ISO/TC 17/SC 11

Date: 2022-~~10-06~~11-03

ISO/FDIS 13583-2: 2022(E)

~~ISO/TC 17/SC 11~~

Secretariat: ANSI

Centrifugally cast steel and alloy products — Part 2: Heat-resistant materials

Produits en aciers et alliages moulés par centrifugation — Partie 2: Aciers moulés réfractaires

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 ~~2. www.iso.org/directives~~).

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This document was prepared by Technical Committee ISO/TC 17, *Steel*, Subcommittee ~~SC11~~SC 11, *Steel ~~Castings~~ castings*.

~~ISO 13583 consists of the following parts, under the general title *Centrifugally cast steel and alloy products:*~~

~~— *Part 1: General testing and tolerances*~~

~~— *Part 2: Heat resistant materials*~~

This third edition cancels and replaces the second edition (ISO 13583~~-~~2:2015), of which ~~has been editorially revised with the following~~it constitutes a minor revision. The changes are as follows:

~~— Conform to the most recent version~~— editorial update.

A list of all parts in the ISO 13583 series can be found on the ISO~~/IEC Directives, Part 2;~~ website.

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 ~~— Wording consistency to align with other ISO documents.~~

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Centrifugally cast steel and alloy products — Part 2: Heat resistant ~~materialsScope~~materials

1 Scope

This ~~part of ISO 13583~~document specifies cast steel and nickel alloy grades for elevated temperature service products manufactured by centrifugal casting.

~~1~~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 ~~conditions~~requirements*

ISO 13583-1, *Centrifugally cast steel and alloy products — Part 1: General testing and tolerances*

~~2~~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/

~~3~~4 General technical delivery conditions

Cast steel and alloy grades specified by this ~~documentshall~~document shall conform to the applicable requirements of ISO 4990 and ISO 13583-1, including the supplementary requirements that are indicated in the enquiry and purchase order.

~~4~~5 Heat treatment

The cast steel and alloy grades specified by this document do not require heat treatment. If heat treatment is required, the treatment shall be established by agreement between the manufacturer and the purchaser, and shall be specified in the purchase contract.

~~5~~6 Chemical composition

The cast steel and nickel alloy grades shall conform to the chemical composition listed in Table 1.

~~6~~7 Mechanical properties

The cast steel and nickel alloy grades shall conform to the requirements given in Tables 2 and 3.

Mechanical tests at room temperature and elevated temperature shall be performed if agreed upon between the manufacturer and purchaser at the time of enquiry and order.

~~7~~8 Supplementary requirements

A list of supplementary requirements for use at the option of the purchaser is included in ISO 4990 and ISO 13583-1. These supplementary requirements may be used with this specification upon agreement between the manufacturer and purchaser. These ~~must~~shall be agreed at the time of the order and listed in the order.

~~8~~9 Additional information

Additional information on the cast steels and nickel alloy grades in this document is included in Tables A.1, A.2, A.3, B.1 and C.1. ~~This information is given for guidance only and is not a requirement of this document.~~

~~NOTE~~ Annex C gives information on ISO grade designation and available UNS numbers which are similar to the ISO grade designation.

Table 1 — Chemical composition (mass fraction in %)[a]

