	8.8	$M \leq 39$	$M \geq 16$	RT ^{b)} / 52 J
EN ISO 898-2:2012	5	$M \leq 39$	None	—
	8	$M \leq 39$	None	—
<p>a) Starting material shall comply with EN 10269:1999.</p> <p>b) According to EN ISO 148-1:2010, the room temperature, RT, is equal to 23 °C ± 5 °C</p>				

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 2 and in Bibliography.

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

1 No	2 Product form	3 European Standard	4 Material description	5 Grade	6 Material number	7 Heat treatment ⁹	8 Thickness mm		9 Material group to CEN ISO/CR 15608: 2000	10 Notes
							min.	max.		
							1	plate and strip		
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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	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	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
39	plate and strip	EN 10028-4	low temperature properties	11MnNi5-3	1.6212	N,NT	0	80	9.1	
40	plate and strip	EN 10028-4	low temperature properties	13MnNi6-3	1.6217	N,NT	0	80	9.1	
41	plate and strip	EN 10028-4	low temperature properties	15NiMn6	1.6228	N,NT,QT	0	80	9.1	
42	plate and strip	EN 10028-4	low temperature properties	12Ni14	1.5637	N,NT,QT	0	80	9.2	
43	plate and strip	EN 10028-4	low temperature properties	X12Ni5	1.5680	N,NT,QT	0	50	9.2	
44	plate and strip	EN 10028-4	low temperature properties	X8Ni9+NT640	1.5662	N+NT	0	50	9.3	
45	plate and strip	EN 10028-4	low temperature properties	X8Ni9+QT640	1.5662	QT	0	50	9.3	
46	plate and strip	EN 10028-4	low temperature properties	X8Ni9+QT680	1.5662	N+NT, QT	0	15	9.3	
47	plate and strip	EN 10028-4	low temperature properties	X8Ni9+QT680	1.5662	QT	15	50	9.3	
48	plate and strip	EN 10028-4	low temperature properties	X7Ni9	1.5663	N+NT, QT	0	15	9.3	
49	plate and strip	EN 10028-4	low temperature properties	X7Ni9	1.5663	QT	15	50	9.3	
50	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P355M	1.8821	M	0	63	1.2	f
51	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P355ML1	1.8832	M	0	63	1.2	f
52	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P355ML2	1.8833	M	0	63	1.2	f
53	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P420M	1.8824	M	0	63	2.1	f
54	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P420ML1	1.8835	M	0	63	2.1	f
55	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P420ML2	1.8828	M	0	63	2.1	f

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608:2000	Notes
56	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P460M	1.8826	M	0	63	2.1	f
57	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P460ML1	1.8837	M	0	63	2.1	f
58	plate and strip	EN 10028-5	fine grain steel, thermomechanically rolled	P460ML2	1.8831	M	0	63	2.1	f
59	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P355Q	1.8866	QT	0	150	1.2	
60	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P355QH	1.8867	QT	0	150	1.2	
61	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P355QL1	1.8868	QT	0	150	1.2	
62	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P355QL2	1.8869	QT	0	150	1.2	
63	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P460Q	1.8870	QT	0	150	3.1	
64	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P460QH	1.8871	QT	0	150	3.1	
65	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P460QL1	1.8872	QT	0	150	3.1	
66	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P460QL2	1.8864	QT	0	150	3.1	
67	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P500Q	1.8873	QT	0	150	3.1	
68	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P500QH	1.8874	QT	0	150	3.1	
69	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P500QL1	1.8875	QT	0	150	3.1	
70	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P500QL2	1.8865	QT	0	150	3.1	
71	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P690Q	1.8879	QT	0	150	3.1	
72	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P690QH	1.8880	QT	0	150	3.1	
73	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P690QL1	1.8881	QT	0	150	3.1	
74	plate and strip	EN 10028-6	fine grain steel, quenched/tempered	P690QL2	1.8888	QT	0	150	3.1	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
75	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNi18-7	1.4318	AT	0	75	8.1	
76	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNi18-9	1.4307	AT	0	75	8.1	
77	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNi19-11	1.4306	AT	0	75	8.1	
78	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNi18-10	1.4311	AT	0	75	8.1	
79	plate and strip	EN 10028-7	stainless steel, austenitic	X5CrNi18-10	1.4301	AT	0	75	8.1	
80	plate and strip	EN 10028-7	stainless steel, austenitic	X5CrNi19-9	1.4315	AT	0	75	8.1	
81	plate and strip	EN 10028-7	stainless steel, austenitic	X6CrNi18-10	1.4948	AT	0	75	8.1	
82	plate and strip	EN 10028-7	stainless steel, austenitic	X6CrNi23-13	1.4950	AT	0	75	8.2	
83	plate and strip	EN 10028-7	stainless steel, austenitic	X6CrNi25-20	1.4951	AT	0	75	8.2	
84	plate and strip	EN 10028-7	stainless steel, austenitic	X6CrNiTi18-10	1.4541	AT	0	75	8.1	
85	plate and strip	EN 10028-7	stainless steel, austenitic	X6CrNiTiB18-10	1.4941	AT	0	75	8.1	
86	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNiMo17-12-2	1.4404	AT	0	75	8.1	
87	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNiMoN17-12-2	1.4406	AT	0	75	8.1	
88	plate and strip	EN 10028-7	stainless steel, austenitic	X5CrNiMo17-12-2	1.4401	AT	0	75	8.1	
89	plate and strip	EN 10028-7	stainless steel, austenitic	X6CrNiMoTi17-12-2	1.4571	AT	0	75	8.1	
90	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNiMo17-12-3	1.4432	AT	0	75	8.1	
91	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNiMo18-14-3	1.4435	AT	0	75	8.1	
92	plate and strip	EN 10028-7	stainless steel, austenitic	X2CrNiMoN17-13-5	1.4439	AT	0	75	8.1	
93	plate and strip	EN 10028-7	stainless steel, austenitic	X1NiCrMoCu25-20-5	1.4539	AT	0	75	8.2	
94	plate and strip	EN 10028-7	stainless steel, austenitic	X5NiCrAlTi31-20	1.4958	AT	0	75	8.2	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
95	plate and strip	EN 10028-7	stainless steel, austenitic	X5NiCrAlTi31-20+RA	1.4958+RA	AT+RA	0	75	8.2	
96	plate and strip	EN 10028-7	stainless steel, austenitic	X8NiCrAlTi32-21	1.4959	AT	0	75	8.2	
97	plate and strip	EN 10028-7	stainless steel, austenitic	X3CrNiMoBN17-13-3	1.4910	AT	0	75	8.2	
98	plate and strip	EN 10028-7	stainless steel, austenitic, special	X1CrNi25-21	1.4335	AT	0	75	8.2	
99	plate and strip	EN 10028-7	stainless steel, austenitic, special	X6CrNiNb18-10	1.4550	AT	0	75	8.1	
100	plate and strip	EN 10028-7	stainless steel, austenitic, special	X8CrNiNb16-13	1.4961	AT	0	75	8.1	
101	plate and strip	EN 10028-7	stainless steel, austenitic, special	X1CrNiMoN25-22-2	1.4466	AT	0	75	8.2	
102	plate and strip	EN 10028-7	stainless steel, austenitic, special	X6CrNiMoNb17-12-2	1.4580	AT	0	75	8.1	
103	plate and strip	EN 10028-7	stainless steel, austenitic, special	X2CrNiMoN17-13-3	1.4429	AT	0	75	8.1	
104	plate and strip	EN 10028-7	stainless steel, austenitic, special	X3CrNiMoN17-13-3	1.4436	AT	0	75	8.1	
105	plate and strip	EN 10028-7	stainless steel, austenitic, special	X2CrNiMoN18-12-4	1.4434	AT	0	75	8.1	
106	plate and strip	EN 10028-7	stainless steel, austenitic, special	X2CrNiMo18-15-4	1.4438	AT	0	75	8.1	
107	plate and strip	EN 10028-7	stainless steel, austenitic, special	X1NiCrMoCu31-27-4	1.4563	AT	0	75	8.2	
108	plate and strip	EN 10028-7	stainless steel, austenitic, special	X1CrNiMoCuN25-25-5	1.4537	AT	0	75	8.2	
109	plate and strip	EN 10028-7	stainless steel, austenitic, special	X1CrNiMoCuN20-18-7	1.4547	AT	0	75	8.2	
110	plate and strip	EN 10028-7	stainless steel, austenitic, special	X1NiCrMoCuN25-20-7	1.4529	AT	0	75	8.2	
111	plate and strip	EN 10028-7	stainless steel, austenitic-ferritic	X2CrNiN23-4	1.4362	AT	0	75	10.1	c
112	plate and strip	EN 10028-7	stainless steel, austenitic-ferritic	X2CrNiMoN22-5-3	1.4462	AT	0	75	10.1	c
113	plate and strip	EN 10028-7	stain, steel, austenitic-ferritic, special	X2CrNiMoCuN25-6-3	1.4507	AT	0	75	10.2	c
114	plate and strip	EN 10028-7	stain, steel, austenitic-ferritic, special	X2CrNiMoN25-7-4	1.4410	AT	0	75	10.2	c
115	plate and strip	EN 10028-7	stain, steel, austenitic-ferritic, special	X2CrNiMoCuWN25-7-4	1.4501	AT	0	75	10.2	c

