BRITISH STANDARD

BS EN 10120:2008

Steel sheet and strip for welded gas cylinders

ICS 77.140.30; 77.140.50

BSI
British Standards

National foreword

This British Standard is the UK implementation of EN 10120:2008. It supersedes BS EN 10120:1997 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/73/2, Steel plates and bars for pressure purposes.

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

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English Version

Steel sheet and strip for welded gas cylinders

Tôles et bandes pour bouteilles à gaz soudées en acier

Stahlblech und -band für geschweißte Gasflaschen

This European Standard was approved by CEN on 1 August 2008.

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Foreword

This document (EN 10120:2008) has been prepared by Technical Committee ECISS/TC 22 “Steels for pressure purposes - Qualities”, 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of an identical text or by endorsement, at the latest by March 2009, and conflicting national standards shall be withdrawn at the latest by March 2009.

This document supersedes EN 10120:1996.

NOTE The clauses marked with a point (•) contain information relating to agreements which are to be made at the time of enquiry and order. The clauses marked by two points (••) contain information relating to agreements that may be made at the time of enquiry and order.

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1 Scope

This European Standard specifies requirements for hot-rolled sheet and strip up to 5 mm thickness of steels listed in Table 1 and intended for the manufacture of welded gas cylinders.

The general technical delivery conditions in EN 10021 also apply to products supplied in accordance with this European Standard.

2 Normative references

The following referenced documents are indispensable for the application 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 10002-1:2001, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 10020:2000, *Definition and classification of grades of steel*

EN 10021, *General technical delivery conditions for steel products*

EN 10027-1, *Designation systems for steels — Part 1: Steel names*

EN 10027-2, *Designation systems for steels — Part 2: Numerical system*

EN 10051, *Continuously hot rolled uncoated plate, sheet and strip of non-alloy and alloy steels — Tolerances on dimensions and shape*

EN 10052:1993, *Vocabulary of heat treatment terms for ferrous products*

EN 10079:2007, *Definition of steel products*

EN 10168, *Steel products — Inspection documents — List of information and description*

EN 10204, *Metallic products — Types of inspection documents*

CEN/TR 10261, *Iron and steel — Review of available methods of chemical analysis*

EN ISO 377, *Steel and steel products — Location and preparation of samples and test pieces for mechanical testing (ISO 377:1997)*

EN ISO 2566-1, *Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels (ISO 2566-1:1984)*

EN ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition (ISO 14284:1996)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 10020:2000, EN 10052:1993 (but see 3.1), EN 10079:2007 and the following apply.

3.1
normalizing rolling [deviating from EN 10052:1993]

rolling process in which the final deformation process is carried out in a certain temperature range leading to a material condition equivalent to that obtained after normalizing so that the specified values of the mechanical properties are retained even after normalizing

NOTE The symbol for this delivery condition is N.

4 Classification and designation

4.1 Classification

The steels specified in this European Standard are non-alloy quality steels in accordance with EN 10020.

4.2 Designation

The steel grades are designated with steel names in accordance with EN 10027-1. The corresponding steel numbers have been allocated in accordance with EN 10027-2.

5 Information to be supplied by the purchaser

5.1 Mandatory information

The following information shall be supplied by the purchaser at the time of enquiry and order:

a) quantity required;

b) type of flat products (sheet or strip);

c) nominal dimensions of the product (length[1)], width, thickness);

d) number of this European Standard;

e) steel name or number (see Table 1 or 3);

f) delivery condition (see 6.2 and 7.5);

g) inspection document to be delivered (see 8.1.1).

5.2 Options

A number of options are specified in this European Standard and listed below. If the purchaser does not indicate his wish to implement any of these options the products shall be supplied in accordance with the basic specification (see 5.1).

1) Information on the melting and deoxidation process (see 6.1.1 and 6.1.2)

2) Product analysis (see 7.1.2 and Table 4)

3) Sampling conditions for the product analysis (see 9.2.2)

1) For sheet only

4) Special marking conditions (see Clause 11)

5.3 Example of ordering

10 t sheets with nominal dimensions of thickness = 4,0 mm, width = 600 mm, length = 1 200 mm, made of the steel grade P265NB (1.0423) as specified in EN 10120, delivered normalized, descaled and oiled, inspection certificate 3.1 in accordance with EN 10204:

10 t sheet – 600x1200x4,0 – EN 10120 – P265NB– normalized and oiled – EN 10204-3.1

or

10 t sheet – 600x1200x4,0 – EN 10120 – 1.0423– normalized and oiled – EN 10204-3.1

6 Manufacturing process

6.1 Steelmaking process

6.1.1 ●● The melting and deoxidation process shall be at the discretion of the manufacturer with the limitations to 6.1.2 and 6.1.3 and Table 1, unless otherwise agreed at the time of enquiry and order.

