INTERNATIONAL STANDARD

ISO 11973

Second edition
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Heat-resistant cast steels and alloys for general applications

Aciers et alliages moulés réfractaires destinés à des applications générales

Reference number
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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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 documents 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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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC17, *Steel*, Subcommitee SC11, *Steel castings.*

This second edition cancels and replaces the first edition (ISO 11973:1999), which has been technically revised with the following changes:

— Clause 8 revised;

— Table 1 composition limits modified — various grades;

— Tables 1 and 2 — grade number added;

— Annex A added.

Heat-resistant cast steels and alloys for general applications

1 Scope

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

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 General conditions for delivery

Materials furnished in conformity with this International Standard shall conform to the applicable requirements of ISO 4990 including the supplementary requirements that are indicated on the enquiry and purchase order.

4 Heat treatment

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 International Standard 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.

5 Chemical composition

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

6 Mechanical properties

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

7 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 must be considered when selecting a grade including the composition of the environment and service mechanical loading.

8 Supplementary requirements

A list of standardized supplementary requirements for use on the option of the purchaser is included in ISO 4990. Others, whether or not in ISO 4990, may be used with this specification upon agreement between the manufacturer and the purchaser.

Table 1 — Chemical composition, % (m/m)

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
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

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									
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		$R_{p0,2}$	R_m	A	*HBW*	Maximum use temperature[b]
Name	Number	MPa[a] min.	MPa[a] min	% min.		°C
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
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[1)] 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.

1) The similar UNS (Unified Numbering System) grades may not be equivalent to the grades in this International Standard.