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
116	bar	EN 10272	stainless steel, martensitic	X4CrNiMo16-5-1	1.4418	QT760	0	160	7.2	e
117	bar	EN 10272	stainless steel, austenitic	X2CrNi18-9	1.4307	AT	0	250	8.1	
118	bar	EN 10272	stainless steel, austenitic	X2CrNi19-11	1.4306	AT	0	250	8.1	
119	bar	EN 10272	stainless steel, austenitic	X2CrNiN18-10	1.4311	AT	0	250	8.1	
120	bar	EN 10272	stainless steel, austenitic	X5CrNi18-10	1.4301	AT	0	250	8.1	
121	bar	EN 10272	stainless steel, austenitic	X6CrNiTi18-10	1.4541	AT	0	250	8.1	
122	bar	EN 10272	stainless steel, austenitic	X2CrNiMo17-12-2	1.4404	AT	0	250	8.1	
123	bar	EN 10272	stainless steel, austenitic	X2CrNiMoN17-11-2	1.4406	AT	0	250	8.1	
124	bar	EN 10272	stainless steel, austenitic	X5CrNiMo17-12-2	1.4401	AT	0	250	8.1	
125	bar	EN 10272	stainless steel, austenitic	X6CrNiMoTi17-12-2	1.4571	AT	0	250	8.1	
126	bar	EN 10272	stainless steel, austenitic	X2CrNiMo17-12-3	1.4432	AT	0	250	8.1	
127	bar	EN 10272	stainless steel, austenitic	X2CrNiMo18-14-3	1.4435	AT	0	250	8.1	
128	bar	EN 10272	stainless steel, austenitic	X2CrNiMo17-13-5	1.4439	AT	0	250	8.1	
129	bar	EN 10272	stainless steel, austenitic	X1NiCrMoCu25-20-5	1.4539	AT	0	250	8.2	
130	bar	EN 10272	stainless steel, austenitic	X6CrNiNb18-10	1.4550	AT	0	250	8.1	
131	bar	EN 10272	stainless steel, austenitic	X6CrNiMoNb17-12-2	1.4580	AT	0	250	8.1	
132	bar	EN 10272	stainless steel, austenitic	X2CrNiMoN17-13-3	1.4429	AT	0	250	8.1	
133	bar	EN 10272	stainless steel, austenitic	X3CrNiMo17-13-3	1.4436	AT	0	250	8.1	
134	bar	EN 10272	stainless steel, austenitic	X1NiCrMoCu31-27-4	1.4563	AT	0	250	8.2	
135	bar	EN 10272	stainless steel, austenitic	X1CrNiMoCuN20-18-7	1.4547	AT	0	250	8.2	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
136	bar	EN 10272	stainless steel, austenitic	X1NiCrMoCuN25-20-7	1.4529	AT	0	250	8.2	
137	bar	EN 10272	stainless steel, austenitic-ferritic	X2CrNiMoN22-5-3	1.4462	AT	0	160	10.1	c
138	bar	EN 10272	stainless steel, austenitic-ferritic	X2CrNiN23-4	1.4362	AT	0	160	10.1	c
139	bar	EN 10272	stainless steel, austenitic-ferritic	X2CrNiMoCuN25-6-3	1.4507	AT	0	160	10.2	c
140	bar	EN 10272	stainless steel, austenitic-ferritic	X2CrNiMoN25-7-4	1.4410	AT	0	160	10.2	c
141	bar	EN 10272	stainless steel, austenitic-ferritic	X2CrNiMoCuWN25-7-4	1.4501	AT	0	160	10.2	c
142	bar	EN 10273	elevated temperature properties	P235GH	1.0345	N	0	150	1.1	
143	bar	EN 10273	elevated temperature properties	P250GH	1.0460	N	0	150	1.1	
144	bar	EN 10273	elevated temperature properties	P265GH	1.0425	N	0	150	1.1	
145	bar	EN 10273	elevated temperature properties	P295GH	1.0481	N	0	150	1.2	
146	bar	EN 10273	elevated temperature properties	P355GH	1.0473	N	0	150	1.2	
147	bar	EN 10273	elevated temperature properties	P275NH	1.0487	N	0	150	1.1	
148	bar	EN 10273	elevated temperature properties	P355NH	1.0565	N	0	150	1.2	
149	bar	EN 10273	elevated temperature properties	P460NH	1.8935	N	0	150	1.3	
150	bar	EN 10273	elevated temperature properties	P355QH	1.8867	QT	0	150	1.2	
151	bar	EN 10273	elevated temperature properties	P460QH	1.8871	QT	0	150	3.1	
152	bar	EN 10273	elevated temperature properties	P500QH	1.8874	QT	0	150	3.1	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
153	bar	EN 10273	elevated temperature properties	P690QH	1.8880	QT	0	150	3.1	
154	bar	EN 10273	elevated temperature properties	16Mo3	1.5415	N	0	150	1.2	e
155	Bar	EN 10273	elevated temperature properties	13CrMo4-5	1.7335	NT	0	16	5.1	
156	bar	EN 10273	elevated temperature properties	13CrMo4-5	1.7335	NT, QA, QL	16	150	5.1	
157	bar	EN 10273	elevated temperature properties	10CrMo9-10	1.7380	NT	0	60	5.2	
158	bar	EN 10273	elevated temperature properties	10CrMo9-10	1.7380	NT, QA, QL	60	150	5.2	
159	bar	EN 10273	elevated temperature properties	11CrMo9-10	1.7383	NT, QA, QL	0	60	5.2	
160	bar	EN 10273	elevated temperature properties	11CrMo9-10	1.7383	QL	60	100	5.2	
161	fastener	EN 10269	elevated temperature properties	C35E	1.1181	N	0	60	—	d
162	fastener	EN 10269	elevated temperature properties	C35E	1.1181	QT	0	150	—	d
163	fastener	EN 10269	elevated temperature properties	C45E	1.1191	N	0	60	—	d
164	fastener	EN 10269	elevated temperature properties	C45E	1.1191	QT	0	150	—	d
165	fastener	EN 10269	elevated temperature properties	35B2	1.5511	QT	0	150	—	d
166	fastener	EN 10269	elevated and low temperature properties	20Mn5	1.1133	N	0	150	—	d
167	fastener	EN 10269	elevated and low temperature properties	25CrMo4	1.7218	QT	0	150	—	d
168	fastener	EN 10269	elevated and low temperature properties	42CrMo4	1.7225	QT	0	60	—	d
169	fastener	EN 10269	elevated temperature properties	42CrMo5-6	1.7233	QT	0	150	—	d
170	fastener	EN 10269	elevated temperature properties	40CrMoV4-6	1.7711	QT	0	160	—	d
171	fastener	EN 10269	elevated temperature properties	21CrMoV5-7	1.7709	QT	0	160	—	d
172	fastener	EN 10269	elevated temperature properties	20CrMoVTiB4-10	1.7729	QT	0	160	—	d