6.1.2 ●● The steel shall be manufactured using the electric arc process or an oxygen process. Other melting processes may be used by agreement at the time of enquiry and order. On request, the purchaser shall be informed of the process used.

6.1.3 The used type of deoxidation shall ensure that the steel has an acceptable degree of resistance to ageing (see Table 1, footnote b).

6.2 Delivery condition

● The delivery condition shall be specified at the time of enquiry and order. Usual delivery conditions are:

a) hot rolled and normalized (N)[2) ;

b) hot rolled (AR).

NOTE The delivery condition "hot rolled and normalized[2)]" is generally used for gas cylinders which are only stress relieved after welding. The "hot rolled" delivery condition is only intended for gas cylinders which are normalized after welding.

7 Requirements

7.1 Chemical composition

7.1.1 Cast analysis

The cast analysis reported by the steel producer shall apply and comply with the requirements of Table 1.

7.1.2 Product analysis

The product analysis shall not deviate from the limiting values for the cast analysis as specified in Table 1 by more than the values given in Table 2.

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2) This includes the normalizing rolled condition.

Table 1 — Chemical composition of the cast analysis, in %[a]

Steel grade		C	Si	Mn	P	S	Al_{total}[b]	N[c]	Nb	Ti
Steel name	Steel number	max.	max.	min.	max.	max.	min.	max.	max.	max.
P245NB	1.0111	0,16	0,25	0,30	0,025	0,015	0,020	0,009	0,050	0,03
P265NB	1.0423	0,19	0,25	0,40	0,025	0,015	0,020	0,009	0,050	0,03
P310NB	1.0437	0,20	0,50	0,70	0,025	0,015	0,020	0,009	0,050	0,03
P355NB	1.0557	0,20	0,50	0,70	0,025	0,015	0,020	0,009	0,050	0,03

a Elements not listed in this table may not be intentionally added to the steel without the agreement of the purchaser except for finishing the cast. All appropriate measures shall be taken to prevent the addition from scrap or other materials used in steelmaking of these elements which may adversely affect the mechanical properties and usability.

b The aluminium content may partly be replaced by ≤ 0,050 % Nb and/or ≤ 0,03 % Ti (see 6.1.3). In such cases the content of these elements is to be reported in the inspection document.

c If the ratio of $\frac{Al_{total}}{N}$ ≥ 2,2 or if Nb and/or Ti additions are applied, the nitrogen content may be ≤ 0,012 %.

Table 2 – Permissible product analysis tolerances on the limiting values given in Table 1 for the cast analysis

Element	Limiting value of the cast analysis	Permissible deviation of the product analysis
C	≤ 0,20	+ 0,02
Si	≤ 0,50	+ 0,05
Mn	≥ 0,30	– 0,05
P	≤ 0,025	+ 0,005
S	≤ 0,015	+ 0,003
Al_{total}	≥ 0,020	– 0,005
N	≤ 0,009	+ 0,002
Nb	≤ 0,050	+ 0,010
Ti	≤ 0, 03	+ 0,01

7.2 Mechanical properties

The mechanical properties shall comply with the values in Table 3 which are applicable to samples in the normalized or normalizing rolled condition.

Table 3 – Mechanical properties and guidance for heat treatment[a]

Steel grade		Upper yield strength R_{eH} min. MPa	Tensile strength R_m MPa	Elongation after fracture A min. for product thickness t in mm		Normalizing temperature (for guidance)[b] °C
Steel name	Steel number			$t < 3$ ($L_O = 80$ mm) %	$3 \le t \le 5$ ($L_O = 5{,}65\sqrt{S_O}$) %	
P245NB	1.0111	245	360 to 450	26	34	900 to 940
P265NB	1.0423	265	410 to 500	24	32	890 to 930
P310NB	1.0437	310	460 to 550	21	28	890 to 930
P355NB	1.0557	355	510 to 620	19	24	880 to 920

a See also 7.2 and 9.2.3.

b The normalizing temperatures given here are only mandatory if reference test pieces are to be tested.

7.3 Weldability

The steels in accordance with this European Standard are weldable using the usual fusion welding processes.

7.4 Tolerances

Tolerances on dimensions and mass shall be in accordance with EN 10051.

7.5 Surface condition

● Depending on the specified surface condition, the sheet or strip shall be supplied either in the rolled condition or in the chemically or mechanically descaled and oiled condition.

