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Prosto kovani jekleni izkovki za splošno tehnično uporabo - 3. del: Legirana plemenita jekla

Open die steel forgings for general engineering purposes - Part 3: Alloy special steels

Freiformschmiedestücke aus Stahl für allgemeine Verwendung - Teil 3: Legierte Edelstähle

Pièces forgées en acier pour usage général - Partie 3: Aciers spéciaux alliés

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ICS:

77.140.20	Visokokakovostna jekla	Stainless steels
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Open die steel forgings for general engineering purposes - Part 3: Alloy special steels

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

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents

Page

European foreword 3
1 Scope 4
2 Normative references 4
3 Terms and definitions 4
4 Chemical composition 4
4.1 Cast analysis 4
4.2 Product analysis 4
5 Heat treatment 4
6 Mechanical properties 4
Annex A (informative) Heat treatment 9
Bibliography 10

European foreword

This document (EN 10250-3:2022) 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of an identical text or by endorsement, at the latest by September 2022, and conflicting national standards shall be withdrawn at the latest by September 2022.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 10250-3:1999.

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

— updating of normative references.

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.

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[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 alloy special steel and supplied in the quenched and tempered condition.

The majority of steels listed in this document 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*

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 steels, 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 Table 2 (see EN 10250-1:2022, 9.2).

5 Heat treatment

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

6 Mechanical properties

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 Table 3.

Table 1 — Steel grades and chemical composition [a]

Name	Number	C %	Si %	Mn %	P max %	S max %	Cr %	Mo %	Ni %	V %
38Cr2	1.7003	0,35 to 0,42	≤ 0,40	0,50 to 0,80	0,035	0,035	0,40 to 0,60	-	-	-
46Cr2	1.7006	0,42 to 0,50	≤ 0,40	0,50 to 0,80	0,035	0,035	0,40 to 0,60	-	-	-
34Cr4	1.7033	0,30 to 0,37	≤ 0,40	0,60 to 0,90	0,035	0,035	0,90 to 1,20	-	-	-
37Cr4	1.7034	0,34 to 0,41	≤ 0,40	0,60 to 0,90	0,035	0,035	0,90 to 1,20	-	-	-
41Cr4	1.7035	0,38 to 0,45	≤ 0,40	0,60 to 0,90	0,035	0,035	0,90 to 1,20	-	-	-
18CrMo4	1.7243	0,15 to 0,21	≤ 0,40	0,60 to 0,90	0,035	0,035	0,90 to 1,20	0,15 to 0,25	-	-
25CrMo4	1.7218	0,22 to 0,29	≤ 0,40	0,60 to 0,90	0,035	0,035	0,90 to 1,20	0,15 to 0,30	-	-
34CrMo4	1.7220	0,30 to 0,37	≤ 0,40	0,60 to 0,90	0,035	0,035	0,90 to 1,20	0,15 to 0,30	-	-
42CrMo4	1.7225	0,38 to 0,45	≤ 0,40	0,60 to 0,90	0,035	0,035	0,90 to 1,20	0,15 to 0,30	-	-
50CrMo4	1.7228	0,46 to 0,54	≤ 0,40	0,50 to 0,80	0,035	0,035	0,90 to 1,20	0,15 to 0,30	-	-
32CrMo12	1.7361	0,28 to 0,35	≤ 0,40	0,40 to 0,70	0,035	0,035	2,80 to 3,30	0,30 to 0,50	≤ 0,60	-
30CrMoV9	1.7707	0,26 to 0,34	≤ 0,40	0,40 to 0,70	0,035	0,035	2,30 to 2,70	0,15 to 0,25	≤ 0,60	0,10 to 0,20
40CrMoV13–9	1.8523	0,35 to 0,45	0,15 to 0,40	0,40 to 0,70	0,035	0,035	3,00 to 3,50	0,80 to 1,10	-	0,15 to 0,25
51CrV4	1.8159	0,47 to 0,55	≤ 0,40	0,70 to 1,10	0,035	0,035	0,90 to 1,20	-	-	0,10 to 0,25
30CrNiMo8	1.6580	0,26 to 0,34	≤ 0,40	0,30 to 0,60	0,035	0,035	1,80 to 2,20	0,30 to 0,50	1,80 to 2,20	-
34CrNiMo6	1.6582	0,30 to 0,38	≤ 0,40	0,50 to 0,80	0,035	0,035	1,30 to 1,70	0,15 to 0,30	1,30 to 1,70	-
36CrNiMo4	1.6511	0,32 to 0,40	≤ 0,40	0,50 to 0,80	0,035	0,035	0,90 to 1,20	0,15 to 0,30	0,90 to 1,20	-
36NiCrMo16	1.6773	0,32 to 0,39	≤ 0,40	0,30 to 0,60	0,030	0,025	1,60 to 2,00	0,25 to 0,45	3,60 to 4,10	-
28NiCrMoV8–5	1.6932	0,24 to 0,32	≤ 0,40	0,15 to 0,40	0,035	0,035	1,00 to 1,50	0,35 to 0,55	1,80 to 2,10	0,05 to 0,15
33NiCrMoV14–5	1.6956	0,28 to 0,38	≤ 0,40	0,15 to 0,40	0,035	0,035	1,00 to 1,70	0,30 to 0,60	2,90 to 3,80	0,08 to 0,25
20MnMoNi4–5	1.6311	0,17 to 0,23	≤ 0,40	1,00 to 1,50	0,035	0,035	≤ 0,50	0,45 to 0,60	0,40 to 0,80 [b]	-

[a] At the option of the manufacturer the elements aluminium, titanium, vanadium and niobium may be added singly or in combination for grain control purposes. Elements not quoted in Tables 1 and 2 shall not be added intentionally to the steel without the agreement of the purchaser, except for the purpose of finishing the heat.