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
173	fastener	EN 10269	elevated temperature properties	X15CrMo5-1	1.7390	NT, QT	0	160	—	d
174	fastener	EN 10269	elevated temperature properties	X22CrMoV12-1	1.4923	QT1, QT2	0	160	—	d
175	fastener	EN 10269	elevated temperature properties	X12CrNiMoV12-3	1.4938	QT	0	160	—	d
176	fastener	EN 10269	elevated temperature properties	X19CrMoNbVN11-1	1.4913	QT	0	160	—	d
177	fastener	EN 10269	elevated temperature properties	X2CrNi18-9	1.4307	AT	0	160	—	d
178	fastener	EN 10269	elevated and low temperature properties	X2CrNi18-9	1.4307	C700, C800	0	25	—	d
179	fastener	EN 10269	elevated and low temperature properties	X2CrNi18-9	1.4307	C700	25	35	—	d
180	fastener	EN 10269	elevated and low temperature properties	X5CrNi18-10	1.4301	AT	0	160	—	d
181	fastener	EN 10269	elevated and low temperature properties	X5CrNi18-10	1.4301	C700	0	35	—	d
182	fastener	EN 10269	elevated and low temperature properties	X4CrNi18-12	1.4303	AT	0	160	—	d
183	fastener	EN 10269	elevated and low temperature properties	X4CrNi18-12	1.4303	C700, C800	0	25	—	d
184	fastener	EN 10269	elevated and low temperature properties	X4CrNi18-12	1.4303	C700	25	35	—	d
185	fastener	EN 10269	elevated temperature properties	X2CrNiMo17-12-2	1.4404	AT	0	160	—	d
186	fastener	EN 10269	elevated and low temperature properties	X2CrNiMo17-12-2	1.4404	C700, C800	0	25	—	d
187	fastener	EN 10269	elevated and low temperature properties	X2CrNiMo17-12-2	1.4404	C 700	25	35	—	d
188	fastener	EN 10269	elevated temperature properties	X5CrNiMo17-12-2	1.4401	AT	0	160	—	d
189	fastener	EN 10269	elevated and low temperature properties	X5CrNiMo17-12-2	1.4401	C700, C800	0	25	—	d

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
190	fastener	EN 10269	elevated and low temperature properties	X5CrNiMo17-12-2	1.4401	C700	25	35	—	d
191	fastener	EN 10269	elevated and low temperature properties	X2CrNiMoN17-13-3	1.4429	AT	0	160	—	d
192	fastener	EN 10269	room temperature properties	X3CrNiCu18-9-4	1.4567	AT	0	160	—	d
193	fastener	EN 10269	room temperature properties	X3CrNiCu18-9-4	1.4567	C700	0	35	—	d
194	fastener	EN 10269	elevated and low temperature properties	X6CrNi18-10	1.4948	AT	0	160	—	d
195	fastener	EN 10269	elevated temperature properties	X10CrNiMoMnNbVB15-10-1	1.4982	AT + WW	0	100	—	d
196	fastener	EN 10269	elevated and low temperature properties	3CrNiMoBN17-13-3	1.4910	AT	0	160	—	d
197	fastener	EN 10269	elevated and low temperature properties	X6CrNiMoB17-12-2	1.4919	AT	0	160	—	d
198	fastener	EN 10269	elevated and low temperature properties	X6CrNiTiB18-10	1.4941	AT	0	160	—	d
199	fastener	EN 10269	elevated and low temperature properties	X6NiCrTiMoVB25-15-2	1.4980	AT + P	0	160	—	d
200	fastener	EN 10269	elevated temperature properties	X7CrNiMoBNb16-16	1.4986	WW + P	0	100	—	d
201	fastener	EN 10269	low temperature properties	19MnB4	1.5523	QT	0	16	—	d
202	fastener	EN 10269	low temperature properties	41NiCrMo7-3-2	1.6563	QT	0	160	—	d
203	fastener	EN 10269	low temperature properties	34CrNiMo6	1.6582	QT	0	100	—	d
204	fastener	EN 10269	low temperature properties	30CrNiMo8	1.6580	QT	0	100	—	d
205	fastener	EN 10269	low temperature properties	X12Ni5	1.5680	N, NT, QT	0	75	—	d
206	fastener	EN 10269	low temperature properties	X8Ni9	1.5662	N, NT, QT	0	75	—	d

