BRITISH STANDARD

BS EN
10277-3:1999

Bright steel products — Technical delivery conditions —

Part 3: Free-cutting steels

The European Standard EN 10277-3:1999 has the status of a British Standard

ICS 77.140.60

National foreword

This British Standard is the English language version of EN 10277-3:1999. This part of BS EN 10277 together with BS EN 10278 and BS EN 10277 parts 1, 2, 4 and 5 supersedes BS 970-3:1991 which is withdrawn.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.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 6, an inside back cover and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 December 1999

ISBN 0 580 32835 X

Amendments issued since publication

Amd. No.	Date	Comments

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 10277-3

July 1999

ICS 77.140.10; 77.140.60

English version

Bright steel products — Technical delivery conditions — Part 3: Free-cutting steels

Produits en acier transformés à froid — Conditions techniques de livraison — Partie 3: Aciers de décolletage

Blankstahlerzeugnisse — Technische Lieferbedingungen — Teil 3: Automatenstähle

This European Standard was approved by CEN on 11 June 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 10277-3:1999 E

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 January 2000, and conflicting national standards shall be withdrawn at the latest by January 2000.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association. This European Standard is considered to be a supporting standard to those applications and product standards which in themselves support an essential safety requirement of a New Approach Directive and which make reference to this European Standard.

This European Standard EN 10277, Bright steel products — Technical delivery conditions, is subdivided as follows:

— *Part 1: General;*

— *Part 2: Steels for general engineering purposes;*

— *Part 3: Free-cutting steels;*

— *Part 4: Case-hardening steels;*

— *Part 5: Steels for quenching and tempering.*

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.

Contents

1 Scope

1.1 This part of EN 10277 applies to bright steel bars in the drawn, turned or ground condition, in straight lengths of free-cutting steels.

1.2 This EN 10277-3 is complemented by EN 10277-1.

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 10087:1998, *Free-cutting steels — Technical delivery conditions for semi-finished products, hot-rolled bars and rods.*

EN 10277-1, *Bright steel products — Technical delivery conditions — Part 1: General.*

3 Definitions

See EN 10277-1.

4 Classification and designation

4.1 Classification

All steels specified in this European Standard are classified as non-alloy quality steels.

4.2 Designation

See EN 10277-1.

5 Information to be supplied by the purchaser

See EN 10277-1.

6 Manufacturing process

See EN 10277-1.

7 Requirements

7.1 Chemical composition

7.1.1 *Cast analysis*

The chemical composition of the steel according to the cast analysis shall be as specified in Table 1.

7.1.2 *Product analysis*

The permissible deviations from the chemical composition as specified in Table 1 for cast analysis and the product analysis of the steel shall be as specified in Table 2.

7.2 Mechanical properties

The mechanical properties shall be as specified:

— in Table 3 for steels not intended for heat treatment;

— in Table 4 for case-hardening steels;

— in Table 5 for direct-hardening steels.

7.3 Supplementary or special requirements

See annex B of EN 10277-1.

8 Inspection and testing

See EN 10277-1.

9 Marking

See EN 10277-1.

Table 1 — Types of steel, chemical composition (applicable to cast analysis)[1)]

