SLOVENSKI STANDARD
SIST EN 10222-4:2017/oprA1:2019

01-oktober-2019

Jekleni izkovki za tlačne posode - 4. del: Variva drobnozrnata jekla z veliko dogovorno napetostjo tečenja - Dopolnilo A1

Steel forgings for pressure purposes - Part 4: Weldable fine grain steels with high proof strength

Schmiedestücke aus Stahl für Druckbehälter - Teil 4: Schweißgeeignete Feinkornbaustähle mit hoher Dehngrenze

Pièces forgées en acier pour appareils à pression - Partie 4 : Aciers soudables à grains fins avec limite d'élasticité élevée

Ta slovenski standard je istoveten z: **EN 10222-4:2017/prA1**

ICS:

77.140.30	Jekla za uporabo pod tlakom	Steels for pressure purposes
77.140.85	Železni in jekleni kovani izdelki	Iron and steel forgings

SIST EN 10222-4:2017/oprA1:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
EN 10222-4:2017

prA1

August 2019

ICS 77.140.30; 77.140.85

English Version

Steel forgings for pressure purposes - Part 4: Weldable fine grain steels with high proof strength

Pièces forgées en acier pour appareils à pression - Partie 4 : Aciers soudables à grains fins avec limite d'élasticité élevée

Schmiedestücke aus Stahl für Druckbehälter - Teil 4: Schweißgeeignete Feinkornbausstähle mit hoher Dehngrenze

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 459/SC 11.

This draft amendment A1, if approved, will modify the European Standard EN 10222-4:2017. 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.

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

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European foreword

This document (EN 10222-4:2017/prA1:2019) has been prepared by Technical Committee CEN/TC 459/SC 11 “Steels castings and forgings”, the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 10222-4:2017.

1 Modification to Table 1

Replace Table 1 with the following: "

Table 1 — Heat treatment

Steel grade		Heat treatment a	Austenitizing or normalizing		Tempering
Steel name	Steel number		Temperature °C	Cooling in b	Temperature °C
P285NH	1.0477	+N	880 to 960	a	–
P285QH	1.0478	+QT	860 to 940	o, w	600 to 700
P355NH	1.0565	+N	880 to 960	a	–
P355NL1 c	1.0566	+N	880 to 960	a	–
P355NL2 c	1.1106	+N	880 to 960	a	–
P355QH1	1.0571	+QT	860 to 940	o, w	600 to 700
P355QL1	1.8868	+QT	860 to 940	o, w	600 to 700
P355QL2	1.8869	+QT	860 to 940	o, w	600 to 700
P420NH c	1.8932	+N	880 to 960	a	–
P420QH	1.8936	+QT	860 to 940	o, w	600 to 700
P460QH	1.8871	+QT	860 to 940	o, w	600 to 700
P460QL1	1.8872	+QT	860 to 940	o, w	600 to 700
P460 QL2	1.8864	+QT	860 to 940	o, w	600 to 700

a +*N* = normalized, +QT = quenched and tempered.

b a = air, o = oil, w = water or water based medium.

c Limited to teq < 40 mm (see EN 10222–1:2017, Table A.1).

".

2 Modification to Table 2

Replace Table 2 with the following: "

Table 2 — Chemical composition (cast analysis)

Steel designation		% by mass [a]														Carbon equivalent value [b] % by mass
Steel name	Steel number	C max.	Si max.	Mn	P max.	S [f] max.	Al_{total}	N max.	Cr max.	Cu max.	Mo max.	Nb max.	Ni max.	V max.	Nb + V max.	
P285NH	1.0477	0,18	0,40	0,80 to 1,50	0,025	0,010	≥ 0,020 [c]	0,020	0,30	0,20	0,08	0,03	0,30	0,05	0,05	0,41
P285QH	1.0478															
P355NH	1.0565	0,18	0,50	1,10 to 1,70	0,025	0,010	≥ 0,020 [c]	0,015	0,30 [d]	0,30 [d]	0,08 [d]	0,05	0,50	0,10	0,12	0,47
P355NL1	1.0566					0,008										
P355NL2	1.1106				0,020											
P355QH1	1.0571	0,18	0,40	0,90 to 1,50	0,025	0,010	≥ 0,020 [c]	0,015	0,30	0,30	0,25	0,05 [e]	0,50	0,10 [e]	0,12	
P355QL1	1.8868				0,020	0,008										
P355QL2	1.8869															
P420NH	1.8932	0,20	0,60	1,10 to 1,70	0,025	0,010	≥ 0,020 [c]	0,020	0,30	0,20	0,10	0,05	1,00	0,20	0,22	0,51
P420QH	1.8936				0,020	0,008								0,15	- [e]	
P460QH	1.8871	0,18	0,50	1,10 to 1,70	0,025	0,010	≥ 0,020 [c]	0,015	0,50	0,30	0,50	0,05	1,00	0,15	- [e]	0,51
P460QL1	1.8872				0,020	0,008										
P460QL2	1.8864															

[a] Elements not listed in this table shall not be intentionally added to the steel without the approval of the purchase except for finishing the cast. All appropriate measures shall be taken to prevent the addition from scrap or other materials used in steelmaking of these elements which may adversely affect the mechanical properties and usability.

[b] If agreed at the time of enquiry and order (see also EN 10222-1:2017, 6.4.1.5).

[c] A maximum value of 0,050 should be agreed at time of enquiry and order. If only aluminium is used for nitrogen binding, a ratio Al/N ≥ 2 shall apply.

[d] The sum of the percentages by mass of the three elements chromium, copper and molybdenum shall not exceed 0,45 %.