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 CEN ISO/CR 15608: 2000	Notes
207	seamless tube	EN 10216-1	room temperature properties	P195TR2	1.0108	N	0	60	1.1	
208	seamless tube	EN 10216-1	room temperature properties	P235TR2	1.0255	N	0	60	1.1	
209	seamless tube	EN 10216-1	room temperature properties	P265TR2	1.0259	N	0	60	1.1	
210	seamless tube	EN 10216-2	elevated temperature properties	P195GH	1.0348	N	0	16	1.1	
211	seamless tube	EN 10216-2	elevated temperature properties	P235GH	1.0345	N	0	60	1.1	
212	seamless tube	EN 10216-2	elevated temperature properties	P265GH	1.0425	N	0	60	1.1	
213	seamless tube	EN 10216-2	elevated temperature properties	20MnNb6	1.0471	N	0	60	1.2	
214	seamless tube	EN 10216-2	elevated temperature properties	16Mo3	1.5415	N	0	60	1.2	e
215	seamless tube	EN 10216-2	elevated temperature properties	8MoB5-4	1.5450	N	0	16	1.3	
216	seamless tube	EN 10216-2	elevated temperature properties	14MoV6-3	1.7715	NT, QT ^b	0	60	6.1	
217	seamless tube	EN 10216-2	elevated temperature properties	10CrMo5-5	1.7338	NT, QT ^b	0	60	5.1	
218	seamless tube	EN 10216-2	elevated temperature properties	13CrMo4-5	1.7335	NT, QT ^b	0	60	5.1	
219	seamless tube	EN 10216-2	elevated temperature properties	10CrMo9-10	1.7380	NT, QT ^b	0	60	5.2	
220	seamless tube	EN 10216-2	elevated temperature properties	11CrMo9-10	1.7383	QT	0	60	5.2	
221	seamless tube	EN 10216-2	elevated temperature properties	25CrMo4	1.7218	QT	0	60	5.1	a
222	seamless tube	EN 10216-2	elevated temperature properties	20CrMoV13-5-5	1.7779	QT	0	60	6.3	
223	seamless tube	EN 10216-2	elevated temperature properties	15NiCuMoNb5-6-4	1.6368	NT, QT ^b	0	80	3.1	
223-2	seamless tube	EN 10216-2	elevated temperature properties	7CrWVMoNb9-6	1.8201	NT	0	60	6.2	
223-2	seamless tube	EN 10216-2	elevated temperature properties	7CrMoVTiB10-10	1.7378	NT	0	60	6.2	
224	seamless tube	EN 10216-2	elevated temperature properties	X11CrMo5 + I ^g	1.7362 + I	I	0	100	5.3	

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 CEN ISO/CR 15608: 2000	Notes
225	seamless tube	EN 10216-2	elevated temperature properties	X11CrMo5 + NT1 ^g	1.7362 + N1	NT	0	100	5.3	
226	seamless tube	EN 10216-2	elevated temperature properties	X11CrMo5 + NT2 ^g	1.7362 + N2	NT, QT ^b	0	100	5.3	
227	seamless tube	EN 10216-2	elevated temperature properties	X11CrMo9-1 + I ^g	1.7386 + I	I	0	60	5.4	
228	seamless tube	EN 10216-2	elevated temperature properties	X11CrMo9-1 + NT ^g	1.7386 + NT	NT, QT ^b	0	60	5.4	
229	seamless tube	EN 10216-2	elevated temperature properties	X10CrMoVNb9-1	1.4903	NT, QT ^b	0	100	6.4	
229-2	seamless tube	EN 10216-2	elevated temperature properties	X10CrWMoVNb9-2	1.4901	NT	0	100	6.4	
229-2	seamless tube	EN 10216-2	elevated temperature properties	X11CrMoWVNb9-1-1	1.4905	NT	0	100	6.4	
230	seamless tube	EN 10216-2	elevated temperature properties	X20CrMoV11-1	1.4922	NT, QT ^b	0	100	6.4	
231	seamless tube	EN 10216-3	fine grain steel	P275NL1	1.0488	N	0	100	1.1	
232	seamless tube	EN 10216-3	fine grain steel	P275NL2	1.1104	N	0	100	1.1	
233	seamless tube	EN 10216-3	fine grain steel	P355N	1.0562	N	0	100	1.2	
234	seamless tube	EN 10216-3	fine grain steel	P355NH	1.0565	N	0	100	1.2	
235	seamless tube	EN 10216-3	fine grain steel	P355NL1	1.0566	N	0	100	1.2	
236	seamless tube	EN 10216-3	fine grain steel	P355NL2	1.1106	N	0	100	1.2	
237	seamless tube	EN 10216-3	fine grain steel	P460N	1.8905	N ^b	0	100	1.3	
238	seamless tube	EN 10216-3	fine grain steel	P460NH	1.8935	N ^b	0	100	1.3	
239	seamless tube	EN 10216-3	fine grain steel	P460NL1	1.8915	N ^b	0	100	1.3	
240	seamless tube	EN 10216-3	fine grain steel	P460NL2	1.8918	N ^b	0	100	1.1	
241	seamless tube	EN 10216-3	fine grain steel	P620Q	1.8876	Q	0	65	3.1	
242	seamless tube	EN 10216-3	fine grain steel	P620QH	1.8877	Q	0	65	3.1	
243	seamless tube	EN 10216-3	fine grain steel	P620QL	1.8890	Q	0	65	3.1	
244	seamless tube	EN 10216-3	fine grain steel	P690Q	1.8879	Q	0	100	3.1	
245	seamless tube	EN 10216-3	fine grain steel	P690QH	1.8880	Q	0	100	3.1	

