BRITISH STANDARD

BS EN 10132-3:2000
Incorporating Corrigendum No.1

Cold rolled narrow steel strip for heat treatment — Technical delivery conditions —

Part 3: Steels for quenching and tempering

The European Standard EN 10132-3:2000 has the status of a British Standard

ICS 77.140.10; 77.140.50

National foreword

This British Standard is the official English language version of EN 10132-3:2000. Together with BS EN 10132-1 and BS EN 10132-2, it supersedes BS 1449-1.15:1991 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/31, Wrought steels, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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Summary of pages

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EUROPEAN STANDARD

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EN 10132-3

February 2000

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English version

Cold rolled narrow steel strip for heat treatment - Technical delivery conditions - Part 3: Steels for quenching and tempering

Feuillards laminés à froid pour traitement thermique - Conditions techniques de livraison - Partie 3: Acier pour trempe et revenu

Kaltband aus Stahl für eine Wärmebehandlung - Technische Lieferbedingungen - Teil 3: Vergütungsstähle

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Contents

Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 23, Steels for heat treatment, alloy steels and free-cutting steels - Qualities and dimensions, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

The European Standard EN 10132, Cold rolled narrow steel strip for heat-treatment - Technical delivery conditions, is subdivided as follows:

Part 1: General;
Part 2: Case hardening steels;
Part 3: Steels for quenching and tempering;
Part 4: Spring steels and other special applications.

1 Scope

1.1 This part of EN 10132 applies to non-alloy and alloy cold rolled narrow steel strip in thicknesses up to 6 mm for quenching and tempering, and in the quenched and tempered condition with thicknesses between 0,30 mm and 3,00 mm for general and for specific applications.

1.2 This EN 10132-3 is complemented by EN 10132-1.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10020, *Definition and classification of grades of steel*.

EN 10132-1, *Cold rolled narrow steel strip for heat treatment - Technical delivery conditions - Part 1: General*.

EN 10140, *Cold rolled narrow steel strip - Tolerances on dimensions and shape*.

EN ISO 6508-1, *Metallic materials - Rockwell hardness test - Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T) (ISO 6508-1:1999)*.

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN 10132-1 apply.

4 Classification and designation

4.1 Classification

All steels covered by this European Standard are classified according to EN 10020. Steel grades C22E, C30E, C35E, C40E, C45E, C50E, C55E, C60E and 25Mn4 are non-alloy special steels, steel grades 25CrMo4, 34CrMo4 and 42CrMo4 are alloy special steels.

4.2 Designation

See EN 10132-1.

5 Information to be supplied by the purchaser

See EN 10132-1.

6 Manufacturing process

See EN 10132-1.

7 Requirements

7.1 General

See EN 10132-1.

7.2 Method of delivery

See EN 10132-1.

7.3 Delivery condition

Cold rolled narrow steel strip covered by EN 10132-3 shall be supplied in one of the following delivery conditions:

— annealed or annealed and skin passed (+A or +LC);

— cold rolled (+CR);

— quenched and tempered (+QT) - for the grades indicated in Table 3 of this standard.

NOTE The delivery condition - annealed to achieve spheroidized carbides (+AC) - may be agreed. In such cases, limits on spheroidization and mechanical properties may also be agreed at the time of enquiry and order.

7.4 Chemical composition

7.4.1 Cast analysis

The chemical composition shall be in accordance with the values specified in Table 1 for the cast analysis.

7.4.2 Product analysis

In cases where a product analysis is requested, the admissible deviations from the values specified for the cast analysis are indicated in Table 2.

7.5 Mechanical properties

The mechanical properties of the strip shall be in accordance with the values given in Table 3. For thicknesses outside this range, mechanical properties shall be agreed between the customer and the supplier.

NOTE 1 For those customers who specify Rockwell hardness rather than Vickers hardness or tensile strength, a table is given in A.1, showing Rockwell hardness values for information.

NOTE 2 For information, the minimum hardness values given in Table A.2 show the minimum values after quenching, without tempering.

7.6 Structure

7.6.1 Grain size

See EN 10132-1.

7.6.2 Non-metallic inclusions

See EN 10132-1.

7.6.3 Decarburization

For steels with minimum carbon contents > 0,50 %, decarburization shall not exceed 3 % of the material thickness per side when measured at a distance of 5 mm from the strip edge (see also EN 10132-1).

7.7 Surface finish

The surface finish of cold rolled steel strip shall be bright as achieved by rolling and annealing in a controlled atmosphere.

The surface finishes of quenched and tempered cold rolled strip are as follows:

— grey/blue oxide finish: unpolished;

— bright tempered: unpolished;

— polished: obtained by fine grinding, abrasive brushing or other processes;

— polished and coloured: blue or yellow colour obtained by oxidization by heat treatment.

