

INTERNATIONAL STANDARD

ISO 11973

First edition
1999-12-01

Heat-resistant cast steels and alloys for general applications

Aciers et alliages moulés réfractaires destinés à des applications générales



Reference number
ISO 11973:1999(E)

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 734 10 79
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 11973 was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 11, *Steel castings*.

Heat-resistant cast steels and alloys for general applications

1 Scope

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

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 4990:1986, *Steel castings — General technical delivery conditions*.

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 inquiry 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 to this International Standard do not require heat treatment. If heat treatment is required, the treatment shall be established by mutual agreement between the manufacturer and the purchaser, and shall be specified in the purchase contract.

5 Chemical requirements

Alloys shall conform to the chemical requirements prescribed in Table 1.

6 Mechanical requirements

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. Those which are ordinarily considered suitable for use with this specification are given below. The details of these are listed in ISO 4990. Others, whether or not in ISO 4990, may be used with this specification upon agreement between the manufacturer and the purchaser.

- 9.1.2 Reporting of the steel making process
- 9.1.3 Agreed manufacturing procedure
- 9.3 Chemical analysis for residual elements
- 9.8.1 Prior agreement relating to major repair welds
- 9.8.2 Weld maps (Sketches)
- 9.9.1 Liquid penetrant inspection
- 9.9.3 Radiographic inspection
- 9.9.4 Ultrasonic inspection (not for austenitic castings)

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

Grade	C	Si	Mn	P max.	S max.	Cr	Mo	Ni	Others
GX30CrSi7	0,20 0,35	1,0 2,5	0,5 1,0	0,04	0,04	6 8	0,5	0,5	
GX40CrSi13	0,3 0,5	1,0 2,5	0,5 1,0	0,04	0,03	12 14	0,5	1	
GX40CrSi17	0,3 0,5	1,0 2,5	0,5 1,0	0,04	0,03	16 19	0,5	1	
GX40CrSi24	0,3 0,5	1,0 2,5	0,5 1,0	0,04	0,03	23 26	0,5	1	
GX40CrSi28	0,3 0,5	1,0 2,5	0,5 1,0	0,04	0,03	27 30	0,5	1	
GX130CrSi29	1,2 1,4	1,0 2,5	0,5 1,0	0,04	0,03	27 30	0,5	1	
GX25CrNiSi18-9	0,15 0,35	1,0 2,5	2	0,04	0,03	17 19	0,5	8 10	
GX25 CrNiSi 20-14	0,15 0,35	1,0 2,5	2	0,04	0,03	19 21	0,5	13 15	
GX40CrNiSi22-10	0,3 0,5	1,0 2,5	2	0,04	0,03	21 23	0,5	9 11	
GX40CrNiSiNb24-24	0,25 0,50	1,0 2,5	2	0,04	0,03	23 25	0,5	23 25	Nb 1,2-1,8
GX40CrNiSi25-12	0,3 0,5	1,0 2,5	2	0,04	0,03	24 27	0,5	11 14	
GX40CrNiSi25-20	0,3 0,5	1,0 2,5	2	0,04	0,03	24 27	0,5	19 22	
GX40CrNiSi27-4	0,3 0,5	1,0 2,5	1,5	0,04	0,03	25 28	0,5	3 6	
GX40NiCrCo20-20-20	0,35 0,60	1,0	2	0,04	0,03	19 22	2,5 3,0	18 22	Co 18-22 W 2-3
GX10NiCrNb31-20	0,05 0,12	1,2	1,2	0,04	0,03	19 23	0,5	30 34	Nb 0,8-1,5
GX40NiCrSi35-17	0,3 0,5	1,0 2,5	2	0,04	0,03	16 18	0,5	34 36	
GX40NiCrSi35-26	0,3 0,5	1,0 2,5	2	0,04	0,03	24 27	0,5	33 36	

Table 1 (continued)

Grade	C	Si	Mn	P max.	S max.	Cr	Mo	Ni	Others
GX40NiCrSiNb35-26	0,3 0,5	1,0 2,5	2	0,04	0,03	24 27	0,5	33 36	Nb 0,8-1,8
GX40NiCrSi38-19	0,3 0,5	1,0 2,5	2	0,04	0,03	18 21	0,5	36	
GX40NiCrSiNb38-19	0,3 0,5	1,0 2,5	2	0,04	0,03	18 21	0,5	36 39	Nb 1,2-1,8
GX45NiCrWSi48-28-5	0,35 0,55	1,0 2,5	1,5	0,04	0,03	27 30		47 50	W 4-6
GX10NiCrNb50-50	0,1	0,5	0,5	0,02	0,02	47 52	0,5	a	N 0,16 N+C 0,2 Nb 1,4-1,7
GX50NiCr52-19	0,4 0,6	0,5 2,0	1,5	0,04	0,03	16 21	0,5	50 55	
GX50NiCr65-15	0,35 0,65	2	1,3	0,04	0,03	13 19		64 69	
GX45NiCrCoW35-25-15-5	0,44 0,48	1 2	2	0,04	0,03	24 26		33 37	W 4-6 Co 14-16
GX30CoCr50-28	0,5	1	1	0,04	0,03	25 30	0,5	1	Co 48-52-0 Fe 20 max.
NOTE A single value is the maximum limit.									
a Balance									

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

Grade	R_p 0,2 MPa ^a min.	R_m MPa ^a min.	A % min.	HB	Maximum use temperature ^b °C
GX30CrSi7					750
GX40CrSi13				300 ^c	850
GX40CrSi17				300 ^c	900
GX40CrSi24				300 ^c	1 050
GX40CrSi28				320 ^c	1 100
GX130CrSi29				400 ^c	1 100
GX25CrNiSi18-9	230	450	15		900
GX25CrNiSi20-14	230	450	10		900
GX40CrNiSi22-10	230	450	8		950
GX40CrNiSiNb24-24	220	400	4		1 050
GX40CrNiSi25-12	220	450	6		1 050
GX40CrNiSi25-20	220	450	6		1 100
GX40CrNiSi27-4	250	400	3	400 ^d	1 100
GX40NiCrCo20-20-20	320	400	6		1 150
GX10NiCrNb31-20	170	440	20		1 000
GX40NiCrSi35-17	220	420	6		980
GX40NiCrSi35-26	220	440	6		1 050
GX40NiCrSiNb35-26	220	440	4		1 050
GX40NiCrSi38-19	220	420	6		1 050
GX40NiCrSiNb38-19	220	420	4		1 000
GX45NiCrWSi48-28-5	220	400	3		1 200
GX10NiCrNb50-50	230	540	8		1 050
GX50NiCr52-19	220	440	5		1 100
GX50NiCr65-15	200	400	3		1 100
GX45NiCrCoW35-25-15-5	270	480	5		1 200
GX30CoCr50-28	e	e	e	e	1 200

^a 1 MPa = 1 N/mm²

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

^c Maximum HB in annealed condition. Castings may also be supplied in the “as cast” condition, in which case hardness limits will not apply.

^d Maximum HB.

^e Properties as agreed.