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 CEN ISO/CR 15608: 2000	Notes
246	seamless tube	EN 10216-3	fine grain steel	P690QL1	1.8881	Q	0	100	3.1	
247	seamless tube	EN 10216-3	fine grain steel	P690QL2	1.8888	Q	0	100	3.1	
248	seamless tube	EN 10216-4	low temperature properties	P215NL	1.0451	N	0	10	1.1	
249	seamless tube	EN 10216-4	low temperature properties	P255QL	1.0452	QT	0	40	1.1	e
250	seamless tube	EN 10216-4	low temperature properties	P265NL	1.0453	N	0	25	1.1	
251	seamless tube	EN 10216-4	low temperature properties	26CrMo4-2	1.7219	QT	0	40	5.1	a
252	seamless tube	EN 10216-4	low temperature properties	11MnNi5-3	1.6212	N, NT ^b	0	40	9.1	
253	seamless tube	EN 10216-4	low temperature properties	13MnNi6-3	1.6217	N, NT ^b	0	40	9.1	
254	seamless tube	EN 10216-4	low temperature properties	12Ni14	1.5637	NT	0	40	9.2	
255	seamless tube	EN 10216-4	low temperature properties	12Ni14 + QT	1.5637	QT	0	40	9.2	
256	seamless tube	EN 10216-4	low temperature properties	X12Ni5	1.5680	N	0	40	9.2	
257	seamless tube	EN 10216-4	low temperature properties	X12Ni5 + QT	1.5680	QT	0	40	9.2	
258	seamless tube	EN 10216-4	low temperature properties	X10Ni9	1.5682	N, NT	0	40	9.3	
259	seamless tube	EN 10216-4	low temperature properties	X10Ni9 + QT	1.5682	QT ^b	0	40	9.3	
260	seamless tube	EN 10216-5	stainless steel, austenitic	X2CrNi18-9	1.4307	AT	0	60	8.1	
261	seamless tube	EN 10216-5	stainless steel, austenitic	X2CrNi19-11	1.4306	AT	0	60	8.1	
262	seamless tube	EN 10216-5	stainless steel, austenitic	X2CrNi18-10	1.4311	AT	0	60	8.1	
263	seamless tube	EN 10216-5	stainless steel, austenitic	X5CrNi18-10	1.4301	AT	0	60	8.1	
264	seamless tube	EN 10216-5	stainless steel, austenitic	X6CrNiTi18-10	1.4541	AT	0	60	8.1	
265	seamless tube	EN 10216-5	stainless steel, austenitic	X6CrNiNb18-10	1.4550	AT	0	60	8.1	
266	seamless tube	EN 10216-5	stainless steel, austenitic	X2CrNiMo18-14-3	1.4435	AT	0	60	8.1	
267	seamless tube	EN 10216-5	stainless steel, austenitic	X2CrNiMo17-12-2	1.4404	AT	0	60	8.1	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
268	seamless tube	EN 10216-5	stainless steel, austenitic	X5CrNiMo17-12-2	1.4401	AT	0	60	8.1	
269	seamless tube	EN 10216-5	stainless steel, austenitic	X1CrNiMoN25-22-2	1.4466	AT	0	60	8.2	
270	seamless tube	EN 10216-5	stainless steel, austenitic	X6CrNiMoTi17-12-2	1.4571	AT	0	60	8.1	
271	seamless tube	EN 10216-5	stainless steel, austenitic	X6CrNiMoNb17-12-2	1.4580	AT	0	60	8.1	
272	seamless tube	EN 10216-5	stainless steel, austenitic	X2CrNiMoN17-13-3	1.4429	AT	0	60	8.1	
273	seamless tube	EN 10216-5	stainless steel, austenitic	X3CrNiMo17-13-3	1.4436	AT	0	60	8.1	
274	seamless tube	EN 10216-5	stainless steel, austenitic	X1CrNi25-21	1.4335	AT	0	60	8.2	
275	seamless tube	EN 10216-5	stainless steel, austenitic	X2CrNiMoN17-13-5	1.4439	AT	0	60	8.1	
276	seamless tube	EN 10216-5	stainless steel, austenitic	X1NiCrMoCu31-27-4	1.4563	AT	0	60	8.2	
277	seamless tube	EN 10216-5	stainless steel, austenitic	X1NiCrMoCu25-20-5	1.4539	AT	0	60	8.2	
278	seamless tube	EN 10216-5	stainless steel, austenitic	X1CrNiMoCuN20-18-7	1.4547	AT	0	60	8.2	
279	seamless tube	EN 10216-5	stainless steel, austenitic	X1NiCrMoCuN25-20-7	1.4529	AT	0	60	8.2	
280	seamless tube	EN 10216-5	stainless steel, austenitic	X2NiCrAlTi32-20	1.4558	AT	0	60	8.2	
281	seamless tube	EN 10216-5	stainless steel, austenitic	X6CrNi18-10	1.4948	AT	0	50	8.1	
282	seamless tube	EN 10216-5	stainless steel, austenitic	X7CrNiTi18-10	1.4940	AT	0	50	8.1	
283	seamless tube	EN 10216-5	stainless steel, austenitic	X7CrNiNb18-10	1.4912	AT	0	50	8.1	
284	seamless tube	EN 10216-5	stainless steel, austenitic	X7CrNiTiB18-10	1.4941	AT	0	50	8.1	
285	seamless tube	EN 10216-5	stainless steel, austenitic	X6CrNiMo17-13-2	1.4918	AT	0	50	8.1	
286	seamless tube	EN 10216-5	stainless steel, austenitic	X5NiCrAlTi31-20	1.4958	AT	0	50	8.2	
287	seamless tube	EN 10216-5	stainless steel, austenitic	X8NiCrAlTi32-21	1.4959	AT	0	50	8.2	
288	seamless tube	EN 10216-5	stainless steel, austenitic	X3CrNiMoNB17-13-3	1.4910	AT	0	50	8.1	
289	seamless tube	EN 10216-5	stainless steel, austenitic	X8CrNiNb16-13	1.4961	AT	0	50	8.1	
290	seamless tube	EN 10216-5	stainless steel, austenitic	X8CrNiMoVNb16-13	1.4988	AT	0	50	8.1	
291	seamless tube	EN 10216-5	stainless steel, austenitic	X8CrNiMoNb16-16	1.4981	AT	0	50	8.1	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
292	seamless tube	EN 10216-5	stainless steel, austenitic	X10CrNiMoMnNbVB15-10-1	1.4982	AT	0	50	8.1	
293	seamless tube	EN 10216-5	stainless steel, austenitic-ferritic	X2CrNiMoN22-5-3	1.4462	AT	0	30	10.1	c
294	seamless tube	EN 10216-5	stainless steel, austenitic-ferritic	X2CrNiMoSi18-5-3	1.4424	AT	0	30	10.1	c
295	seamless tube	EN 10216-5	stainless steel, austenitic-ferritic	X2CrNiN23-4	1.4362	AT	0	30	10.1	c
296	seamless tube	EN 10216-5	stainless steel, austenitic-ferritic	X2CrNiMoN25-7-4	1.4410	AT	0	30	10.2	c
297	seamless tube	EN 10216-5	stainless steel, austenitic-ferritic	X2CrNiMoCuN25-6-3	1.4507	AT	0	30	10.2	c
298	seamless tube	EN 10216-5	stainless steel, austenitic-ferritic	X2CrNiMoCuWN25-7-4	1.4501	AT	0	30	10.2	c
299	welded tube	EN 10217-1	room temperature properties	P195TR2	1.0108	N	0	40	1.1	
300	welded tube	EN 10217-1	room temperature properties	P235TR2	1.0255	N	0	40	1.1	
301	welded tube	EN 10217-1	room temperature properties	P265TR2	1.0259	N	0	40	1.1	
302	welded tube	EN 10217-2	elevated temperature properties	P195GH	1.0348	N	0	16	1.1	
303	welded tube	EN 10217-2	elevated temperature properties	P235GH	1.0345	N	0	16	1.1	
304	welded tube	EN 10217-2	elevated temperature properties	P265GH	1.0425	N	0	16	1.1	
305	welded tube	EN 10217-2	elevated temperature properties	16Mo3	1.5415	N	0	16	1.2	e
306	welded tube	EN 10217-3	fine grain steel	P275NL1	1.0488	N	0	40	1.1	
307	welded tube	EN 10217-3	fine grain steel	P275NL2	1.1104	N	0	40	1.1	
308	welded tube	EN 10217-3	fine grain steel	P355N	1.0562	N	0	40	1.2	
309	welded tube	EN 10217-3	fine grain steel	P355NH	1.0565	N	0	40	1.2	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
310	welded tube	EN 10217-3	fine grain steel	P355NL1	1.0566	N	0	40	1.2	
311	welded tube	EN 10217-3	fine grain steel	P355NL2	1.1106	N	0	40	1.2	
312	welded tube	EN 10217-3	fine grain steel	P460N	1.8905	N	0	40	1.3	
313	welded tube	EN 10217-3	fine grain steel	P460NH	1.8935	N	0	40	1.3	
314	welded tube	EN 10217-3	fine grain steel	P460NL1	1.8915	N	0	40	1.3	
315	welded tube	EN 10217-3	fine grain steel	P460NL2	1.8918	N	0	40	1.3	
316	welded tube	EN 10217-4	low temperature properties	P215NL	1.0451	N	0	10	1.1	
317	welded tube	EN 10217-4	low temperature properties	P265NL	1.0453	N	0	16	1.1	
318	welded tube	EN 10217-5	elevated temperature properties	P235GH	1.0345	N	0	40	1.1	
319	welded tube	EN 10217-5	elevated temperature properties	P265GH	1.0425	N	0	40	1.1	
320	welded tube	EN 10217-5	elevated temperature properties	16Mo3	1.5415	N	0	40	1.2	e
321	welded tube	EN 10217-6	low temperature properties	P215NL	1.0451	N	0	10	1.1	
322	welded tube	EN 10217-6	low temperature properties	P265NL	1.0453	N	0	25	1.1	
323	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNi18-9	1.4307	AT	0	60	8.1	
324	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNi19-11	1.4306	AT	0	60	8.1	
325	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNi18-10	1.4311	AT	0	60	8.1	
326	welded tube	EN 10217-7	stainless steel, austenitic	X5CrNi18-10	1.4301	AT	0	60	8.1	
327	welded tube	EN 10217-7	stainless steel, austenitic	X6CrNiTi18-10	1.4541	AT	0	60	8.1	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
328	welded tube	EN 10217-7	stainless steel, austenitic	X6CrNiNb18-10	1.4550	AT	0	60	8.1	
329	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNiMo17-12-2	1.4404	AT	0	60	8.1	
330	welded tube	EN 10217-7	stainless steel, austenitic	X5CrNiMo17-12-2	1.4401	AT	0	60	8.1	
331	welded tube	EN 10217-7	stainless steel, austenitic	X6CrNiMoTi17-12-2	1.4571	AT	0	60	8.1	
332	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNiMo17-12-3	1.4432	AT	0	60	8.1	
333	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNiMoN17-13-3	1.4429	AT	0	60	8.1	
334	welded tube	EN 10217-7	stainless steel, austenitic	X3CrNiMo17-13-3	1.4436	AT	0	60	8.1	
335	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNiMo18-14-3	1.4435	AT	0	60	8.1	
336	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNiMoN17-13-5	1.4439	AT	0	60	8.1	
337	welded tube	EN 10217-7	stainless steel, austenitic	X2CrNiMo18-15-4	1.4438	AT	0	60	8.1	
338	welded tube	EN 10217-7	stainless steel, austenitic	X1NiCrMoCu31-27-7	1.4563	AT	0	60	8.2	
339	welded tube	EN 10217-7	stainless steel, austenitic	X1NiCrMoCu25-20-5	1.4539	AT	0	60	8.2	
340	welded tube	EN 10217-7	stainless steel, austenitic	X1CrNiMoCuN20-18-7	1.4547	AT	0	60	8.2	
341	welded tube	EN 10217-7	stainless steel, austenitic	X1NiCrMoCuN25-20-7	1.4529	AT	0	60	8.2	
342	welded tube	EN 10217-7	stainless steel, austenitic-ferritic	X2CrNiMoN22-5-3	1.4462	AT	0	30	10.1	c
343	welded tube	EN 10217-7	stainless steel, austenitic-ferritic	X2CrNiN23-4	1.4362	AT	0	30	10.1	c
344	welded tube	EN 10217-7	stainless steel, austenitic-ferritic	X2CrNiMoN25-7-4	1.4410	AT	0	30	10.2	c
345	welded tube	EN 10217-7	stainless steel, austenitic-ferritic	X2CrNiMoCuWN25-7-4	1.4501	AT	0	30	10.2	c

