

Specification for

Flat products made of steels for pressure purposes —

Part 2: Non-alloy and alloy steels with specified elevated temperature properties

The European Standard EN 10028-2:1992 has the status of a
British Standard

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This British Standard, having been prepared under the direction of the Iron and Steel Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 February 1993

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Contents

	Page
Cooperating organizations	Inside front cover
National foreword	ii
Foreword	2
Text of EN 10028-2	3
National annex NA (informative)	12
National annex NB (informative)	12
National annex NC (normative)	13

National foreword

This British Standard has been prepared under the direction of the Iron and Steel Standards Policy Committee and is the English language version of EN 10028-2 *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties* published by the European Committee for Standardization (CEN).

This British Standard supersedes BS 1501-1 which is withdrawn. It also supersedes part of BS 1501-2. Amendment No. 3 to BS 1501-2 will be published simultaneously with this British Standard.

National Annex NC of this British Standard specifies non-conflicting national additional steels.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 20 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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Descriptors: Iron and steel products, metal plates, strips, unalloyed steels, heat resistant steels, pressure equipment, designation, specifications, delivery condition, tests, marking

English version

Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties

Produits plats en aciers pour appareils à
pression — Partie 2: Aciers non alliés et alliés
avec caractéristiques spécifiées à température
élevée

Flacherzeugnisse aus Druckbehälterstählen —
Teil 2: Unlegierte und legierte warmfeste
Stähle

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

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Foreword

This European Standard has been prepared by ECISS/TC 22 "Steels for pressure purposes — Qualities", the Secretariat of which is held by Normenausschuß Eisen und Stahl (FES) im DIN.

Within the framework of the ECISS (European Committee for Iron and Steel Standardization) programme of work, TC 22 was allocated the task of revising EURONORM 28-85 "Steel plate, sheet and strip with elevated temperature properties — Technical delivery conditions" and (where relevant to pressure vessel fabrication) EURONORM 113-72 "Weldable fine-grain structural steels" and replacing them with a European Standard.

At its meeting in November 1990, ECISS/TC 22 approved this document. The following ECISS members were represented at the meeting:

Austria, Finland, France, Germany, Italy, Norway, Sweden, United Kingdom.

This European Standard was adopted and in accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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 June 1993, and conflicting national standards shall be withdrawn at the latest by June 1993.

Contents

	Page
Foreword	2
1 Scope	3
2 Normative references	3
3 Definitions	3
4 Dimensions and tolerances on dimensions	3
5 Calculation of mass	3
6 Designation and ordering	3
7 Classification into grades	3
8 Requirements	3
8.1 Steelmaking process	3
8.2 Delivery condition	3
8.3 Chemical composition	5
8.4 Mechanical properties	5
8.5 Surface condition	5
8.6 Internal soundness	5
9 Testing	5

9.1 Type and content of inspection documents	5
9.2 Tests to be carried out	5
9.3 Number of tests	5
9.4 Sampling and sample preparation	5
9.5 Test procedures	5
9.6 Re-tests	5
10 Marking	5
Annex A Preliminary reference data for the long-term creep and stress rupture values (informative)	9
Annex B Guidance for heat treatment (informative)	11
Table 1 — Chemical composition (cast analysis)	4
Table 2 — Permissible deviations in the results of the product analysis from specified values applicable to the cast analysis (see Table 1)	5
Table 3 — Mechanical properties (applicable to transverse test pieces)	6
Table 4 — 0,2 % proof stress at elevated temperatures	8
Table A.1	9
Table B.1 — Guidance for heat treatment	11
Table NC.1 — Normalizing and tempering ranges for steels 271, 281, 621 and 660	13
Table NC.2 — Chemical composition (cast analysis) of steel 161	14
Table NC.3 — Chemical composition (cast analysis) of steels 271, 281, 621, and 660	14
Table NC.4 — Mechanical properties at room temperature of steel 161	15
Table NC.5 — Mechanical properties at room temperature of steels 271, 281, 621 and 660	16
Table NC.6 — Transverse Charpy V-notch impact values of steels for use at room temperature or elevated temperatures	16
Table NC.7 — Minimum yield strength (R_{eL}) or 0,2 % proof stress ($R_{p0,2}$) values at elevated temperatures of steel 161	17
Table NC.8 — Minimum yield strength (R_e) or 0,2 % proof stress ($R_{p0,2}$) at elevated temperatures of steels 271, 281, 621 and 660	18
Table NC.9 — Stress rupture values for steel 161	18
Table NC.10 — Stress rupture values for steels 271 and 281	19
Table NC.11 — Stress rupture values for steels 621 and 660	20
NOTE The clauses marked with two points (. .) contain information relating to agreements that may be made at the time of ordering.	