Grade designation		C	Si	Mn	P	S	Cr	Ni	Mo	Nb	W	Co	Others
Name	Number												
GX25CrNiSi18–9	1.4825	0,15 to 0,35	0,5 to 2,5	2,0	0,040	0,030	17,0 to 19,0	8,0 to 10,0	0,50				
GX40CrNiSi25–12	1.4837	0,30 to 0,50	1,0 to 2,5	2,0	0,040	0,030	24,0 to 27,0	11,0 to 14,0	0,50				
GX40CrNiSi25–20	1.4848	0,30 to 0,50	1,0 to 2,5	2,0	0,040	0,030	24,0 to 27,0	19,0 to 22,0	0,50				
GX40CrNiSiNb24–24	1.4855	0,30 to 0,50	1,0 to 2,5	2,0	0,040	0,030	23,0 to 25,0	23,0 to 25,0	0,50	0,80 to 1,80			
GX10NiCrSiNb32–20	1.4859	0,050 to 0,15	0,5 to 1,5	2,0	0,040	0,030	19,0 to 21,0	31,0 to 33,0	0,50	0,50 to 1,50			
GX40NiCrSi38–19	1.4865	0,30 to 0,50	1,0 to 2,5	2,0	0,040	0,030	18,0 to 21,0	36,0 to 39,0	0,50				
GX12NiCrSiNb35–26	1.4851	0,08 to 0,15	0,5 to 1,5	0,5 to 1,5	0,030	0,030	24,0 to 27,0	34,0 to 37,0	0,50	0,60 to 1,30			
GX40NiCrSiNb35–26	1.4852	0,30 to 0,50	1,0 to 2,5	2,0	0,040	0,030	24,0 to 27,0	33,0 to 36,0	0,50	0,80 to 1,80			
GX42NiCrSiNbTi35–25	1.4838	0,38 to 0,48	1,5 to 2,5	0,5 to 1,5	0,030	0,030	24,0 to 27,0	34,0 to 37,0	0,50	0,60 to 1,80			Ti: 0,06 min.[b] addition required
GX42NiCrWSi35–25–5	1.4836	0,38 to 0,45	1,0 to 2,0	0,5 to 1,5	0,030	0,030	24,0 to 27,0	34,0 to 37,0	0,50		4,0 to 6,0		
GX42NiCrSiNbTi45–35	1.4839	0,38 to 0,45	1,0 to 2,0	0,5 to 1,5	0,030	0,030	33,0 to 36,0	44,0 to 47,0	0,50	0,50 to 1,50			Ti: 0,06 min.[b] addition required
GX50NiCrCoW35–25–15–5	1.4869	0,45 to 0,55	1,0 to 2,0	1,0	0,040	0,030	24,0 to 26,0	33,0 to 37,0	0,50		4,0 to 6,0	14,0 to 16,0	
G-NiCr28W	2.4879	0,35 to 0,55	1,0 to 2,0	1,5	0,040	0,030	27,0 to 30,0	47,0 to 50,0	0,50		4,0 to 6,0		Fe: Balance
G-NiCr28WCo	2.4881	0,40 to 0,55	1,0 to 2,0	0,5 to 1,5	0,030	0,030	27,0 to 30,0	47,0 to 50,0	0,50		4,0 to 6,0	2,5 to 3,5	
G-NiCr50Nb	2.4680	0,10	1,0	0,5	0,020	0,020	48,0 to 52,0	balance	0,50	1,00 to 1,80			N: 0,16 Fe: 1,0

[a] A single value indicates a maximum limit.

[b] Other micro alloying elements can be substituted for titanium. The total micro alloying elements shall be 0,06 % min.

Table 2 — Mechanical properties at room temperature

Grade designation		$R_{p0.2}$	R_m	A_5
Name	Number	MPa[a] min.	MPa[a] min.	% min.
GX25CrNiSi18–9	1.4825	230	450	15
GX40CrNiSi25–12	1.4837	220	450	10
GX40CrNiSi25–20	1.4848	220	450	8
GX40CrNiSiNb24–24	1.4855	220	450	10
GX10NiCrSiNb32–20	1.4859	180	440	20
GX40NiCrSi38–19	1.4865	220	420	6
GX12NiCrSiNb35–26	1.4851	175	440	20
GX40NiCrSiNb35–26	1.4852	220	440	4
GX42NiCrSiNbTi35–25	1.4838	220	450	8
GX42NiCrWSi35–25–5	1.4836	220	450	4
GX42NiCrSiNbTi45–35	1.4839	270	480	5
GX50NiCrCoW35–25–15–5	1.4869	250	450	5
G-NiCr28W	2.4879	240	440	3
G-NiCr28WCo	2.4881	220	400	5
G-NiCr50Nb	2.4680	230	540	8

[a] 1 MPa = 1 N/mm²

Table 3 — Short time rupture test: minimum time to rupture of 100 h at constant stress and temperature

Grade designation		Temperature °C	Stress MPa
Name	Number		
GX25CrNiSi18–9	1.4825	800	60
GX40CrNiSi25–12	1.4837	900	34
GX40CrNiSi25–20	1.4848	900	47
GX40CrNiSiNb24–24	1.4855	900	48
GX10NiCrSiNb32–20	1.4859	800	84
GX40NiCrSi38–19	1.4865	900	34
GX12NiCrSiNb35–26	1.4851	800	70

GX40NiCrSiNb35–26	1.4852	900	49
GX42NiCrSiNbTi35–25	1.4838	950	42
GX42NiCrWSi35–25–5	1.4836	950	35
GX42NiCrSiNbTi45–35	1.4839	1 050	21
GX450NiCrCoW35–25–15–5	1.4869	950	40
G-NiCr28W	2.4879	1 050	20
G-NiCr28WCo	2.4881	1 050	20
G-NiCr50Nb	2.4680	900	60