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
346	forging	EN 10222-2	elevated temperature properties	P245GH	1.0352	A	0	35	1.1	
347	forging	EN 10222-2	elevated temperature properties	P245GH	1.0352	N, NT, QT	35	160	1.1	
348	forging	EN 10222-2	elevated temperature properties	P280GH	1.0426	N	0	35	1.2	
349	forging	EN 10222-2	elevated temperature properties	P280GH	1.0426	NT, QT	35	160	1.2	
350	forging	EN 10222-2	elevated temperature properties	P305GH	1.0436	N	0	35	1.2	
351	forging	EN 10222-2	elevated temperature properties	P305GH	1.0436	NT	35	160	1.2	
352	forging	EN 10222-2	elevated temperature properties	P305GH	1.0436	QT	0	70	1.2	e
353	forging	EN 10222-2	elevated temperature properties	16Mo3	1.5415	N	0	35	1.2	e
354	forging	EN 10222-2	elevated temperature properties	16Mo3	1.5415	QT	35	500	1.2	e
355	forging	EN 10222-2	elevated temperature properties	13CrMo4-5	1.7335	NT	0	70	5.1	
356	forging	EN 10222-2	elevated temperature properties	13CrMo4-5	1.7335	NT, QT	70	500	5.1	
357	forging	EN 10222-2	elevated temperature properties	15MnMoV4-5	1.5402	NT, QT	0	250	1.2	
358	forging	EN 10222-2	elevated temperature properties	18MnMoNi5-5	1.6308	QT	0	200	4.1	
359	forging	EN 10222-2	elevated temperature properties	14MoV6-3	1.7715	NT, QT	0	500	6.1	
360	forging	EN 10222-2	elevated temperature properties	15MnCrMoNiV5-3	1.6920	NT, QT	0	100	4.1	
361	forging	EN 10222-2	elevated temperature properties	11CrMo9-10	1.7383	NT	0	200	5.2	
362	forging	EN 10222-2	elevated temperature properties	11CrMo9-10	1.7383	NT, QT	200	500	5.2	
363	forging	EN 10222-2	elevated temperature properties	X16CrMo5-1	1.7366	A	0	300	5.3	
364	forging	EN 10222-2	elevated temperature properties	X16CrMo5-1	1.7366	NT	0	300	5.3	

