

Technical delivery conditions for steel castings for pressure purposes —

Part 4: Austenitic and austenitic-ferritic steel grades

The European Standard EN 10213-4:1995 has the status of a
British Standard

ICS 11.140.30

Committees responsible for this British Standard

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- BEAMA Ltd.
- British Pump Manufacturers' Association
- British Valve and Actuator Manufacturers' Association
- Castings Technology International
- Engineering Equipment and Materials Users' Association
- Hopkinsons Limited
- Institute of British Foundrymen
- Institution of Mechanical Engineers
- Lloyd's Register of Shipping
- Ministry of Defence
- Railway Industry Association

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National foreword

This British Standard has been prepared under the direction of Technical Committee ISE/6, Steel castings, and is the English language version of EN 10213-4 *Technical delivery conditions for steel castings for pressure purposes — Part 4: Austenitic and austenitic-ferritic steel grades* published by the European Committee for Standardization (CEN).

The following Parts of BS EN 10213 supersede BS 1504:1976 which is now withdrawn:

BS EN 10213-1	<i>Technical delivery conditions for steel castings for pressure purposes</i> Part 1:1996 <i>General</i>
BS EN 10213-2	<i>Technical delivery conditions for steel castings for pressure purposes</i> Part 2:1996 <i>Steel grades for use at room temperature and elevated temperatures</i>
BS EN 10213-3	<i>Technical delivery conditions for steel castings for pressure purposes</i> Part 3:1996 <i>Steels for use at low temperatures</i>
BS EN 10213-4	<i>Technical delivery conditions for steel castings for pressure purposes</i> Part 4:1996 <i>Austenitic and austenitic-ferritic steel grades</i>

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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 6 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: Cast steels, structural steels, boilers, pressure equipment, delivery, designation, grades: quality, chemical composition, mechanical properties, austenitic steels, ferritic steels

English version

Technical delivery conditions for steel castings for pressure purposes — Part 4: Austenitic and austenitic-ferritic steel grades

Conditions techniques de livraison des pièces
moulées en acier pour service sous pression —
Partie 4: Nuances d'aciers austénitiques et
austéno-ferritiques

Technische Lieferbedingungen für Stahlguß für
Druckbehälter — Teil 4: Austenitische und
austenitisch-ferritische Stahlsorten

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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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CEN

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

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

Foreword

This European Standard was prepared by Technical Committee ECISS/TC 31, Steel castings, the secretariat of which is held by AFNOR.

The text of the European Standard EN 10213 *Technical delivery conditions for steel castings for pressure purposes* consists of 4 Parts:

- *Part 1: General;*
- *Part 2: Steel grades for use at room temperature and elevated temperatures;*
- *Part 3: Steel grades for use at low temperatures;*
- *Part 4: Austenitic and austenitic-ferritic steel grades.*

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 1996, and conflicting national standards shall be withdrawn at the latest by June 1996.

According to the Internal Regulations of CEN/CENELEC, 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 the United Kingdom.

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1 Scope

According to the general delivery conditions of EN 10213-1 this standard specifies the chemical and mechanical requirements to be met under specific inspection of austenitic and austenitic-ferritic grades.

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 10213-1, *Technical delivery conditions for steel castings for pressure purposes — Part 1: General*.

3 Requirements

3.1 Chemical composition

The cast analysis shall comply with Table 1 (see 7.1 of EN 10213-1 for permissible deviations and for unspecified elements). For chemical analysis on castings see 8.4.1 of EN 10213-1.

3.2 Heat treatment

Heat treatment shall comply with Table 2 (see 6.2 of EN 10213-1).

3.3 Mechanical properties

3.3.1 The mechanical properties at room, low and elevated temperatures shall comply with Table 2. For the conditions of verification on test block see 7.2.1 of EN 10213-1, and on castings see 7.2.2 and 8.4.2 of EN 10213-1.

3.3.2 Mechanical properties at elevated temperatures are specified in Table 2 but their verification is performed only by agreement (see 7.2.3 of EN 10213-1), and on castings (see 7.2.2 and 8.4.2 of EN 10213-1).

NOTE Creep resistance mean values are given, for some grades in Annex A Table A.1 only for information.

Table 1 — Chemical composition (cast analysis)
[% (m/m)]

