

SLOVENSKI

**SIST EN 10216-
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PREDSTANDARD

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**Nevarjene jeklene cevi za tlačne posode - Tehnični dobavni pogoji - 2. del:
Nelegirane in legirane jeklene cevi s specificiranimi lastnostmi za delo pri
povišanih temperaturah**

Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 2:
Non-alloy and alloy steel tubes with specified elevated temperature properties

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ICS

English version

Seamless steel tubes for pressure purposes - Technical delivery conditions - Part 2: Non-alloy and alloy steel tubes with specified elevated temperature properties

Tubes sans soudure en acier pour service sous pression -
 Conditions techniques de livraison - Partie 2 : Tubes en
 acier non allié et allié avec caractéristiques spécifiées à
 température élevée

Nahtlose Stahlrohre für Druckbeanspruchungen -
 Technische Lieferbedingungen - Teil 2: Rohre aus
 unlegierten und legierten Stählen mit festgelegten
 Eigenschaften bei erhöhten Temperaturen

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee ECISS/TC 29.

This draft amendment A2, if approved, will modify the European Standard EN 10216-2:2002. If this draft becomes an amendment, 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.

This draft amendment was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 10216-2:2002/prA2:2005) has been prepared by Technical Committee ECISS/TC 29 “Steel tubes and fittings for steel tubes”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

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 97/23/EC.

For relationship with EU Directive 97/23/EC, see informative annex ZA, which is an integral part of this document.

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7.3 Tube manufacture and delivery condition

Table 1 — Heat treatment conditions

Steel grade		Heat treatment ^a	Austenitizing		Tempering	
Steel name	Steel number		Temperature °C	Cooling Medium	Temperature °C	Cooling medium
P195GH	1.0348	+N ^b	880 to 940	Air	-	-
P235GH	1.0345	+N ^b	880 to 940	Air	-	-
P265GH	1.0425	+N ^b	880 to 940	Air	-	-
20MnNb6	1.0471	+N ^b	900 to 960	Air	-	-
16Mo3	1.5415	+N ^b	890 to 950	Air	-	-
8MoB5-4	1.5450	+N ^b	920 to 960	Air	-	-
14MoV6-3	1.7715	+NT ^{b c}	930 to 990	Air	680 to 730	air
10CrMo5-5	1.7338	+NT ^{b c}	900 to 960	Air	650 to 750	air
13CrMo4-5	1.7335	+NT ^{b c}	900 to 960	Air	660 to 730	air
10CrMo9-10	1.7380	+NT ^{b c}	900 to 960	Air	680 to 750	air
11CrMo9-10	1.7383	+QT	900 to 960	Air or Liquid	680 to 750	air
25CrMo4	1.7218	+QT	860 to 900	Air or Liquid	620 to 680	air
20CrMoV13-5-5	1.7779	+QT	980 to 1030	Air or Liquid	680 to 730	air
7CrWVMoNb9-6		+NT ^d	1040 to 1080	Air	730 to 780	Air
7CrMoVTiB10-10	1.7378	+NT ^d	980 to 1020	Air	730 to 770	Air
X11CrMo5+NT1	1.7362+NT1	+NT1	930 to 980	Air	730 to 770	air
X11CrMo5+NT2	1.7362+NT2	+NT2 ^c	930 to 980	air	710 to 750	air
X11CrMo9-1+I	1.7386+I	+I	950 to 980	Furnace Atmosphere	-	-
X11CrMo9-1+NT	1.7386+NT	+NT ^c	890 to 950	air	720 to 800	air
X10CrMoVNb9-1	1.4903	+NT ^c	1040 to 1090	air	730 to 780	air
X10CrWMoVnb9-2		+NT ^c	1040 to 1090	Air	730 to 780	Air
X11CrMoWVnb9-1-1	1.4905	+NT ^c	1040 to 1080	Air	740 to 770	Air
X20CrMoV11-1	1.4922	+NT ^c	1020 to 1080	air	730 to 780	air

^a +N = Normalising, +NT = Normalising + Tempering, +QT = Quenching + Tempering (air or liquid), +I = Isothermal Annealing.