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
365	forging	EN 10222-2	elevated temperature properties	X10CrMoVNb9-1	1.4903	NT	0	130	6.4	
366	forging	EN 10222-2	elevated temperature properties	X20CrMoV11-1	1.4922	QT	0	330	6.4	
367	forging	EN 10222-3	low temperature properties	13MnNi6-3	1.6217	NT	0	70	9.1	
368	forging	EN 10222-3	low temperature properties	15NiMn6	1.6228	N	0	35	9.1	
369	forging	EN 10222-3	low temperature properties	15NiMn6	1.6228	NT, QT	35	50	9.1	
370	forging	EN 10222-3	low temperature properties	12Ni14	1.5637	N	0	35	9.2	
371	forging	EN 10222-3	low temperature properties	12Ni14	1.5637	NT	35	50	9.2	
372	forging	EN 10222-3	low temperature properties	12Ni14	1.5637	QT	50	70	9.2	
373	forging	EN 10222-3	low temperature properties	X12Ni5	1.5680	N	0	35	9.2	
374	forging	EN 10222-3	low temperature properties	X12Ni5	1.5680	NT, QT	35	50	9.2	
375	forging	EN 10222-3	low temperature properties	X8Ni9	1.5662	N, NT	0	50	9.3	
376	forging	EN 10222-3	low temperature properties	X8Ni9	1.5662	QT	50	70	9.3	
377	forging	EN 10222-4	fine grain steel, high proof strength	P285NH	1.0477	N	0	70	1.2	
378	forging	EN 10222-4	fine grain steel, high proof strength	P285QH	1.0478	QT	70	400	1.2	e
379	forging	EN 10222-4	fine grain steel, high proof strength	P355NH	1.0565	N	0	70	1.2	
380	forging	EN 10222-4	fine grain steel, high proof strength	P355QH	1.0571	QT	70	400	1.2	e
381	forging	EN 10222-4	fine grain steel, high proof strength	P420NH	1.8932	N	0	70	1.3	
382	forging	EN 10222-4	fine grain steel, high proof strength	P420QH	1.8936	QT	70	400	3.1	
383	forging	EN 10222-5	stainless steel, martensitic	X3CrNi13-4	1.4313	QT+T	0	350	7.2	e
384	forging	EN 10222-5	stainless steel, martensitic	X3CrNi13-4	1.4313	QT	0	250	7.2	e

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608: 2000	Notes
385	forging	EN 10222-5	stainless steel, austenitic	X2CrNi18-9	1.4307	AT	0	250	8.1	
386	forging	EN 10222-5	stainless steel, austenitic	X2CrNi18-10	1.4311	AT	0	250	8.1	
387	forging	EN 10222-5	stainless steel, austenitic	X5CrNi18-10	1.4301	AT	0	250	8.1	
388	forging	EN 10222-5	stainless steel, austenitic	X6CrNiTi18-10	1.4541	AT	0	450	8.1	
389	forging	EN 10222-5	stainless steel, austenitic	X6CrNiNb18-10	1.4550	AT	0	450	8.1	
390	forging	EN 10222-5	stainless steel, austenitic	X6CrNi18-10	1.4948	AT	0	250	8.1	
391	forging	EN 10222-5	stainless steel, austenitic	X6CrNiTiB18-10	1.4941	AT	0	450	8.1	
392	forging	EN 10222-5	stainless steel, austenitic	X7CrNiNb18-10	1.4912	AT	0	450	8.1	
393	forging	EN 10222-5	stainless steel, austenitic	X2CrNiMo17-12-2	1.4404	AT	0	250	8.1	
394	forging	EN 10222-5	stainless steel, austenitic	X2CrNiMoN17-11-2	1.4406	AT	0	160	8.1	
395	forging	EN 10222-5	stainless steel, austenitic	X5CrNiMo17-12-2	1.4401	AT	0	250	8.1	
396	forging	EN 10222-5	stainless steel, austenitic	X6CrNiMoTi17-12-2	1.4571	AT	0	450	8.1	
397	forging	EN 10222-5	stainless steel, austenitic	X2CrNiMo17-12-3	1.4432	AT	0	250	8.1	
398	forging	EN 10222-5	stainless steel, austenitic	X2CrNiMoN17-13-3	1.4429	AT	0	160	8.1	
399	forging	EN 10222-5	stainless steel, austenitic	X3CrNiMo17-13-3	1.4436	AT	0	250	8.1	
400	forging	EN 10222-5	stainless steel, austenitic	X2CrNiMo18-14-3	1.4435	AT	0	75	8.1	
401	forging	EN 10222-5	stainless steel, austenitic	X3CrNiMoN17-13-3	1.4910	AT	0	75	8.1	
402	forging	EN 10222-5	stainless steel, austenitic	X2CrNiCu19-10	1.4650	AT	0	450	8.1	
403	forging	EN 10222-5	stainless steel, austenitic	X3CrNiMo18-12-3	1.4449	AT	0	450	8.1	
404	forging	EN 10222-5	stainless steel, austenitic-ferritic	X2CrNiMoN22-5-3	1.4462	AT	0	350	10.1	c

