SLOVENSKI STANDARD
SIST EN 10250-2:2022

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Prosto kovani jekleni izkovki za splošno tehnično uporabo - 2. del: Nelegirana kakovostna in plemenita jekla

Open die steel forgings for general engineering purposes - Part 2: Non-alloy quality and special steels

Freiformschmiedestücke aus Stahl für allgemeine Verwendung - Teil 2: Unlegierte Qualitäts- und Edelstähle

Pièces forgées en acier pour usage général - Partie 2: Aciers de qualité non alliés et aciers spéciaux

Ta slovenski standard je istoveten z: **EN 10250-2:2022**

ICS:

77.140.20	Visokokakovostna jekla	Stainless steels
77.140.45	Nelegirana jekla	Non-alloyed steels
77.140.85	Železni in jekleni kovani izdelki	Iron and steel forgings

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English Version

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This European Standard was approved by CEN on 14 February 2022.

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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 10250-2:2022) has been prepared by Technical Committee CEN/TC 459 “ECISS - European Committee for Iron and Steel Standardization”,[1] the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by September 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10250-2:1999.

In comparison with the previous edition, the following technical modifications have been made:

— updating of normative references;

— deletion of previous Table 2 - Permissible deviations between the product analysis and the limiting values given in Table 1 for the cast analysis;

— deletion of C 22 steel grade from all the tables.

EN 10250, *Open die steel forgings for general engineering purposes*, consists of the following parts:

— *Part 1: General requirements;*

— *Part 2: Non-alloy quality and special steels;*

— *Part 3: Alloy special steels;*

— *Part 4: Stainless steels.*

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

[1] Through its sub-committee SC 11 “Steel castings and forgings” (secretariat: AFNOR).

1 Scope

This document specifies the technical delivery requirements for open die forgings, forged bars and products pre-forged and finished in ring rolling mills, manufactured from non-alloy quality and special steels and supplied in the normalized, normalized and tempered, quenched and tempered or annealed condition.

The majority of steels listed in this document, with properties in the quenched and tempered condition up to 160 mm thickness, are identical to steels specified in EN ISO 683-1 and EN ISO 683-2 and more extensive information on hardenability and technological properties is given in these standards.

General information on technical delivery conditions is given in EN 10021.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 10250-1:2022, *Open die steel forgings for general engineering purposes - Part 1: General requirements*

EN ISO 683-1:2018, *Heat-treatable steels, alloy steels and free-cutting steels - Part 1: Non-alloy steels for quenching and tempering (ISO 683-1:2016)*

EN ISO 6506-1, *Metallic materials - Brinell hardness test - Part 1: Test method (ISO 6506-1)*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Chemical composition

4.1 Cast analysis

The chemical composition of the steel shall be determined by cast analysis and shall conform to the analysis given in Table 1 (see EN 10250-1:2022, A.7 and A.8).

Measures should be taken to prevent the addition from the scrap, or other material used in the manufacture of the steel, of such elements which affect the hardenability, mechanical properties and applicability of the steel.

4.2 Product analysis

The product analysis shall not deviate from the specified cast analysis (see Table 1) by more than the values specified in EN ISO 683-1:2018, Table 4 (see EN 10250-1:2022, 9.2).

5 Heat treatment

Heat treatment details are given in Table A.1 for guidance.

6 Mechanical properties

6.1 Forgings in the normalized, normalized and tempered, and quenched and tempered condition

The mechanical properties determined on test pieces selected, prepared and tested in accordance with EN 10250-1:2022, Clauses 11 and 12 shall conform to the property requirements given in Tables 2 and 3, respectively.

6.2 Forgings in the annealed condition (Steels C45, C55 and C60)

Representative forgings selected by a method agreed with the purchaser shall be Brinell hardness tested in designated positions using techniques described in EN ISO 6506-1.

The maximum hardness obtained shall not exceed those given for the steel in Table 4.