Designation		Steel grade according to	Chemical composition (% by mass)					
Steel name	Steel number		C	Si max.	Mn	P max.	S	Pb
Steels not intended for heat treatment								
11SMn30	1.0715	EN 10087:1998	≤0,14	0,05[2)]	0,90 to 1,30	0,11	0,27 to 0,33	—
11SMnPb30	1.0718	EN 10087:1998	≤0,14	0,05	0,90 to 1,30	0,11	0,27 to 0,33	0,20 to 0,35
11SMn37	1.0736	EN 10087:1998	≤0,14	0,05[2)]	1,00 to 1,50	0,11	0,34 to 0,40	—
11SMnPb37	1.0737	EN 10087:1998	≤0,14	0,05	1,00 to 1,50	0,11	0,34 to 0,40	0,20 to 0,35
Case-hardening steels								
10S20	1.0721	EN 10087:1998	0,07 to 0,13	0,40	0,70 to 1,10	0,06	0,15 to 0,25	—
10SPb20	1.0722	EN 10087:1998	0,07 to 0,13	0,40	0,70 to 1,10	0,06	0,15 to 0,25	0,20 to 0,35
15SMn13	1.0725	EN 10087:1998	0,12 to 0,18	0,40	0,90 to 1,30	0,06	0,08 to 0,18	—
Direct-hardening steels								
35S20	1.0726	EN 10087:1998	0,32 to 0,39	0,40	0,70 to 1,10	0,06	0,15 to 0,25	—
35SPb20	1.0756	EN 10087:1998	0,32 to 0,39	0,40	0,70 to 1,10	0,06	0,15 to 0,25	0,15 to 0,35
36SMn14	1.0764	EN 10087:1998	0,32 to 0,39	0,40	1,30 to 1,70	0,06	0,10 to 0,18	—
36SMnPb14	1.0765	EN 10087:1998	0,32 to 0,39	0,40	1,30 to 1,70	0,06	0,10 to 0,18	0,15 to 0,35
38SMn28	1.0760	EN 10087:1998	0,35 to 0,40	0,40	1,20 to 1,50	0,06	0,24 to 0,33	—
38SMnPb28	1.0761	EN 10087:1998	0,35 to 0,40	0,40	1,20 to 1,50	0,06	0,24 to 0,33	0,15 to 0,35
44SMn28	1.0762	EN 10087:1998	0,40 to 0,48	0,40	1,30 to 1,70	0,06	0,24 to 0,33	—
44SMnPb28	1.0763	EN 10087:1998	0,40 to 0,48	0,40	1,30 to 1,70	0,06	0,24 to 0,33	0,15 to 0,35
46S20	1.0727	EN 10087:1998	0,42 to 0,50	0,40	0,70 to 1,10	0,06	0,15 to 0,25	—
46SPb20	1.0757	EN 10087:1998	0,42 to 0,50	0,40	0,70 to 1,10	0,06	0,15 to 0,25	0,15 to 0,35

[1)] 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. However, elements such as Te, Bi, etc., may be added by the manufacturer for improving the machinability, if this has been agreed at the time of enquiry and order.

[2)] If, by metallurgical techniques, the formation of special oxides is guaranteed, a Si-content of 0,10 to 0,40 % can be agreed.

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

Element	Permissible maximum content according to cast analysis % by mass		Permissible deviations[1] % by mass
C		≤0,30	±0,02
	>0,30	≤0,50	±0,03
Si		≤0,05	+0,01
	>0,05	≤0,40	+0,03
Mn		≤1,00	±0,04
	>1,00	≤1,70	±0,06
P		≤0,06	+0,008
	>0,06	≤0,11	+0,02
S		≤0,33	±0,03
	>0,33	≤0,40	±0,04
Pb		≤0,35	+0,03 −0,02

[1] ± 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 of free-cutting steels not intended for heat treatment

Designation		Thickness[1]	Mechanical properties[1]				
			As rolled + turned (+SH)		Cold drawn (+C)		
Steel name	Steel number	mm	Hardness[2] HB	R_m N/mm²	$R_{p0,2}$[3] N/mm² min.	R_m[3] N/mm²	A_5 % min.
11SMn30	1.0715	≥5 ≤10			440	510 to 810	6
11SMnPb30	1.0718	>10 ≤16			410	490 to 760	7
11SMn37	1.0736	>16 ≤40	112 to 169	380 to 570	375	460 to 710	8
11SMnPb37	1.0737	>40 ≤63	112 to 169	370 to 570	305	400 to 650	9
		>63 ≤100	107 to 154	360 to 520	245	360 to 630	9

[1] For thicknesses <5 mm the mechanical properties may be agreed at the time of enquiry and order.

[2] Only for information.

[3] For flats the proof strength ($R_{p0,2}$) may deviate by −10 % and the tensile strength (R_m) by ±10 %.

Table 4 — Mechanical properties of free-cutting steels for case hardening

Designation		Thickness[1]	Mechanical properties[1]				
			As rolled + turned (+SH)		Cold drawn (+C)		
Steel name	Steel number	mm	Hardness[2] HB	R_m N/mm²	$R_{p0,2}$[3] N/mm² min.	R_m[3] N/mm²	A_5 % min.
10S20	1.0721	≥5 ≤10			410	520 to 780	7
10SPb20	1.0722	>10 ≤16			390	490 to 740	8
		>16 ≤40	107 to 156	360 to 530	360	460 to 720	9
		>40 ≤63	107 to 156	360 to 530	295	410 to 660	10
		>63 ≤100	105 to 146	350 to 490	235	380 to 630	11
15SMn13	1.0725	≥5 ≤10			450	560 to 840	6
		>10 ≤16			430	500 to 800	7
		>16 ≤40	128 to 178	430 to 600	390	470 to 770	8
		>40 ≤63	128 to 172	430 to 580	350	460 to 680	9
		>63 ≤100	125 to 160	420 to 540	265	440 to 650	10

[1] For thicknesses <5 mm the mechanical properties may be agreed at the time of enquiry and order.