^b Normalising includes Normalising Forming.

^c For these steel grades it may be necessary in the case of wall thickness T above 25 mm or T/D > 0,15 to apply quenching and tempering in order to achieve the intended structure and material properties. The decision shall be left to the discretion of the manufacturer but shall be stated to the customer at the time of enquiry and order. Steel tubes treated in such a way shall be designated by the steel name supplemented by the symbol "+QT".

^d For these steel grades it may be necessary in case of wall thickness T above 16 mm or T/D > 0,15 to apply quenching and tempering in order to achieve the intended structure and material properties. The decision shall be left to the discretion of the manufacturer but shall be stated to the customer at the time of enquiry and order. Steel tubes treated in such a way shall be designated by the steel name supplemented by the symbol "+QT".

8.2 Chemical composition

Table 2 — Chemical composition (cast analysis) ^a, in % by mass

Steel grade		C	Si	Mn	P max	S max	Cr	Mo	Ni	Al _{tot}	Cu	Nb	Ti max	V	Cr+Cu +Mo+Ni	Others
Steel name	Steel number															
195GH	1.0348	≤ 0,13	≤ 0,35	≤ 0,70	0,025	0,020	≤ 0,30	≤ 0,08	≤ 0,30	≥ 0,020 ^b	≤ 0,30 ^c	≤ 0,010 ^d	0,040 ^d	≤ 0,02 ^d	≤ 0,70	-
P235GH	1.0345	≤ 0,16	≤ 0,35	≤ 1,20	0,025	0,020	≤ 0,30	≤ 0,08	≤ 0,30	≥ 0,020 ^b	≤ 0,30 ^c	≤ 0,010 ^d	0,040 ^d	≤ 0,02 ^d	≤ 0,70	-
P265GH	1.0425	≤ 0,20	≤ 0,40	≤ 1,40	0,025	0,020	≤ 0,30	≤ 0,08	≤ 0,30	≥ 0,020 ^b	≤ 0,30 ^c	≤ 0,010 ^d	0,040 ^d	≤ 0,02 ^d	≤ 0,70	-
20MnNb6	1.0471	≤ 0,22	0,15 to 0,35	1,00 to 1,50	0,025	0,020	-	-	-	≤ 0,060	≤ 0,30 ^c	0,015 to 0,10	-	-	-	-
16Mo3	1.5415	0,12 to 0,20 ^e	≤ 0,35	0,40 to 0,90	0,025	0,020	≤ 0,30	0,25 to 0,35	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	-	-	-
8MoB5-4	1.5450	0,06 to 0,10	0,10 to 0,35	0,60 to 0,80	0,025	0,020	≤ 0,20	0,40 to 0,50	-	≤ 0,060	≤ 0,30 ^c	-	0,060	-	-	B = 0,002 to 0,006
14MoV63	1.7715	0,10 to 0,15	0,15 to 0,35	0,40 to 0,70	0,025	0,020	0,30 to 0,60	0,50 to 0,70	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	0,22 to 0,28	-	-
10CrMo5-5	1.7338	≤ 0,15	0,50 to 1,00	0,30 to 0,60	0,025	0,020	1,00 to 1,50	0,45 to 0,65	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	-	-	-
13CrMo4-5	1.7335	0,10 to 0,17 ^e	≤ 0,35	0,40 to 0,70	0,025	0,020	0,70 to 1,15	0,40 to 0,60	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	-	-	-
10CrMo9-10	1.7380	0,08 to 0,14	≤ 0,50	0,30 to 0,70	0,025	0,020	2,00 to 2,50	0,90 to 1,10	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	-	-	-
11CrMo9-10	1.7383	0,08 to 0,15	≤ 0,50	0,40 to 0,80	0,025	0,020	2,00 to 2,50	0,90 to 1,10	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	-	-	-