Table 1 — Steel grades and chemical composition - Cast analysis [a]

Chemical composition % (m/m)											
Steel designation		C	Si Max	Mn	P Max	S Max	Cr Max	Mo Max	Ni Max	Cr+Mo+Ni Max	Al Min
Name	Number										
S235JR	1.0038	0,20 max [b]	0,55	1,40 max	0,045	0,045	0,30	0,08	0,30	0,48	0,020
S215G	1.0116	0,17 max [b]	0,55	1,40 max	0,035	0,035	0,30	0,08	0,30	0,48	0,020
S325G	1.0570	0,22 max [b]	0,55	1,60 max	0,035	0,035	0,30	0,08	0,30	0,48	0,020
C22	1.0402	0,17 to 0,24	0,40	0,40 to 0,70	0,045	0,045	0,40	0,10	0,40	0,63	–
C25	1.0406	0,22 to 0,29	0,40	0,40 to 0,70	0,045	0,045	0,40	0,10	0,40	0,63	–
C25E	1.1158	0,22 to 0,29	0,40	0,40 to 0,70	0,035	0,035	0,40	0,10	0,40	0,63	–
C30	1.0528	0,27 to 0,34	0,40	0,50 to 0,80	0,045	0,045	0,40	0,10	0,40	0,63	–
C30E	1.1178	0,27 to 0,34	0,40	0,50 to 0,80	0,025	0,035	0,40	0,10	0,40	0,63	-
C35	1.0501	0,32 to 0,39	0,40	0,50 to 0,80	0,045	0,045	0,40	0,10	0,40	0,63	–
C35E	1.1181	0,32 to 0,39	0,40	0,50 to 0,80	0,035	0,035	0,40	0,10	0,40	0,63	–
C40	1.0511	0,37 to 0,44	0,40	0,50 to 0,80	0,045	0,045	0,40	0,10	0,40	0,63	–
C40E	1.1185	0,37 to 0,44	0,40	0,50 to 0,80	0,025	0,035	0,40	0,10	0,40	0,63	-
C45	1.0503	0,42 to 0,50	0,40	0,50 to 0,80	0,045	0,045	0,40	0,10	0,40	0,63	–
C45E	1.1191	0,42 to 0,50	0,40	0,50 to 0,80	0,035	0,035	0,40	0,10	0,40	0,63	–
C50	1.0540	0,47 to 0,55	0,40	0,60 to 0,90	0,045	0,045	0,40	0,10	0,40	0,63	–
C50E	1.1206	0,47 to 0,55	0,40	0,60 to 0,90	0,025	0,035	0,40	0,10	0,40	0,63	-
C55	1.0535	0,52 to 0,60	0,40	0,60 to 0,90	0,045	0,045	0,40	0,10	0,40	0,63	–
C55E	1.1203	0,52 to 0,60	0,40	0,60 to 0,90	0,035	0,035	0,40	0,10	0,40	0,63	–
C60	1.0601	0,57 to 0,65	0,40	0,60 to 0,90	0,045	0,045	0,40	0,10	0,40	0,63	–
C60E	1.1221	0,57 to 0,65	0,40	0,60 to 0,90	0,035	0,035	0,40	0,10	0,40	0,63	
28Mn6	1.1170	0,25 to 0,32	0,40	1,30 to 1,65	0,035	0,035	0,40	0,10	0,40	0,63	–
20Mn5	1.1133	0,17 to 0,23	0,40	1,00 to 1,50	0,035	0,035	0,40	0,10	0,40	0,63	0,020

[a] At the option of the manufacturer the elements aluminium, titanium, vanadium and niobium may be added singly or in combination for grain size control purposes. Elements not quoted in Table 1 shall not be added to the steel without the agreement of the purchaser, except for the purpose of finishing the heat.

[b] For forgings with an equivalent diameter or thickness > 100 mm the carbon content shall be agreed between purchaser and supplier.