7.8 Dimensions and tolerances on dimensions and shape

Tolerances on width for quenched and tempered strip shall be agreed between customer and supplier. For all other tolerances EN 10140 applies (see also EN 10132-1).

Special edges are available by agreement between supplier and customer, and the tolerances on width for these edges are to be agreed.

8 Inspection

See EN 10132-1.

9 Sampling

See EN 10132-1.

10 Test methods

See EN 10132-1.

11 Labelling, packaging and protection

See EN 10132-1.

12 Retests

See EN 10132-1.

Table 1 - Chemical composition of steels for quenching and tempering[a] (cast analysis)

Steel designation		% by mass							
name	number	C	Si max.	Mn	P max.	S max.	Cr	Mo	Ni max.
C22E	1.1151	0,17 to 0,24	0,40	0,40 to 0,70	0,035	0,035	max. 0,40	max. 0,10	0,40
C30E	1.1178	0,27 to 0,34	0,40	0,50 to 0,80	0,035	0,035	max. 0,40	max. 0,10	0,40
C35E	1.1181	0,32 to 0,39	0,40	0,50 to 0,80	0,035	0,035	max. 0,40	max. 0,10	0,40
C40E	1.1186	0,37 to 0,44	0,40	0,50 to 0,80	0,035	0,035	max. 0,40	max. 0,10	0,40
C45E	1.1191	0,42 to 0,50	0,40	0,50 to 0,80	0,035	0,035	max. 0,40	max. 0,10	0,40
C50E	1.1206	0,47 to 0,55	0,40	0,60 to 0,90	0,035	0,035	max. 0,40	max. 0,10	0,40
C55E	1.1203	0,52 to 0,60	0,40	0,60 to 0,90	0,035	0,035	max. 0,40	max. 0,10	0,40
C60E	1.1221	0,57 to 0,65	0,40	0,60 to 0,90	0,035	0,035	max. 0,40	max. 0,10	0,40
25Mn4	1.1177	0,23 to 0,28	0,40	0,95 to 1,15	0,035	0,035	max. 0,40	max. 0,10	0,40
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	-

[a] Elements not quoted in this table shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition, from scrap or other material used in manufacture, of such elements which affect the hardenability, mechanical properties and application.

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 % by mass	Permissible deviation[a] % by mass
C	≤ 0,55 > 0,55 ≤ 0,65	±0,02 ±0,03
Si	≤ 0,40	+0,03
Mn	≤ 0,95 > 0,95 ≤ 1,15	±0,04 ±0,05
P	≤ 0,035	+0,005
S	≤ 0,035	+0,005
Cr	≤ 0,40 > 0,40 ≤ 1,20	+0,03 ±0,04
Mo	≤ 0,10 > 0,10 ≤ 0,30	+0,02 ±0,03
Ni	≤ 0,40	+0,04

[a] ± means that in one cast the deviation may occur over the upper value or under the lower value of the specified range in Table 1, but not both at the same time.

Table 3 - Mechanical properties and hardness requirements[a, b]

Steel designation		delivery condition							
		annealed (+A) or annealed and skin passed (+LC)				cold rolled[c] (+CR)		quenched and tempered[d] (+QT)	
name	number	$R_{p0,2e}$[e] N/mm² Max.	R_m[e] N/mm² max.	A_{80}[e] % min.	HV[e] max.	R_m[e] N/mm² max.	HV[e] max.	R_m[e] N/mm²	HV[e]
C22E	1.1151	400	500	22	155	900	265	-	-
C30E	1.1178	420	520	20	165	920	270	-	-
C35E	1.1181	430	540	19	170	930	275	-	-
C40E	1.1186	440	550	18	170	970	280	-	-
C45E	1.1191	455	570	18	180	1 020	290	-	-
C50E	1.1206	465	580	17	180	1 050	295	1 050 to 1650	325 to 505
C55E	1.1203	480	600	17	185	1 070	300	1 100 to 1700	340 to 520
C60E	1.1221	495	620	17	195	1 100	305	1 150 to 1750	345 to 530
25Mn4	1.1177	460	590	20	180	[f]	[f]	-	-
25CrMo4	1.7218	440	580	19	175	[f]	[f]	990 to 1400	305 to 435
34CrMo4	1.7220	460	600	16	185	[f]	[f]	1 020 to 1500	315 to 465
42CrMo4	1.7225	480	620	15	195	[f]	[f]	1 100 to 1600	340 to 490

[a] The customer may specify hardness or tensile values but not both. If neither is specified then tensile values shall apply.