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Steel grade		C	Si	Mn	P max	S max	Cr	Mo	Ni	Al _{tot}	Cu	Nb	Ti	V	Cr+Cu +Mo+Ni	Others
Steel name	Steel number															
25CrMo4	1.7218	0,22 to 0,29	≤ 0,40	0,60 to 0,90	0,025	0,020	0,90 to 1,20	0,15 to 0,30	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	-	-	-
20CrMoV13-5-5	1.7779	0,17 to 0,23	0,15 to 0,35	0,30 to 0,50	0,025	0,020	3,00 to 3,30	0,50 to 0,60	≤ 0,30	≤ 0,040	≤ 0,30 ^c	-	-	0,45 to 0,55	-	-
15NiCuMoNb5-6-4	1.6368	≤ 0,17	0,25 to 0,50	0,80 to 1,20	0,025	0,020	≤ 0,30	0,25 to 0,50	1,00 to 1,30	≤ 0,050	0,50 to 0,80	0,015 to 0,045	-	-	-	-
7CrWVNb9-6		0,04 to 0,10	≤ 0,50	0,10 to 0,60	0,030	0,010	1,90 to 2,60	0,05 to 0,30	-	≤ 0,030	-	0,02 to 0,08	-	0,20 to 0,30	-	N ≤ 0,03 B = 0,0005 to 0,006 W = 1,45 to 1,75
7CrMoVTiB10-10	1.7378	0,05 to 0,10	0,15 to 0,45	0,30 to 0,70	0,020	0,010	2,20 to 2,60	0,90 to 1,10	-	≤ 0,020	-	-	0,05 to 0,10	0,20 to 0,30	-	N ≤ 0,010 B = 0,0015 to 0,0070
X11CrMo5+I X11CrMo5+NT1 X11CrMo5+NT2	1.7362+I 1.7362+NT1 1.7362+NT2	0,08 to 0,15	0,15 to 0,50	0,30 to 0,60	0,025	0,020	4,00 to 6,00	0,45 to 0,65		≤ 0,040	≤ 0,30 ^c					
X11CrMo9-1+I X11CrMo9-1+NT	1.7386+I 1.7386+NT	0,08 to 0,15	0,25 to 1,00	0,30 to 0,60	0,025	0,020	8,00 to 10,00	0,90 to 1,10		≤ 0,040	≤ 0,30 ^c					
X10CrMoVNb9-1	1.4903	0,08 to 0,12	0,20 to 0,50	0,30 to 0,60	0,020	0,010	8,00 to 9,50	0,85 to 1,05	≤ 0,40	≤ 0,040	≤ 0,30 ^c	0,06 to 0,10	-	0,18 to 0,25	-	N = 0,030 to 0,070
X10CrWMoVNb9-2		0,07 to 0,13	≤ 0,50	0,30 to 0,60	0,020	0,010	8,50 to 9,50	0,30 to 0,60	≤ 0,40	≤ 0,040	-	0,40 to 0,90	-	0,15 to 0,25	-	N = 0,030 to 0,070 B = 0,001 to 0,006 W = 1,50 to 2,00
X11CrMoWVNb9-1-1	1.4905	0,09 to 0,13	0,10 to 0,50	0,30 to 0,60	0,020	0,010	8,50 to 9,50	0,90 to 1,10	0,10 to 0,40	≤ 0,040	-	0,06 to 0,10	-	0,18 to 0,25	-	N = 0,050 to 0,090 B = 0,0005 to 0,005 W = 0,90 to

																1,10
X20CrMoV11-1	1.4922	0,17 to 0,23 ^f	0,15 to 0,50	≤ 1,00	0,025	0,020	10,00 to 12,50	0,80 to 1,20	0,30 to 0,80	≤ 0,040	≤ 0,30 ^c	-	-	0,25 to 0,35	-	-

^a Elements not included in this Table shall not be intentionally added to the steel without the agreement of the purchaser, except for elements which may be added for finishing the cast. All appropriate measures shall be taken to prevent the addition of undesirable elements from scrap or other materials used in the steel making process.

^b This requirement is not applicable provided the steel contains a sufficient amount of other nitrogen binding elements which shall be reported. When using titanium, the producer shall verify that $(Al+Ti/2) \geq 0,020\%$

^c **Option 2:** In order to facilitate subsequent forming operations, an agreed maximum copper content lower than indicated and an agreed specified maximum tin content shall apply

^d The content of these elements need not to be reported unless intentionally added to the cast.