External imperfections which do not impair the intended application shall not be the cause of rejection. Only the material involved can be rejected on the basis of external defects.

8 Inspection

8.1 Types of inspection and inspection documents

8.1.1 The compliance with the requirements of the order shall be checked for products in accordance with this European Standard by specific inspection.

● The purchaser shall state the required type of inspection document (3.1 or 3.2) in accordance with EN 10204.

If an inspection document 3.2 is specified, the purchaser shall notify the manufacturer of the name and address of the organization or person who is to carry out the inspection and produce the inspection document. It shall be agreed which party shall issue the certificate.

8.1.2 The inspection document shall include, in accordance with EN 10168, the following codes and information:

A Commercial transactions and parties involved;

B Description of products to which the inspection certificate applies;

C03 Test temperature;

C10-C13 Tensile test at room temperature;

C70 Steelmaking process, if applicable;

C71-C92 Cast analysis and, if applicable, product analysis;

D01 Marking, dimensional and visual inspection;

Z Validation.

8.2 Tests to be carried out

The mandatory and optional tests to be carried out, the size of the test units, and the number of samples and test pieces to be taken are specified in 10.1 and Table 4.

Table 4 – Summary of tests and extent of testing

Type of inspection and test		Test frequency[a]	Refer to
Mandatory tests	Cast analysis	1 per cast	7.1.1
	Tensile test	1 per sample	9.1, 9.2 and 10.2
	Dimensional and visual inspection	Each product	10.3.1 and 10.3.2
Optional tests	Product analysis	1 per cast	9.1, 9.2 and 10.1
[a] For sampling and size of test units, see 9.1 and 9.2.1.			

8.3 Retests, sorting and reprocessing

For retests, sorting and reprocessing the requirements of EN 10021 shall apply.

9 Sampling

9.1 Frequency of testing

9.1.1 The tests shall be carried out by cast.

9.1.2 The inspection unit shall be 40 t or the remaining fraction. However, a maximum of 4 samples per cast shall be tested.

9.2 Sampling and test piece preparation

9.2.1 Sampling and test piece preparation shall be in accordance with the requirements of EN ISO 14284 and EN ISO 377.

9.2.2 ●● Unless otherwise agreed at the time of enquiry and order, the sample for the product analysis may be taken from the samples for the tensile test.

9.2.3 The test samples for the tensile test shall be taken at 1/4 product width from the rolled edge. In the case of strip, the test samples shall be taken from the outer end; in cases of dispute, it shall be taken at an adequate distance from the outer end (at least one turn). The longitudinal axis of the test piece shall be perpendicular to the (final) rolling direction. If products are delivered in a condition other than the normalized or normalizing rolled condition (see 6.2 b)), the test samples or test pieces shall be normalized.

For thicknesses ≥ 3 mm, test pieces in accordance with EN 10002-1 shall be prepared. The test piece shall include both rolled surfaces. Except in the case of dispute, non-proportional test pieces may be also used (see 10.2).

10 Test methods

10.1 Chemical analysis

●● Unless otherwise agreed at the time of enquiry and order, the choice of a suitable physical or chemical analytical method for the product analysis shall be at the discretion of the manufacturer. In cases of dispute, the analysis shall be carried out by a laboratory approved by both parties. In this case, the analysis method to be used shall be agreed taking into account the relevant existing European Standards. The list of available European Standards is given in CEN/TR 10261.

10.2 Tensile test

The tensile test shall be carried out in accordance with EN 10002-1 at (23 ± 5) °C, generally using a proportional test piece of gauge length (L_O = 5,65 $\sqrt{S_O}$), where S_o is the initial cross-sectional area of the test piece. Test pieces with a constant gauge length may be used; in this case the elongation value shall be converted in accordance with EN ISO 2566-1. In the case of flat products less than 3 mm thick, the tensile test in accordance with EN 10002-1:2001, Annex B, using an original gauge length of 80 mm shall be applied.

The tensile strength R_m, upper yield strength R_{eH} and elongation A shall be determined.

10.3 Other testing

10.3.1 The dimensions of the products shall be checked.

10.3.2 The surface condition of the products shall be checked for conformity with 7.5 by visual examination without optical aids or, at the discretion of the manufacturer, by an approved automated process.

11 Marking

●● Unless otherwise agreed at the time of enquiry and order, the products shall be marked with labels. The marking shall contain the following information:

a) mark of the manufacturer;

b) designation of the steel grade;

c) cast number;

d) strip number;

e) inspector's mark;

f) identification number which permits the correlation of the delivery unit with the related inspection document.

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