[b] For greater cross-sections up to 1,00 % Ni is admissible.

Table 2 — Permissible deviations between the product analysis and the limiting values given in Table 1 for the cast analysis

Element	Permissible maximum content in the cast analysis %	Permissible deviation %
Carbon	≤ 0,55	±0,02
Silicon [a]	≤ 0,40	+0,03
Manganese	≤ 1,00 > 1,00 ≤ 1,50	±0,04 ±0,06
Phosphorus	≤ 0,035	+0,005
Sulphur	≤ 0,045	+0,005
Chromium	≤ 2,00 > 2,00 ≤ 3,50	±0,05 ±0,12
Molybdenum	≤ 0,30 > 0,30 ≤ 1,10	±0,03 ±0,06
Nickel	≤ 2,00 > 2,00 ≤ 4,10	±0,05 ±0,07
Vanadium	≤ 0,25	±0,02
[a] For steel 40CrMoV13-9, the permissible deviation is ±0,03 %.		

Table 3 — Mechanical properties in the quenched and tempered condition

Thickness of ruling section t_R																			
Steel designation		**t_R ≤ 160 mm**						**160 < t_R ≤ 330 mm**						**330 < t_R ≤ 660 mm [b]**					
Name	**Number**	**$R_{e\,min}$ 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**	
				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]
38Cr2	1.7003	350	600	17	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46Cr2	1.7006	400	650	15	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34Cr4	1.7033	460	700	15	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37Cr4	1.7034	510	750	14	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41Cr4	1.7035	560	800	14	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18CrMo4	1.7243	275 ($R_{p\,0,2}$)	485–660	20	20	50	50	-	-	-	-	-	-	-	-	-	-	-	-
25CrMo4	1.7218	450	700	15	-	50	-	400	650	17	13	45	27	380	600	18	14	38	22
34CrMo4	1.7220	550	800	14	-	45	-	450	700	15	10	40	22	410	650	16	12	33	17
42CrMo4	1.7225	500	750	14	10	30	16	460	700	15	11	27	14	390	600	16	12	22	12
50CrMo4	1.7228	550	800	13	9	25	14	540	750	14	10	20	12	490	700	15	11	15	10
32CrMo12	1.7361	680	900	12	8	35	20	630	850	13	9	35	20	490	700	15	11	35	20
30CrMoV9	1.7707	700	900	12	8	35	20	590	800	14	10	35	20	-	-	-	-	-	-
40CrMoV13–9	1.8523	660	850	15	15	35	35	660	850	15	15	35	35	660	850	15	15	35	35
		720	900	15	15	32	32	720	900	15	15	32	32	720	900	15	15	32	32
		780	950	14	14	30	30	780	950	14	14	30	30	780	950	14	14	30	30
		840	1000	12	12	25	25	840	1000	12	12	25	25	-	-	-	-	-	-
		890	1050	11	11	22	22	-	-	-	-	-	-	-	-	-	-	-	-
		940	1100	11	11	20	20	-	-	-	-	-	-	-	-	-	-	-	-
51CrV4	1.8159	600	800	13	9	30	16	-	-	-	-	-	-	-	-	-	-	-	-
30NiCrMo8	1.6580	700	900	12	8	45	22	630	850	12	8	45	22	590	800	12	8	40	20
34CrNiMo6	1.6582	600	800	13	9	45	22	540	750	14	10	45	22	490	700	15	11	40	20
36CrNiMo4	1.6511	550	750	14	10	45	22	500	700	15	11	45	22	450	650	16	12	40	20

Thickness of ruling section t_R																			
Steel designation		$t_R \leq 160$ mm						$160 < t_R \leq 330$ mm						$330 < t_R \leq 660$ mm [b]					
Name	Number	$R_{e\,min}$ 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	
				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]
36NiCrMo16	1.6773	800	1000	11	8	45	22	800	1000	11	8	45	22	800	1000	11	8	45	22
28NiCrMoV8–5	1.6932	630	800	14	10	45	25	590	750	15	11	40	21	590	750	15	11	40	21
33NiCrMoV14–5	1.6956	980	1100	10	7	28	17	820	1000	12	8	48	27	780	950	12	8	48	27
20MnMoNi4–5	1.6311	420	580	17	14	39	24	390	550	17	14	39	24	-	-	-	-	-	-

[a] l = longitudinal; tr = transverse.

[b] For steels 42CrMo4, 50CrMo4, 36CrNiMo4 these properties apply only to a $t_R \leq 500$ mm.