^e For wall thickness ≥ 30 mm the carbon content may be increased by 0,02 % for cast and product analysis.

^f The upper carbon value of 0,23 % shall not be exceeded for product analysis.

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Table 3 — Permissible deviations of the product analysis from specified limits on cast analysis given in Table 2

Element	Limiting value for the cast analysis in accordance with Table 2 % by mass	Permissible deviation of the product analysis % by mass
C	≤ 0,29	± 0,02
Si	≤ 0,40	± 0,05
	> 0,40 to ≤ 1,00	± 0,06
Mn	≤ 1,00	± 0,05
	> 1,00 to ≤ 1,50	± 0,10
P	≤ 0,025	+ 0,005
S	≤ 0,010	+ 0,003
	> 0,010 ≤ 0,020	+ 0,005
Al	≤ 0,060	± 0,005
B	≤ 0,007	± 0,001
Cr	≤ 1,00	± 0,05
	> 1,00 to ≤ 10,00	± 0,10
	> 10,00 to ≤ 12,50	± 0,15
Cu	≤ 0,80	± 0,05
Mo	≤ 0,35	± 0,03
	> 0,35 to ≤ 1,20	± 0,04
N	≤ 0,070	± 0,01
Nb	≤ 0,10	± 0,005
Ni	≤ 0,35	± 0,05
	> 0,35 to ≤ 1,30	± 0,07
Ti	≤ 0,060	+ 0,010
V	≤ 0,10	+ 0,01
	> 0,10 to ≤ 0,55	± 0,03
W	≤ 2,00	± 0,10

8.3 Mechanical properties

Table 4 — Mechanical properties

Steel grade		Tensile properties at room temperature							Impact properties ^{a b}				
Steel name	Steel number	Upper yield strength or proof strength R _{eH} or R _{p0,2} for Wall Thickness T min.				Tensile Strength R _m	Elongation A min. % ^a		Minimum average absorbed energy KV J at a temperature of °C				
		T ≤ 16	16 < T ≤ 40	40 < T ≤ 60	60 < T ≤ 100		l	t	l			t	
		MPa ^{g)}	MPa ^{g)}	MPa ^{g)}	MPa ^{g)}	MPa ^{g)}			20	0	-10	20	0
P195GH	1.0348	195	-	-	-	320 to 440	27	25	-	40 ^c	28 ^d	-	27 ^c
P235GH	1.0345	235	225	215	-	360 to 500	25	23	-	40 ^c	28 ^d	-	27 ^c
P265GH	1.0425	265	255	245	-	410 to 570	23	21	-	40 ^c	28 ^d	-	27 ^c
20MnNb6	1.0471	355	345	335	-	500 to 650	22	20	-	40 ^c	-	-	27 ^c
16Mo3	1.5415	280	270	260	-	450 to 600	22	20	40 ^c	-	-	27 ^c	-
8MoB5-4	1.5450	400	-	-	-	540 to 690	19	17	40 ^c	-	-	27 ^c	-
14MoV6-3	1.7715	320	320	310	-	460 to 610	20	18	40 ^{c f}	-	-	27 ^c	-
10CrMo5-5	1.7338	275	275	265	-	410 to 560	22	20	40 ^c	-	-	27 ^c	-
13CrMo4-5	1.7335	290	290	280	-	440 to 590	22	20	40 ^c	-	-	27 ^c	-
10CrMo9-10	1.7380	280	280	270	-	480 to 630	22	20	40 ^c	-	-	27 ^c	-
11CrMo9-10	1.7383	355	355	355	-	540 to 680	20	18	40 ^c	-	-	27 ^c	-
25CrMo4	1.7218	345	345	345	-	540 to 690	18	15	40 ^{c f}	-	-	27 ^c	-
20CrMoV13-5-5	1.7779	590	590	590	-	740 to 880	16	14	40 ^{c f}	-	-	27 ^c	-
15NiCuMoNb5-6-4	1.6368	440	440	440	440 ^e	610 to 780	19	17	40 ^{c f}	-	-	27 ^c	-

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