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Heat-resistant cast steels and alloys for general applications

Aciers et alliages moulés réfractaires destinés à des applications générales

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 11, *Steel castings.*

This third edition cancels and replaces the second edition (ISO 11973:2015), which has been technically revised.

The main changes are as follows:

— the mandatory Terms and definitions clause (see Clause 3) has been added and subsequent clauses have been renumbered;

— Clause 4 has been updated to add a reference to Annex A;

— the title for Table 1 has been changed;

— supplementary requirements (see Clause 9) has been updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Heat-resistant cast steels and alloys for general applications

1 Scope

This document specifies chemical composition and mechanical properties of cast steels and alloys for heat-resistant service.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 4990, *Steel castings — General technical delivery requirements*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 General conditions of delivery

Materials furnished in conformity with this document shall conform to the applicable requirements of ISO 4990 including the supplementary requirements that are indicated on the enquiry and purchase order. Similar UNS numbers to the grades in this document are included in Annex A.

5 Heat treatment

The grades GX40CrSi13, GX40CrSi17, GX30CrSi7, GX40CrSi24, GX40CrSi28, and GX130CrSi29 may be annealed at a temperature of 800 °C to 850 °C. If required, GX30CrSi7 may also be supplied in the as-cast condition. Other grades produced according to this document do not require heat treatment. If heat treatment is required, the treatment should be established by agreement between the manufacturer and the purchaser, and should be specified in the purchase contract.

6 Chemical composition

The chemical composition of the alloys shall comply with the values given in Table 1.

7 Mechanical properties

Mechanical testing at room temperature shall be performed if agreed upon between the manufacturer and purchaser the material shall conform to the requirements listed in Table 2.

8 Maximum use temperature

Limited information on maximum use temperatures are included in Table 2. These values are intended to allow comparison of grades. The actual conditions of service shall be considered when selecting a grade including the composition of the environment and service mechanical loading.

9 Supplementary requirements

A list of standardized supplementary requirements for use on the option of the purchaser is included in ISO 4990.

Table 1 — Chemical composition, mass fraction in %

Grade designation		C	Si	Mn	P	S	Cr	Mo	Ni	Others
Name	Number									
GX30CrSi7	1.4710	0,20 0,35	1,0 2,5	0,5 1,0	0,035	0,030	6,0 8,0	0,15	0,5	
GX40CrSi13	1.4729	0,30 0,50	1,0 2,5	1,0	0,040	0,030	12,0 14,0	0,15	0,5	
GX40CrSi17	1.4740	0,30 0,50	1,0 2,5	1,0	0,040	0,030	16,0 19,0	0,50	1,0	
GX40CrSi24	1.4745	0,30 0,50	1,0 2,5	1,0	0,040	0,030	23,0 26,0	0,50	1,0	
GX40CrSi28	1.4776	0,30 0,50	1,0 2,5	1,0	0,040	0,030	27,0 30,0	0,50	1,0	
GX130CrSi29	1.4777	1,20 1,40	1,0 2,5	0,5 1,0	0,035	0,030	27,0 30,0	0,50	1,0	
GX25CrNiSi18–9	1.4825	0,15 0,35	0,5 2,5	2,0	0,040	0,030	17,0 19,0	0,50	8,0 10,0	
GX25CrNiSi20–14	1.4832	0,15 0,35	0,5 2,5	2,0	0,040	0,030	19,0 21,0	0,50	13,0 15,0	
GX40CrNiSi22–10	1.4826	0,30 0,50	1,0 2,5	2,0	0,040	0,030	21,0 23,0	0,50	9,0 11,0	
GX40CrNiSiNb24–24	1.4855	0,30 0,50	1,0 2,5	2,0	0,040	0,030	23,0 25,0	0,50	23,0 25,0	Nb: 0,80–1,80
GX40CrNiSi25–12	1.4837	0,30 0,50	1,0 2,5	0,5 2,0	0,040	0,030	24,0 27,0	0,50	11,0 14,0	
GX40CrNiSi25–20	1.4848	0,30 0,50	1,0 2,5	2,0	0,040	0,030	24,0 27,0	0,50	19,0 22,0	
GX40CrNiSi27–4	1.4823	0,30 0,50	1,0 2,5	1,5	0,040	0,030	25,0 28,0	0,50	3,0 6,0	
GX50NiCrCo20–20–20	1.4874	0,35 0,65	1,0	2,0	0,040	0,030	19,0 22,0	2,50 3,00	18,0 22,0	Co: 18,5 –22,0 Nb: 0,75 – 1,25 W: 2,0– 3,0
GX10NiCrSiNb32–20	1.4859	0,05 0,15	0,5 1,5	2,0	0,040	0,030	19,0 21,0	0,50	31,0 33,0	Nb: 0,50 –1,50
GX40NiCrSi35–17	1.4806	0,30 0,50	1,0 2,5	2,0	0,040	0,030	16,0 18,0	0,50	34,0 36,0	
GX40NiCrSi35–26	1.4857	0,30 0,50	1,0 2,5	2,0	0,040	0,030	24,0 27,0	0,50	33,0 36,0	
GX40NiCrSiNb35–26	1.4852	0,30 0,50	1,0 2,5	2,0	0,040	0,030	24,0 27,0	0,50	33,0 36,0	Nb: 0,80–1,80