[e] Ti and Zr may also be added: Ti ≤ 0,03 %, Zr ≤ 0,05 %. The percentage of grain refining elements shall be at least 0,15 %.

[f] A maximum sulphur content up to 0,015 % may be agreed at time of enquiry and order. In this case the mechanical properties stated in the according tables are also valid and shall be fulfilled.

".

3 Modification to Table 4

Replace Table 4 with the following: "

Table 4 — Mechanical properties at room temperature

Steel grade		Heat treatment [a]	Thickness of the ruling section t_R [b] mm	Yield strength R_{eH} [c] MPa min.	Tensile strength R_m MPa	Elongation after fracture A [d] % min	
Steel name	Steel number					l	tr, t
P285NH	1.0477	+N	$t_R \leq 16$	285	390 to 510	24	23
			$16 < t_R \leq 35$	275			
			$35 < t_R \leq 70$	260			
P285QH [e]	1.0478	+QT	$70 < t_R \leq 100$	245	370 to 510	22	21
			$100 < t_R \leq 250$	225			
			$250 < t_R \leq 400$	205			
P355NH P355NL1 P355NL2	1.0565 1.0566 1.1106	+N	$t_R \leq 16$	355	490 to 630	23	21
			$16 < t_R \leq 35$	345			
			$35 < t_R \leq 70$	330			
P355QH1 [e] P355QL1 [e] P355QL2 [e]	1.0571 1.8868	+QT	$70 < t_R \leq 100$	315	470 to 630	21	19
			$100 < t_R \leq 250$	295			
			$250 < t_R \leq 400$	275			
P420NH	1.8932	+N	$t_R \leq 16$	420	530 to 680	20	19
			$16 < t_R \leq 35$	410			
			$35 < t_R \leq 70$	390			
P420QH [e]	1.8936	+QT	$70 < t_R \leq 100$	375	510 to 670	18	17
			$100 < t_R \leq 250$	345			
			$250 < t_R \leq 400$	325			
P460QH [e f] P460QL1 [e f] P460QL2 [e f]	1.8871 1.8872 1.8864	+QT	$t_R \leq 100$	420	520 to 710	18	16
			$100 < t_R \leq 250$	400			
			$250 < t_R \leq 400$	380			

a +A annealed; +N normalized; +QT quenched and tempered; +NT normalized and tempered.

b The thickness ranges given in this column apply for the as heat treated thickness of forgings with the ruling section. This is characterized by rectangular shape, a width to thickness ratio ≥ 2 and a length to thickness ratio ≥ 4. For forgings with other sections the equivalent thickness shall be determined according to EN 10222-1:2017, Annex A or be agreed at the time of enquiry and order.

c Until the yield point criteria are harmonized in the various national codes, determination of R_{eH} may be replaced by determination of $R_{p0,2}$. In this case, $R_{p0,2}$ values are 10 MPa lower for ReH values up to 355 MPa and 15 MPa lower for R_{eH} values greater than 355 MPa.

d l = longitudinal, t = tangential, tr = transverse.

e For thickness less than 70 mm the tensile strength values for QT grades are the same as for normalized grades.

f For the three grades P460QH, P460QL1, and P460QL2 in normalized conditions the values for the mechanical properties -shall be agreed at the time of enquiry and order.

".

4 Modification to Table 5

Replace Table 5 with the following: "

Table 5 — Minimum impact energy

Steel designation	Heat treatment condition [a] [b]	Thickness of the ruling section t_R mm	Impact energy KV_2 in J [c] min at a test temperature in °C of:									
			longitudinal					Transversal and tangential				
			+20	0	-20	-40	-50	+20	0	-20	-40	-50
P285NH P355NH P420NH	+N	≤ 70	55	47	40	27 [d]	-	40	34	27 [d]	-	-
P285QH P355QH1 P420QH P460QH	+QT	≤ 400	63	55	47	34	-	40	34	27 [d]	-	-
P355NL1	+N	≤ 70	55	47	40	27 [d]	-	47	40	34	27 [d]	-
P355QL1 P460QL1	+QT	≤ 400	63	55	47	34	-	47	40	34	27 [d]	-
P355NL2	+N	≤ 70	55	47	40	30	27 [d]	47	40	34	30	27 [d]
P355QL2 P460QL2	+QT	≤ 400	63	55	47	34	27 [d]	47	40	34	30	27 [d]

a +N = normalized; +QT = quenched and tempered.

b For temperatures and cooling conditions, see Table 1.

c Where minimum impact energy values are specified for several temperatures, verification of the impact energy, unless otherwise agreed, shall be carried out at the temperature for which the value of 27 J is specified. Where the minimum impact energy value specified at the lowest temperature is higher than 27 J, this higher value shall be verified.

d A minimum impact energy value of 40 J may be agreed at the time of enquiry and order.

e For steel grades P460QH/QL1/QL2 the minimal impact energy values (normalized conditions) have to be fixed at the time of enquiry and order.

".

5 Modification to 4.1, Classification

Replace

"are non-alloy quality steels (P285NH, P285QH, P355NH, P355QH1, P355NL1), non-alloy special steel (P355NL2) and alloy special steels (P355QL1, P355QL2, P420NH, P420QH, P460QH, P460QL1, P460QL2)"

with

"are non-alloy quality steels (P285NH, P285QH, P355NH, P355NL1), non-alloy special steel (P355NL2) and alloy special steels (P355QH1, P355QL1, P355QL2, P420NH, P420QH, P460QH, P460QL1, P460QL2)".

6 Modification to 5.2, Options

Replace the text of 5) with:

"delivery of steel grade P460N in normalized condition and determination of mechanical properties (see Table 4 footnote f, Table 5 footnote e, and Table 6, footnote a);".