1 Scope

1.1 This Part 2 of EN 10028 specifies requirements for flat products for pressure purposes made of weldable non-alloy and alloy steels with elevated temperature properties as specified in Table 1.

1.2 The requirements of EN 10028-1 also apply.

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 10028-1, *Flat products made of steels for pressure purposes — Part 1: General requirements*.

3 Definitions

See EN 10028-1.

4 Dimensions and tolerances on dimensions

See EN 10028-1.

5 Calculation of mass

See EN 10028-1.

6 Designation and ordering

See EN 10028-1.

7 Classification into grades

This EN covers the steel grades given in Table 1. In accordance with EN 10020, grades P235GH, P265GH, P295GH and P335GH are non alloy quality steels and grades 16 Mo 3, 13 CrMo 4-5, 10 CrMo 9-10 and 11 CrMo 9-10 are alloy special steels.

8 Requirements

8.1 Steelmaking process

See EN 10028-1.

8.2 Delivery condition

8.2.1 . . Unless otherwise agreed at the time of ordering, the products covered by this EN shall be supplied in the usual conditions given in Table 3.

8.2.2 Normalizing may be replaced by normalizing rolling for steel grades P235GH, P265GH, P295GH and P355GH. This means that the requirements have to be met again even after subsequent normalizing.

8.2.3 . . If specially agreed, products made of steel grades P235GH, P265GH, P295GH, P355GH and 16 Mo 3 may also be delivered in the untreated condition. Products made of steel grades 13 CrMo 4-5, 10 CrMo 9-10 and 11 CrMo 9-10 may be supplied in the tempered or normalized condition or, in exceptional cases, in the untreated condition if so agreed. (Annex B contains heat treatment information for the purchaser.)

In these cases, the test pieces shall be tested in the usual delivery condition as indicated in Table 3.

NOTE The testing of the test pieces in a simulated heat treated condition does not discharge the processor from the obligation of providing proof of the specified properties in the finished product.

Table 1 — Chemical composition (cast analysis)

Steel grade		Classification ^a	% by mass ^b													
Name	Material number		C	Si	Mn	P	S	Al _{ges}	Cr	Cu ^c	Mo	Nb	Ni	Ti	V	Cr + Cu + Mo + Ni
				max.			max.			max.				max.		max.
P235GH	1.0345	UQ	max. 0,16	0,35	0,40 to 1,20	0,030	0,025	min. 0,020	max. 0,30	0,30	max. 0,08	0,010	0,30	0,03	0,02	0,70
P265GH	1.0425	UQ	max. 0,20	0,40	0,50 to 1,40	0,030	0,025	min. 0,020	max. 0,30	0,30	max. 0,08	0,010	0,30	0,03	0,02	0,70
P295GH	1.0481	UQ	0,08 to 0,20	0,40	0,90 to 1,50	0,030	0,025	min. 0,020	max. 0,30	0,30	max. 0,08	0,010	0,30	0,03	0,02	0,70
P355GH	1.0473	UQ	0,10 to 0,22	0,60	1,00 to 1,70	0,030	0,025	min. 0,020	max. 0,30	0,30	max. 0,08	0,010	0,30	0,03	0,02	0,70
16 Mo 3	1.5415	LE	0,12 to 0,20	0,35	0,40 to 0,90	0,030	0,025	^d	max. 0,30	0,30	0,25 to 0,35	—	0,30	—	—	—
13 CrMo 4-5	1.7335	LE	0,08 to 0,18	0,35	0,40 to 1,00	0,030	0,025	^d	0,70 to 1,15 ^e	0,30	0,40 to 0,60	—	—	—	—	—
10 CrMo 9-10	1.7380	LE	0,08 ^f to 0,14 ^g	0,50	0,40 to 0,80	0,030	0,025	^d	2,00 to 2,50	0,30	0,90 to 1,10	—	—	—	—	—
11 CrMo 9-10	1.7383	LE	0,08 ^f to 0,15	0,50	0,40 to 0,80	0,030	0,025	^d	2,00 to 2,50	0,30	0,90 to 1,10	—	—	—	—	—

^a UQ = non-alloy quality steel; LE = alloy special steel.

^b Elements not listed in this table shall 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.

^c . . A lower Cu content and a maximum tin content may be agreed upon at the time of ordering, e. g. with regard to formability.

^d The Al content of the cast shall be determined and given in the inspection document.

^e . . If resistance to pressurized hydrogen is of importance, a minimum percentage by mass of Cr of 0,80 % may be agreed upon at the time of ordering.

^f . . For product thicknesses less than 10 mm, a minimum content of 0,60 % C may be agreed upon at the time of ordering.

^g . . For product thicknesses greater than 150 mm, a maximum content of 0,17 % C may be agreed upon at the time of ordering.