NOTE A single value is the maximum limit.

[a] Balance.

Table 1 *(continued)*

Grade designation		C	Si	Mn	P	S	Cr	Mo	Ni	Others
Name	Number									
GX40NiCrSi38–19	1.4865	0,30 0,50	1,0 2,5	2,0	0,040	0,030	18,0 21,0	0,50	36,0 39,0	
GX40NiCrSiNb38–19	1.4849	0,30 0,50	1,0 2,5	2,0	0,040	0,030	18,0 21,0	0,50	36,0 39,0	Nb: 1,20 –1,80
G-NiCr28W	2.4879	0,35 0,55	1,0 2,0	1,5	0,040	0,030	27,0 30,0	0,50	47,0 50,0	W: 4,0–6,0
G-NiCr50Nb	2.4680	0,10	1,0	1,0	0,020	0,020	48,0 52,0	0,50	[a]	Fe: 1,00 N: 0,16 Nb: 1,00 –1,80
G-NiCr19	2.4687	0,40 0,60	0,5 2,0	1,5	0,040	0,030	16,0 21,0	0,50	50,0 55,0	
G-NiCr15	2.4815	0,35 0,65	2,0	1,3	0,040	0,030	13,0 19,0	-	64,0 69,0	
GX50NiCr- CoW35–25–15–5	1.4869	0,45 0,55	1,0 2,0	1,0	0,040	0,030	24,0 26,0	-	33,0 37,0	W: 4,0–6,0 Co: 14,0–16,0
G-CoCr28	2.4778	0,05 0,25	0,5 1,5	1,5	0,040	0,030	27,0 30,0	0,50	4,0	Co: 48,0–52,0 Fe: balance

NOTE A single value is the maximum limit.

[a] Balance.

Table 2 — Mechanical properties at room temperature and maximum use temperature

Grade designation		$R_{p0,2}$ MPa[a] min.	R_m MPa[a] min.	A % min.	*HBW* max.	Maximum use temperature[b] °C
Name	Number					
GX30CrSi7	1.4710					750
GX40CrSi13	1.4729				300[c]	850
GX40CrSi17	1.4740				300[c]	900
GX40CrSi24	1.4745				300[c]	1 050
GX40CrSi28	1.4776				320[c]	1 100
GX130CrSi29	1.4777				400[c]	1 100
GX25CrNiSi18–9	1.4825	230	450	15		900
GX25CrNiSi20–14	1.4832	230	450	10		900
GX40CrNiSi22–10	1.4826	230	450	8		950
GX40CrNiSiNb24–24	1.4855	220	400	4		1 050
GX40CrNiSi25–12	1.4837	220	450	6		1 050
GX40CrNiSi25–20	1.4848	220	450	6		1 100
GX40CrNiSi27–4	1.4823	250	400	3	400[d]	1 100
GX40NiCrCo20–20–20	1.4874	320	400	6		1 150

[a] 1 MPa = 1 N/mm^2.