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 ⁹	Thickness mm		Material group to CEN ISO/CR 15608:2000	Notes
405	forging	EN 10222-5	stainless steel, austenitic-ferritic	X2CrNiMoN25-7-4	1.4410	AT	0	160	10.2	c
406	casting	EN 10213	elevated temperature properties	GP240GR	1.0621	N	0	100	1.1	h
407	casting	EN 10213	elevated temperature properties	GP240GH	1.0619	N, QT	0	100	1.1	e
408	casting	EN 10213	elevated temperature properties	GP280GH	1.0625	N, QT	0	100	1.2	e
409	casting	EN 10213	elevated temperature properties	G20Mo5	1.5419	QT	0	100	3.1	
410	casting	EN 10213	elevated temperature properties	G17CrMo5-5	1.7357	QT	0	100	5.1	
411	casting	EN 10213	elevated temperature properties	G17CrMo9-10	1.7379	QT	0	150	5.2	
412	casting	EN 10213	elevated temperature properties	G12MoCrV5-2	1.7720	QT	0	100	6.1	
413	casting	EN 10213	elevated temperature properties	G17CrMoV5-10	1.7706	QT	0	150	6.2	
414	casting	EN10213	elevated temperature properties	GX4CrNi 13-4	1.4317	QT	0	300	8.1	
415	casting	EN10213	elevated temperature properties	GX8CrNi 12	1.4107	QT	0	300	8.1	
416	casting	EN 10213	elevated temperature properties	GX15CrMo5	1.7365	QT	0	150	5.3	
417	casting	EN 10213	elevated temperature properties	GX23CrMoV12-1	1.4931	QT	0	150	6.4	
418	casting	EN 10213	low temperature properties	G17Mn5	1.1131	QT	0	50	1.1	
419	casting	EN 10213	low temperature properties	G20Mn5	1.6220	N	0	30	1.2	
420	casting	EN 10213	low temperature properties	G20Mn5	1.6220	QT	0	100	1.2	e
421	casting	EN 10213	low temperature properties	G18Mo5	1.5422	QT	0	100	1.2	e
422	casting	EN 10213	low temperature properties	G9Ni10	1.5636	QT	0	35	9.1	
423	casting	EN 10213	low temperature properties	G17NiCrMo13-6	1.6781	QT	0	200	9.2	
424	casting	EN 10213	low temperature properties	G9Ni14	1.5638	QT	0	35	9.2	
425	casting	EN 10213	low temperature properties	GX3CrNi13-4	1.6982	QT	0	300	8.1	
426	casting	EN 10213	stainless steel, austenitic	GX2CrNi19-11	1.4309	AT	0	150	8.1	

Table E.2-1 (concluded)

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 CEN ISO/CR 15608: 2000	Notes
427	casting	EN 10213	stainless steel, austenitic	GX5CrNi19-10	1.4308	AT	0	150	8.1	
428	casting	EN 10213	stainless steel, austenitic	GX5CrNiNb19-11	1.4552	AT	0	150	8.1	
429	casting	EN 10213	stainless steel, austenitic	GX2CrNiMo19-11-2	1.4409	AT	0	150	8.1	
430	casting	EN 10213	stainless steel, austenitic	GX5CrNiMo19-11-2	1.4408	AT	0	150	8.1	
431	casting	EN 10213	stainless steel, austenitic	GX5CrNiMoNb19-11-2	1.4581	AT	0	150	8.1	
432	casting	EN 10213	stainless steel, austenitic	GX2NiCrMo28-20-2	1.4458	AT	0	150	8.2	
433	casting	EN10213	stainless steel, austenitic-ferritic	GX2CrNiMoN25-7-3	1.4417	AT	0	150	10.2	c
434	casting	EN 10213	stainless steel, austenitic-ferritic	GX2CrNiMoN22-5-3	1.4470	AT	0	150	10.1	c
435	casting	EN 10213	stainless steel, austenitic-ferritic	GX2CrNiMoCuN25-6-3-3	1.4517	AT	0	150	10.2	c
436	casting	EN 10213	stainless steel, austenitic-ferritic	GX2CrNiMoN26-7-4	1.4469	AT	0	150	10.2	c

- a Because of the carbon content special precautions are necessary when the material is welded.
- b See EN 10216 series for details of heat treatment.
- c See B.2.3, Figures B.2-9 to B.2-11.
- d Welding on fasteners made of these materials is not permitted.
- e Additional requirements for forming and welding should be considered on a case by case basis.
- f Hot forming is not allowed for thermomechanically treated steels, see 9.3.2 of EN 13445-4:2014.
- g Heat treatment conditions:
 - A annealed
 - AT solution annealed
 - C cold worked
 - I isothermally annealed
 - M thermomechanically rolled
 - N normalised
 - NT normalised and tempered
 - P precipitation hardened
 - QT quenched and tempered
 - RA recrystallised annealed
 - WW warm worked
- h steel grade deleted in EN 10213:2007.

Annex Y **(informative)**

History of EN 13445-2

Y.1 Differences between EN 13445-2:2009 and EN 13445-2:2014

The 2014 edition of EN 13445-2 contains the 2009 edition of the standard and all Amendment(s) and/or correction(s) issued in the meantime.

Significant technical changes include:

- the modification of Annex B "the prevention of brittle fracture" to extend the method 2 and to adjust of calculation methods;
- the modification of the annex on the prevention of brittle fracture and methods 1 and 2. It introduces modifications on the temperature adjustment term T_s to calculate the reference design temperature values T_R .

NOTE The changes referred include the significant technical changes but is not an exhaustive list of all modifications.

Y.2 List of corrected pages of Issue 2 (2015-07)

Pages 5, 7, 11, 17, 21, 22, 23, 24, 25, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81.