Designation		C max.	Si max.	Mn max.	P max.	S max.	Cr	Mo	Ni	Cu	Others
Name	Number										
GX2CrNi19-11 ^a	1.4309 ^a	0,030	1,50	2,00	0,035	0,025	18,00 to 20,00	—	9,00 to 12,00	—	N: 0,20 max.
GX5CrNi19-10 ^a	1.4308 ^a	0,07	1,50	1,50	0,040	0,030	18,00 to 20,00	—	8,00 to 11,00	—	—
GX5CrNiNb19-11 ^a	1.4552 ^a	0,07	1,50	1,50	0,040	0,030	18,00 to 20,00	—	9,00 to 12,00	—	Nb: 8 × C, max: 1,00
GX2CrNiMo19-11-2 ^a	1.4409 ^a	0,030	1,50	2,00	0,035	0,025	18,00 to 20,00	2,00 to 2,50	9,00 to 12,00	—	N: 0,20 max.
GX5CrNiMo19-11-2 ^a	1.4408 ^a	0,07	1,50	1,50	0,040	0,030	18,00 to 20,00	2,00 to 2,50	9,00 to 12,00	—	—
GX5CrNiMoNb19-11-2 ^a	1.4581 ^a	0,07	1,50	1,50	0,040	0,030	18,00 to 20,00	2,00 to 2,50	9,00 to 12,00	—	Nb: 8 × C, max: 1,00
GX2NiCrMo28-20-2 ^a	1.4458 ^a	0,030	1,00	2,00	0,035	0,025	19,00 to 22,00	2,00 to 2,50	26,00 to 30,00	2,00 max.	N: 0,20 max.
GX2CrNiMoN22-5-3	1.4470	0,030	1,00	2,00	0,035	0,025	21,00 to 23,00	2,50 to 3,50	4,50 to 6,50	—	N: 0,12 to 0,20
GX2CrNiMoCuN25-6-3-3	1.4517	0,030	1,00	1,50	0,035	0,025	24,50 to 26,50	2,50 to 3,50	5,00 to 7,00	2,75 to 3,50	N: 0,12 to 0,22
GX2CrNiMoN26-7-4 ^b	1.4469 ^b	0,030	1,00	1,00	0,035	0,025	25,00 to 27,00	3,00 to 5,00	6,00 to 8,00	1,30 max.	N: 0,12 to 0,22
^a It should be pointed out that the suggested chemical composition ranges of these high alloyed corrosion resistant steel grades are rather large. According to the final destination (high temperature/low temperature, etc...) it may be advisable for the founder to aim for narrower ranges for different elements in order to achieve the most suitable structures.											
^b For this steel grade a minimum value of the “pitting index” may be required as $PI = Cr + 3,3 Mo + 16 N \geq 40$.											

Table 2 — Mechanical properties

Designation		Heat treatment ^a + AT ^a °C	Thickness mm max.	Tensile test at room temperature			Impact test		Tensile test at elevated temperature						
Name	Number			$R_{p1,0}$ ^e MPa ⁱ min.	R_m MPa ⁱ min.	A % min.	KV J min.	°C ^h	$R_{p1,0}$ ^e MPa ⁱ min. at °C						
									100	200	300	350	400	500	550
GX2CrNi19-11	1.4309	1 050 to 1 150	150	210	440 to 640	30	80 ^g	RT ^g	165	130	110	100	—	—	—
GX5CrNi19-10	1.4308	1 050 to 1 150	150	200	440 to 640	30	60 ^g	RT ^g	160	125	110	—	—	—	—
GX5CrNiNb19-11	1.4552	1 050 to 1 150	150	200	440 to 640	25	40	RT	165	145	130	—	120	110	100
GX2CrNiMo19-11-2	1.4409	1 080 to 1 150	150	220	440 to 640	30	80 ^g	RT ^g	175	145	115	—	105	—	—
GX5CrNiMo19-11-2	1.4408	1 080 to 1 150	150	210	440 to 640	30	60 ^g	RT ^g	170	135	115	—	105	—	—
GX5CrNiMoNb19-11-2	1.4581	1 080 to 1 150	150	210	440 to 640	25	40	RT	185	160	145	—	130	120	115
GX2NiCrMo28-20-2	1.4458	1 100 to 1 180	150	190	430 to 630	30	60 ^g	RT ^g	165	135	120	—	110	—	—
GX2CrNiMoN22-5-3	1.4470	1 120 to 1 150 ^{bc}	150	420 ^f	600 to 800	20	30	RT	330 ^f	280 ^f	^d	—	—	—	—
GX3CrNiMoCuN25-6-3-3	1.4517	1 120 to 1 150 ^{bc}	150	480 ^f	650 to 850	22	50 ^g	RT ^g	390 ^f	330 ^f	^d	—	—	—	—
GX2CrNiMoN26-7-4	1.4469	1 140 to 1 180 ^{bc}	150	480 ^f	650 to 850	22	50 ^g	RT ^g	390 ^f	330 ^f	^d	—	—	—	—

^a The heat treatment for all the steel grades is + AT + QW (solution annealing + water quenching).

^b After solution annealing at high temperature, castings may be cooled down to 1 040 °C to 1 010 °C prior to water quenching in order to improve corrosion resistance and prevent cracks in complex shapes.

^c As far as steel castings for pressure vessels are concerned the austenitic-ferritic steels are not considered in their age hardened condition.

^d For similar reasons as those concerning note ^c the austenitic-ferritic steels have not to be used for temperatures higher than 250 °C in pressure vessel applications.

^e $R_{p0,2}$ may be estimated by lowering $R_{p1,0}$ by 25 MPa.

^f $R_{p0,2}$.

^g For use at low temperatures impact properties may be agreed and the following applies:

Steel number	KV J min.	at °C
1.4517, 1.4469	35	— 70
1.4308, 1.4408, 1.4458	60	— 196
1.4309, 1.4409	70	— 196

^h RT = room temperature.

ⁱ 1 MPa = 1 N/mm².

Annex A (informative)
Creep properties

Table A.1 — Creep resistance (mean values) σ_r : rupture stress MPa

Designation		Temperature °C	550		600		650		700	
Name	Number	Time h	10 000	100 000	10 000	100 000	10 000	100 000	10 000	100 000
GX5CrNi19-10	1.4308	σ_r	147	124	110	83	73	52	47	—
GX5CrNiNb19-11	1.4552	σ_r	246	192	156	124	109	80	73	—
GX5CrNiMo19-11-2	1.4408	σ_r	194	160	148	113	103	66	60	42

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