

	Bright steel products Technical delivery conditions Part 2: Steels for general engineering purposes English version of DIN EN 10277-2	DIN EN 10277-2
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November 1990 edition.

Blankstahlerzeugnisse – Technische Lieferbedingungen –
 Teil 2: Stähle für allgemeine technische Verwendung

European Standard EN 10277-2 : 1999 has the status of a DIN Standard.

A comma is used as the decimal marker.

National foreword

This standard has been prepared by ECISS/TC 23.

The responsible German body involved in its preparation was the *Normenausschuß Eisen und Stahl* (Iron and Steel Standards Committee).

Amendments

DIN 1652-2, November 1990 edition, has been superseded by the specifications of EN 10277-2.

Previous editions

DIN 1652: 1944x-08, 1963-05; DIN 1652-2: 1990-11.

EN comprises 9 pages.

English version

Bright steel products
Technical delivery conditions
Part 2: Steels for general engineering purposes

Produits en acier transformés à froid – Conditions techniques de livraison – Partie 2: Aciers d'usage général	Blankstahlerzeugnisse – Technische Lieferbedingungen – Teil 2: Stähle für allgemeine technische Verwendung
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This European Standard was approved by CEN on 1999-06-11.

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.

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CEN

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

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

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of an identical text or by endorsement, at the latest by January 2000, and conflicting national standards shall be withdrawn at the latest by January 2000.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

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 general engineering steels.

1.2 This EN 10277-2 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 10025:1990+A1:1993	Hot rolled products of non-alloy structural steels - Technical delivery conditions (includes amendment A1:1993)
EN 10083-2:1991+A1:1996	Quenched and tempered steels - Part 2: Technical delivery conditions for unalloyed quality steels (includes amendment A1:1996)
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.

NOTE: This Standard does not comprise impact requirements.

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 of the steels shall be as specified in table 3.

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: Chemical composition¹⁾

Designation		Steel grade according to	Chemical composition, % by mass									
Steel	Steel		C	Si	Mn	P	S	N ^{2,3)}	Cr	Mo	Ni	Cr+Mo+Ni
S235JRG2	1.0122	EN 10025:1990+A1:1993	max. 0,17 ⁴⁾	⁵⁾	max. 1,40	0,045	0,045	0,009	-	-	-	-
E295GC ⁶⁾	1.0533 ⁶⁾	EN 10025:1990+A1:1993	-	⁷⁾	-	0,045	0,045	0,009	-	-	-	-
E355GC	1.0543	EN 10025:1990+A1:1993	-	⁷⁾	-	0,045	0,045	0,009	-	-	-	-
S355J2G3C	1.0569 ⁶⁾	EN 10025:1990+A1:1993	max. 0,20 ⁸⁾	0,55 ⁹⁾	max. 1,60	0,035	0,035	-	-	-	-	-
C10 ¹⁰⁾	1.0301 ¹⁰⁾	-	0,07 to 0,13	0,40	0,30 to 0,60	0,045	0,045	-	-	-	-	-
C15 ¹⁰⁾	1.0401 ¹⁰⁾	-	0,12 to 0,18	0,40	0,30 to 0,80	0,045	0,045	-	-	-	-	-
C16 ¹⁰⁾	1.0407 ¹⁰⁾	-	0,12 to 0,18	0,40	0,60 to 0,90	0,045	0,045	-	-	-	-	-
C35 ¹⁰⁾	1.0501 ¹⁰⁾	EN 10083-	0,32 to 0,39	0,40	0,50 to 0,80	0,045	0,045	-	0,40	0,10	0,40	0,63
C40 ¹⁰⁾	1.0511 ¹⁰⁾	EN 10083-	0,37 to 0,44	0,40	0,50 to 0,80	0,045	0,045	-	0,40	0,10	0,40	0,63
C45 ¹⁰⁾	1.0503 ¹⁰⁾	EN 10083-	0,42 to 0,50	0,40	0,50 to 0,80	0,045	0,045	-	0,40	0,10	0,40	0,63
C50 ¹⁰⁾	1.0540 ¹⁰⁾	EN 10083-	0,47 to 0,55	0,40	0,60 to 0,90	0,045	0,045	-	0,40	0,10	0,40	0,63
C60 ¹⁰⁾	1.0601 ¹⁰⁾	EN 10083-	0,57 to 0,65	0,40	0,60 to 0,90	0,045	0,045	-	0,40	0,10	0,40	0,63

1) Chemical composition is determined by cast analysis.