Table 2 — Mechanical properties in the normalized and normalized and tempered conditions

Steel designation		Thickness of ruling section t_R																					
		$t_R \leq 100$ mm						$100 < t_R \leq 250$ mm						$250 < t_R \leq 500$ mm						$500 < t_R \leq 1\,000$ mm [c]					
		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A_{min} %		KV_{min} J		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A_{min} %		KV_{min} J		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A_{min} %		KV_{min} J		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A min %		KV_{min} J	
Name	Number			l [a]	t_r [a]	l [a]	t_r [a]			l [a]	t_r [a]	l [a]	t_r [a]			l [a]	t_r [a]	l [a]	t_r [a]			l [a]	t_r [a]	l [a]	t_r [a]
S235JR	1.0038	215	340	24	-	35	-	175	340	23	17	30	20	165	340	23	17	27	15	-	-	-	-	-	-
S215G [b]	1.0116	215	340	24	-	35	-	175	340	23	17	30	20	165	340	23	17	27	15	-	-	-	-	-	-
S325G [b]	1.0570	315	490	20	-	35	-	275	450	18	12	30	20	265	450	18	12	27	15	-	-	-	-	-	-
C22	1.0402	210 [d]	410 [d]	25 [d]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C25	1.0406	230	440	23	-	35	-	210	420	23	17	30	20	190	400	23	17	25	15	180	390	22	16	20	15
C25E	1.1158	230	440	23	-	35	-	210	420	23	17	30	20	190	400	23	17	25	15	180	390	22	16	20	15
C30	1.1178	250	480	21	-	-	-	230	460	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C30E	1.1178	420 [d]	520 [d]	20 [d]																					
C35	1.0501	270	520	19	-	30	-	245	500	19	15	25	15	220	480	19	15	20	12	210	470	18	14	17	12
C35E	1.1181	270	520	19	-	30	-	245	500	19	15	25	15	220	480	19	15	20	12	210	470	18	14	17	12
C40	1.0511	290	550	17	-	-	-	260	530	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C40E	1.1186	460 [d]	650–800 [d]	16 [d]																					
C45	1.0503	305	580	16	-	-	-	275	560	16	12	18	10	240	540	16	12	15	10	230	530	15	11	12	10
C45E	1.1191	305	580	16	-	-	-	275	560	16	12	18	10	240	540	16	12	15	10	230	530	15	11	12	10
C50	1.0540	320	610	14	-	-	-	290	590	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C50E	1.1206	520 [d]	750–900 [d]	13 [d]																					
C55	1.0535	330	640	12	-	-	-	300	620	12	9	-	-	260	600	12	9	-	-	250	590	11	8	-	-
C55E	1.1203	330	640	12	-	-	-	300	620	12	9	-	-	260	600	12	9	-	-	250	590	11	8	-	-
C60	1.0601	340	670	11	-	-	-	310	650	11	8	-	-	275	630	11	8	-	-	260	620	10	7	-	-
C60E	1.1221	340	670	11	-	-	-	310	650	11	8	-	-	275	630	11	8	-	-	260	620	10	7	-	-

Steel designation		Thickness of ruling section t_R																					
		$t_R \leq 100$ mm						$100 < t_R \leq 250$ mm						$250 < t_R \leq 500$ mm						$500 < t_R \leq 1\,000$ mm [c]					
		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A_{min} %		KV_{min} J		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A_{min} %		KV_{min} J		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A_{min} %		KV_{min} J		$R_{e\,min}$ N/mm²	$R_{m\,min}$ N/mm²	A min %		KV_{min} J	
Name	Number			l [a]	t_r [a]	l [a]	t_r [a]			l [a]	t_r [a]	l [a]	t_r [a]			l [a]	t_r [a]	l [a]	t_r [a]			l [a]	t_r [a]	l [a]	t_r [a]
28Mn6	1.1170	310	600	18	-	35	-	290	570	18	12	30	20	270	540	18	12	25	15	260	540	17	11	20	15
20Mn5	1.1133	300	530	22	20	50	35	280	520	22	20	50	35	260	500	22	20	40	27	250	490	22	20	40	27

[a] l = longitudinal; tr = transverse.

[b] Impact testing shall be carried out at −20 °C.

[c] For steel grade 20 Mn5 max value for t_R is 750 mm.

[d] Please be aware that the indicated values referred to the footnote d are only valid for the smallest thickness of ruling section be $t_R \leq$ 8 mm. Therefore, only rough referenced values.