[b] Maximum use temperature depends on the actual use conditions and these values are being given only to aid the user. These are given for oxidising environments. The actual composition will also affect performance.

[c] Maximum HBW in annealed condition. Castings may also be supplied in the "as-cast" condition, in which case hardness limits will not apply.

[d] Maximum HBW.

[e] Properties as agreed.

Table 2 *(continued)*

Grade designation		$R_{p0,2}$ MPa[a] min.	R_m MPa[a] min.	A % min.	*HBW* max.	Maximum use temperature[b] °C
Name	**Number**					
GX10NiCrNb32–20	1.4859	170	440	20		1 000
GX40NiCrSi35–17	1.4806	220	420	6		980
GX40NiCrSi35–26	1.4857	220	440	6		1 050
GX40NiCrSiNb35–26	1.4852	220	440	4		1 050
GX40NiCrSi38–19	1.4865	220	420	6		1 050
GX40NiCrSiNb38–19	1.4849	220	420	4		1 000
G-NiCr28W	2.4879	220	400	3		1 200
G-NiCr50Nb	2.4680	230	540	8		1 050
G-NiCr19	2.4687	220	440	5		1 100
G-NiCr15	2.4815	200	400	3		1 100
GX50NiCrCoW35–25–15–5	1.4869	270	480	5		1 200
G-CoCr28	2.4778	[e]	[e]	[e]		1 200

[a] 1 MPa = 1 N/mm^2.

[b] Maximum use temperature depends on the actual use conditions and these values are being given only to aid the user. These are given for oxidising environments. The actual composition will also affect performance.

[c] Maximum HBW in annealed condition. Castings may also be supplied in the "as-cast" condition, in which case hardness limits will not apply.

[d] Maximum HBW.

[e] Properties as agreed.

Annex A
(informative)

UNS cast grades similar to ISO cast grades

Table A.1 — UNS cast grades similar to ISO cast grades

Grade designation		UNS number (similar or identical)
Name	Number	
GX30CrSi7	1.4710	—
GX40CrSi13	1.4729	J91153
GX40CrSi17	1.4740	—
GX40CrSi24	1.4745	—
GX40CrSi28	1.4776	J92605
GX130CrSi29	1.4777	—
GX25CrNiSi18–9	1.4825	J92803
GX25CrNiSi20–14	1.4832	—
GX40CrNiSi22–10	1.4826	J92803
GX40CrNiSiNb24–24	1.4855	—
GX40CrNiSi25–12	1.4837	J93503
GX40CrNiSi25–20	1.4848	J94204
GX40CrNiSi27–4	1.4823	J93005
GX40NiCrCo20–20–20	1.4874	—
GX10NiCrNb32–20	1.4859	N08151
GX40NiCrSi35–17	1.4806	N08002
GX40NiCrSi35–26	1.4857	N08705
GX40NiCrSiNb35–26	1.4852	—
GX40NiCrSi38–19	1.4865	N08004
GX40NiCrSiNb38–19	1.4849	N08008
G-NiCr28W	2.4879	—
G-NiCr50Nb	2.4680	R20501
G-NiCr19	2.4687	—
G-NiCr15	2.4815	N06006
GX50NiCrCoW35–25–15–5	1.4869	—
G-CoCr28	2.4778	—
NOTE The grade designations including the names and the numbers follow the rules of EN 10027-1 and EN 10027-2.		