2) It is permissible to exceed the specified values provided that for each increase of 0,001 % N the P max. content will be reduced by 0,005 %; the N content of the ladle analysis, however, shall not be more than 0,012 %.

3) The max. value for nitrogen does not apply if the chemical composition shows a minimum total Al content of 0,020 % or if sufficient other N binding elements are present. The N binding elements shall be mentioned in the inspection document.

4) Max. 0,20 % C for nominal thicknesses > 16 mm.

5) Method of deoxidation optional.

6) For applications where weldability is necessary, steel S355J2G3C (1.0569) should be used instead of E295GC (1.0533).

7) Rimming steel not permitted.

8) Max. 0,22 % C for nominal thicknesses > 30 mm.

9) Fully killed steel containing nitrogen binding elements in amounts sufficient to bind the available nitrogen (for example min. 0,020 % Al). If other elements are used they shall be reported in the inspection document.

10) Steels with improved machinability and/or addition of lead (Pb) may be supplied on request (e.g. 0,15 % Pb to 0,35 % Pb).

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

Element	Specified maximum content in the cast analysis % by mass	Steel grades	Permissible deviations ¹⁾ % by mass
C	<div><div>≤ 0,17</div><div>> 0,17</div><div>≤ 0,20</div></div>	S235JRG2C	<div>+ 0,04</div> <div>+ 0,05</div>
	<div><div>≤ 0,20</div><div>> 0,20</div><div>≤ 0,22</div></div>	S355J2G3C	<div>+ 0,03</div> <div>+ 0,04</div>
	<div><div>≤ 0,55</div><div>> 0,55</div><div>≤ 0,65</div></div>	C10, C15, C16, C35, C45, C50 C60	<div>± 0,02</div> <div>± 0,03</div>
Si	<div><div>≤ 0,40</div><div>≤ 0,55</div></div>	C10 to C60 S355J2G3C	<div>+ 0,03</div> <div>+ 0,05</div>
	<div><div>≤ 1,40</div><div>≤ 1,60</div><div>≤ 0,90</div></div>	S235JRC S355J2G3C C10 to C60	<div>+ 0,10</div> <div>+ 0,10</div> <div>± 0,04</div>
P and S	<div><div>≤ 0,035</div><div>≤ 0,045</div></div>	S355J2G3C S235JRC to E335GC C10 to C60	<div>+ 0,010</div> <div>+ 0,010</div> <div>+ 0,005</div>
	N	S235JRC to E335GC	+ 0,002
	Cr	<div><div>≤ 0,40</div><div>≤ 0,10</div><div>≤ 0,40</div></div>	C35 to C60
Mo			
Ni			
<div><div><div>1)</div><div>± 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.</div></div></div>			