[b] Values apply to thicknesses 0,30 mm ≤ t < 3,00 mm. For thicker strip, the values for the mechanical properties shall be agreed at the time of enquiry and order.

[c] For material supplied in the cold rolled condition, a range of 150 N/mm² or 50 HV shall apply, e.g. 700 N/mm² to 850 N/mm² or e.g. 200 HV to 250 HV.

[d] For material supplied in the quenched and tempered condition, a range of 150 N/mm² or 50 HV shall apply, e.g. 1 150 N/mm² to 1 300 N/mm² or e.g. 350 HV to 400 HV.

[e] $R_{p0,2}$ 0,2 %-Proof strength; R_m Tensile strength; A_{80} Elongation on a gauge length of 80 mm; HV Vickers hardness.

[f] Cold rolled condition may be supplied on request. In this case, the mechanical properties shall be agreed at the time of enquiry and order.

Annex A
(informative)

Technical information on steels for quenching and tempering

Table A.1 - Reference values for Rockwell hardnesses for steels for quenching and tempering[a]

Steel designation		delivery condition	
name	number	annealed (+A) or annealed and skin passed (+LC) HRB[c] max.	quenched and tempered (+QT)[b] HRC[c]
C22E	1.1151	78	-
C30E	1.1178	82	-
C35E	1.1181	86	-
C40E	1.1186	87	-
C45E	1.1191	88	-
C50E	1.1206	89	33 to 49,5
C55E	1.1203	90	34 to 50,5
C60E	1.1221	91	35 to 51
25Mn4	1.1177	88	-
25CrMo4	1.7218	87	31,5 to 44
34CrMo4	1.7220	88	32 to 46
42CrMo4	1.7225	90	35 to 48,5

[a] For thicknesses less than those allowed in EN ISO 6508-1, the scale of Rockwell hardness shall be agreed at the time of enquiry and order.

[b] For material supplied in the quenched and tempered condition, a range of 5 HRC shall apply for hardnesses ≤ 40 HRC and a range of 4 HRC shall apply for hardnesses > 40 HRC.

[c] HRB Rockwell hardness (scale B); HRC Rockwell hardness (scale C).

Table A.2 - Reference values for the heat treatment and the minimum hardness values in the quenched condition

Steel designation		Austenitizing temperature	Quenching medium	Minimum hardness[a] in the quenched condition without tempering	
name	number	°C		HRC[b, c]	HV[c]
C22E	1.1151	-	-	-	-
C30E	1.1178	-	-	-	-
C35E	1.1181	-	-	-	-
C40E	1.1186	840 to 870	water	51	530
C45E	1.1191	840 to 870	water	52	540
C50E	1.1206	830 to 860	water	53	560
C55E	1.1203	830 to 860	oil	55	600
C60E	1.1221	825 to 855	oil	57	640
25Mn4	1.1177	-	-	-	-
25CrMo4	1.7218	840 to 870	water	44	430
34CrMo4	1.7220	840 to 870	oil	48	480
42CrMo4	1.7225	840 to 870	oil	51	530

[a] The thickness range up to which these minimum values apply is 0,30 mm to 3,00 mm.

[b] For thicknesses less than those allowed in EN ISO 6508-1, the scale of Rockwell hardness shall be agreed at the time of enquiry and order.

[c] HRC Rockwell hardness (scale C); HV Vickers hardness.

Annex B
(informative)

List of corresponding former national designations

Table B.1 - List of corresponding former designations

Steel designation according to EN 10132-3:2000		Comparable former steel designation in						
name	number	Germany		France	United Kingdom	Finland	Sweden	Spain
		name	number					
C22E	1.1151	Ck22	1.1151	XC18	CS22	-	-	-
C30E	1.1178	Ck30	1.1178	XC32	CS30	-	-	C25K
C35E	1.1181	Ck35	1.1181	XC38H1	-	C35	SS1572	-
C40E	1.1186	Ck40	1.1186	XC42H1	CS40	-	-	C35K
C45E	1.1191	Ck45	1.1191	XC48H1	-	C45	SS1672	-
C50E	1.1206	Ck50	1.1206	-	CS50	-	SS1674	C45K
C55E	1.1203	Ck55	1.1203	XC55H1	-	-	-	-
C60E	1.1221	Ck60	1.1221	-	CS60	-	-	C55K
25Mn4	1.1177	-	-	-	-	-	-	-
25CrMo4	1.7218	25CrMo4	1.7218	25CD4	-	25CrMo4	SS2225	-
34CrMo4	1.7220	34CrMo4	1.7220	34CD4	-	34CrMo4	SS2234	-
42CrMo4	1.7225	42CrMo4	1.7225	42CD4	-	42CrMo4	SS2244	40CrMo4

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