[2] Only for information.

[3] For flats the proof strength ($R_{p0,2}$) may deviate by −10 % and the tensile strength (R_m) by ±10 %.

Table 5 — Mechanical properties of free-cutting steels for direct hardening

Designation		Thickness[1)2)]	Mechanical properties[2)]										
Steel name	Steel number		As rolled + turned (+SH)		Cold drawn (+C)			Cold drawn + quenched + tempered[3)] (+C +QT)			Quenched + tempered + cold drawn (+QT +C)		
		mm	Hardness[4)] HB	R_m N/mm²	$R_{p0,2}$[5)] N/mm² min.	R_m[5)] N/mm²	A_5 % min.	$R_{p0,2}$ N/mm² min.	R_m N/mm²	A_5 % min.	$R_{p0,2}$ N/mm² min.	R_m N/mm²	A_5 % min.
35S20	1.0726	≥5 ≤10			480	640 to 880	6				600	700 to 870	9
35SPb20	1.0756	>10 ≤16			400	590 to 830	7				580	700 to 850	11
		>16 ≤40	154 to 201	520 to 680	360	560 to 800	8	380	600 to 750	16	550	700 to 850	12
		>40 ≤63	154 to 198	520 to 670	340	530 to 760	9	320	550 to 700	17	530	650 to 800	13
		>63 ≤100	149 to 193	500 to 650	300	510 to 680	9	320	550 to 700	17	500	650 to 800	14
36SMn14	1.0764	≥5 ≤10			500	660 to 960	6				560	750 to 1 000	6
36SMnPb14	1.0765	>10 ≤16			440	620 to 900	6				530	740 to 990	6
		>16 ≤40	166 to 222	560 to 750	390	600 to 840	7	420	670 to 820	15	470	720 to 970	8
		>40 ≤63	166 to 219	560 to 740	360	580 to 780	8	400	640 to 790	16	420	680 to 930	9
		>63 ≤100	163 to 219	550 to 740	340	560 to 760	9	360	570 to 720	17	400	580 to 840	9
38SMn28	1.0760	≥5 ≤10			550	700 to 960	6				700	850 to 1 000	9
38SMnPb28	1.0761	>10 ≤16			500	660 to 930	6				680	775 to 925	10
		>16 ≤40	166 to 216	560 to 730	420	610 to 850	7	420	700 to 850	15	650	700 to 900	12
		>40 ≤63	166 to 216	560 to 730	400	600 to 790	7	400	700 to 850	16	650	700 to 900	13
		>63 ≤100	163 to 207	550 to 700	350	580 to 760	8	380	630 to 800	16	500	625 to 850	14
44SMn28	1.0762	≥5 ≤10			600	760 to 1 030[6)]	5[6)]				710	850 to 1 000	9
44SMnPb28	1.0763	>10 ≤16			530	710 to 980[6)]	5[6)]				710	850 to 1 000	9
		>16 ≤40	187 to 242	630 to 820	460	660 to 900[6)]	6[6)]	420	700 to 850	16	660	700 to 900	11
		>40 ≤63	184 to 235	620 to 790	430	650 to 870	7	410	700 to 850	16	660	700 to 900	12
		>63 ≤100	181 to 231	610 to 780	390	630 to 840	7	400	700 to 850	16	660	700 to 900	12
46S20	1.0727	≥5 ≤10			570	740 to 980	5				680	850 to 1 000	8
46SPb20	1.0757	>10 ≤16			470	690 to 930	6				650	800 to 950	9
		>16 ≤40	175 to 225	590 to 760	400	640 to 880	7	430	650 to 800	13	620	700 to 850	10
		>40 ≤63	172 to 216	580 to 730	380	610 to 850	8	370	630 to 780	14	620	700 to 850	11
		>63 ≤100	166 to 211	560 to 710	340	580 to 770	8	370	630 to 780	14	580	650 to 850	11

[1)] For non-round products in the quenched and tempered condition, see EN 10277-1, Figure A.1.

[2)] For thicknesses <5 mm the mechanical properties may be agreed at the time of enquiry and order.

[3)] These values are also valid for the quenched + tempered + turned condition.

[4)] Only for information.

[5)] For flats the proof strength ($R_{p0,2}$) may deviate by −10 % and the tensile strength (R_m) by ±10 %.

[6)] By means of heavy drafting these steels may be supplied with a minimum tensile strength (R_m) of 920 N/mm² and a minimum elongation (A) of 4 %.

BS EN 10277-3:1999

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL

Previous page is blank