Table 3: Mechanical properties¹⁾

Designation		Thickness ²⁾ mm	Mechanical properties ²⁾				
Steel name	Steel number		As rolled + turned (+SH) ³⁾		Cold drawn (+C)		
			Hardness ⁴⁾ HB	R _m N/mm	R _{p0.2} ⁵⁾ N/mm ² min.	R _m ⁵⁾ N/mm ²	A ₅ % min.
S235JRG2C	1.0122	≤ 5 ≤ 10			355	470 to 840	8
		> 10 ≤ 16			300	420 to 710	9
		> 16 ≤ 40	102 to 140	340 to	260	390 to 690	10
		> 40 ≤ 63	102 to 140	340 to	235	380 to 630	11
		> 63 ≤ 100	102 to 140	340 to	215	340 to 600	11
E295GC	1.0533	≤ 5 ≤ 10			510	650 to 950	6
		> 10 ≤ 16			420	600 to 900	7
		> 16 ≤ 40	140 to 181	470 to	320	550 to 850	8
		> 40 ≤ 63	140 to 181	470 to	300	520 to 770	9
		> 63 ≤ 100	140 to 181	470 to	255	470 to 740	9
E335GC	1.0543	≤ 5 ≤ 10			540	700 to 1050	5
		> 10 ≤ 16			480	680 to 970	6
		> 16 ≤ 40	169 to 211	570 to	390	640 to 930	7
		> 40 ≤ 63	169 to 211	570 to	340	620 to 870	8
		> 63 ≤ 100	169 to 211	570 to	295	570 to 810	8
S355J2G3C	1.0569	≤ 5 ≤ 10			520	650 to 950	6
		> 10 ≤ 16			450	600 to 880	7
		> 16 ≤ 40	146 to 187	490 to	350	550 to 850	8
		> 40 ≤ 63	146 to 187	490 to	335	520 to 770	9
		> 63 ≤ 100	146 to 187	490 to	315	490 to 740	9
C10	1.0301	≤ 5 ≤ 10			350	460 to 760	8
		> 10 ≤ 16			300	430 to 730	9
		> 16 ≤ 40	92 to 163	310 to	250	400 to 700	10
		> 40 ≤ 63	92 to 163	310 to	200	350 to 640	12
		> 63 ≤ 100	92 to 163	310 to	180	320 to 580	12
C15	1.0401	≤ 5 ≤ 10			380	500 to 800	7
		> 10 ≤ 16			340	480 to 780	8
		> 16 ≤ 40	98 to 178	330 to	280	430 to 730	9
		> 40 ≤ 63	98 to 178	330 to	240	380 to 670	11
		> 63 ≤ 100	98 to 178	330 to	215	340 to 600	12
C16	1.0407	≤ 5 ≤ 10			400	520 to 820	7
		> 10 ≤ 16			360	500 to 800	8
		> 16 ≤ 40	105 to 184	350 to	300	450 to 750	9
		> 40 ≤ 63	105 to 184	350 to	260	400 to 690	11
		> 63 ≤ 100	105 to 184	350 to	235	360 to 620	12
C35	1.0501	≤ 5 ≤ 10			510	650 to 1000	6
		> 10 ≤ 16			420	600 to 950	7
		> 16 ≤ 40	154 to 207	520 to	320	580 to 880	8
		> 40 ≤ 63	154 to 207	520 to	300	550 to 840	9
		> 63 ≤ 100	154 to 207	520 to	270	520 to 800	9
C40	1.0511	≤ 5 ≤ 10			540	700 to 1000	6
		> 10 ≤ 16			460	650 to 980	7
		> 16 ≤ 40	163 to 211	550 to	365	620 to 920	8
		> 40 ≤ 63	163 to 211	550 to	330	590 to 840	9
		> 63 ≤ 100	163 to 211	550 to	290	550 to 820	9
continued							

continued

Designation		Thickness ¹⁾ mm	Mechanical properties ²⁾				
Steel name	Steel number		As rolled + turned (+SH) ³⁾		Cold drawn (+C)		
			Hardness ⁴⁾ HB	R _m N/mm ²	R _{p0.2} ⁵⁾ N/mm ² min.	R _m ⁵⁾ N/mm ²	A ₅ % min.
C45	1.0503	≤ 5 : 10			565	750 to 1050	5
		> 10 : 16			500	710 to 1030	6
		> 16 : 40	172 to 242	580 to	410	650 to 1000	7
		> 40 : 63	172 to 242	580 to	360	630 to 900	8
		> 63 : 100	172 to 242	580 to	310	580 to 850	8
C50	1.0540	≤ 5 : 10			590	770 to 1100	5
		> 10 : 16			520	730 to 1080	6
		> 16 : 40	181 to 269	610 to	440	690 to 1050	7
		> 40 : 63	181 to 269	610 to	390	650 to 1030	8
		> 63 : 100	181 to 269	610 to	--	--	--
C60	1.0601	≤ 5 : 10			630	800 to 1150	5
		> 10 : 16			550	780 to 1130	5
		> 16 : 40	198 to 278	670 to	480	730 to 1100	6
		> 40 : 63	198 to 278	670 to	--	--	--
		> 63 : 100	198 to 278	670 to	--	--	--

1) This Standard does not include impact requirements.

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

3) For this condition it is not necessary to choose the drawing qualities C. It is sufficient to use grades S235JRG2, E295, E335 and S355J2G3 instead.

4) For information only.

5) For flats the proof strength (R_{p0.2}) may deviate by -10% and the tensile strength (R_m) by ± 10%