

BS ISO 13583-2:2015



BSI Standards Publication

# Centrifugally cast steel and alloy products

Part 2: Heat-resistant materials

**bsi.**

...making excellence a habit.™

**National foreword**

This British Standard is the UK implementation of ISO 13583-2:2015. It supersedes BS ISO 13583-2:2003 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/111, Steel Castings and Forgings.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015.  
Published by BSI Standards Limited 2015

ISBN 978 0 580 76503 2

ICS 77.140.80

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2015.

**Amendments/corrigenda issued since publication**

Date	Text affected
------	---------------

---

INTERNATIONAL  
STANDARD

BS ISO 13583-2:2015

**ISO**  
**13583-2**

Second edition  
2015-09-15

---

---

**Centrifugally cast steel and alloy  
products —**

**Part 2:  
Heat-resistant materials**

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



Reference number  
ISO 13583-2:2015(E)

© ISO 2015



## **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

# Contents

	Page
Foreword .....	iv
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 General technical delivery conditions .....</b>	<b>1</b>
<b>4 Heat treatment .....</b>	<b>1</b>
<b>5 Chemical composition .....</b>	<b>1</b>
<b>6 Mechanical properties .....</b>	<b>1</b>
<b>7 Supplementary requirements .....</b>	<b>1</b>
<b>8 Additional information .....</b>	<b>2</b>
<b>Annex A (informative) Mean values for 1 % elongation and creep rupture .....</b>	<b>5</b>
<b>Annex B (informative) Table of physical properties (<a href="#">Table B.1</a>) .....</b>	<b>7</b>
<b>Annex C (informative) UNS cast grades similar to ISO cast grades .....</b>	<b>8</b>
<b>Bibliography .....</b>	<b>9</b>

## 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.

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. [www.iso.org/directives](http://www.iso.org/directives)

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. [www.iso.org/patents](http://www.iso.org/patents)

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 Technical Committee ISO/TC 17, *Steel*, Subcommittee SC 11, *Steel 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 second edition cancels and replaces the first edition (ISO 13583-2:2003), which has been technically revised with the following changes:

- [Clause 2](#), standard references added where appropriate;
- [Table 1](#), composition limits modified for various grades;
- [Tables 1, 2, 3, A.1, A.2, A.3](#), and [B.1](#);
- [Annex C](#) is added.

# Centrifugally cast steel and alloy products —

## Part 2: Heat-resistant materials

### 1 Scope

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

### 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 conditions*

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

### 3 General technical delivery conditions

Cast steel and alloy grades specified by this International Standard 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 Heat treatment

The cast steel and alloy grades specified by this International Standard 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 Chemical composition

The cast steel and nickel alloy grades shall conform to the chemical composition listed in [Table 1](#).

### 6 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 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 be agreed at the time of the order and listed in the order.

## 8 Additional information

Additional information on the cast steels and nickel alloy grades in this International Standard 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 International Standard.

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 (cast analysis % by mass)<sup>a</sup>

Grade designation	Number	C	Si	Mn	P	S	Cr	Ni	Mo	Nb	W	Co	Others
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. <sup>b</sup> 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. <sup>b</sup> 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

<sup>a</sup> A single value indicates a maximum limit.

<sup>b</sup> 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 <sup>a</sup> min	MPa <sup>a</sup> 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
<sup>a</sup> 1 MPa = 1 N/mm <sup>2</sup>				

**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

## Annex A (informative)

### Mean values for 1 % elongation and creep rupture

**Table A.1 — Mean values of stress for 1 % elongation in 10 000 h  
(mean values out of a scatter band  $\pm 20$  %)**

Grade designation		$R_{1/10\,000}$	$R_{1/10\,000}$	$R_{1/10\,000}$	$R_{1/10\,000}$	$R_{1/10\,000}$	$R_{1/10\,000}$
Name	Number	at 600 °C	at 700 °C	at 800 °C	at 900 °C	at 1 000 °C	at 1 100 °C
GX25CrNiSi18-9	1.4825	78	44	22	9		
GX40CrNiSi25-12	1.4837		50	26	13	6	
GX40CrNiSi25-20	1.4848		65	36	17	7	2,5
GX40CrNiSiNb24-24	1.4855		80	46	22	7,5	
GX10NiCrSiNb32-20	1.4859		64	36	15,5	5	
GX40NiCrSi38-19	1.4865		55	32	18	7	
GX12NiCrSiNb35-26	1.4851		64	36	15,5	5	
GX40NiCrSiNb35-26	1.4852		72	41	22	9	3
GX42NiCrSiNbTi35-25	1.4838		84	54	29	14	4
GX42NiCrWSi35-25-5	1.4836		73	43	22	9,8	2,6
GX42NiCrSiNbTi45-35	1.4839		84	50	28	15,4	7,1
GX50NiCrCoW35-25-15-5	1.4869		90	60	32	17	6
G-NioCr28W	2.4879		70	41	22	10	4
G-NiCr28WCo	2.4881		90	55	29	13,5	6
G-NiCr50Nb	2.4680		71	38	18	6,8	

NOTE Purchasers should consider the effects of atmospheres and temperatures in service when assessing the suitability of component design and selection of grade.

**Table A.2 — Mean values for creep rupture strength for 10 000 h  
(mean values out of a scatter band  $\pm 20\%$ )**

Grade designation		Creep rupture strength MPa at				
Name	Number	700 °C	800 °C	900 °C	1 000 °C	1 100 °C
GX25CrNiSi18-9	1.4825	56	26	14		
GX40CrNiSi25-12	1.4837	56	28	14	7	
GX40CrNiSi25-20	1.4848		45	23	9,6	2,5
GX40CrNiSiNb24-24	1.4855		56	28	12	
GX10NiCrSiNb32-20	1.4859	80	43	23	9	
GX40NiCrSi38-19	1.4865			27	12,5	
GX12NiCrSiNb35-26	1.4851	90	52	26	11	
GX40NiCrSiNb35-26	1.4852		55	32	14,5	4
GX42NiCrSiNbTi35-25	1.4838		64	39	17	7
GX42NiCrWSi35-25-5	1.4836			32	14	5,3
GX42NiCrSiNbTi45-35	1.4839		54	34	18,6	8,3
GX40NiCrCoW35-25-15-5	1.4869		65	38	17	6
G-NiCr28W	2.4879		52	29	14	5
G-NiCrWCo	2.4881		54	33	17	7,8
G-NiCr50Nb	2.4680		49	21	4,5	

**Table A.3 — Mean values for creep rupture strength for 100 000 h  
(mean values out of a scatter band  $\pm 20\%$ )**

Grade designation		Creep rupture strength MPa at				
Name	Number	700 °C	800 °C	900 °C	1 000 °C	1 100 °C
GX25CrNiSi18-9	1.4525	36	18	7,7		
GX40CrNiSi25-12	1.4837	36	19	8	3	
GX40CrNiSi25-20	1.4848		29	12	5	
GX40CrNiSiNb24-24	1.4855		40	18,5	7	
GX10NiCrSiNb32-20	1.4859	60	32	14	4,5	
GX40NiCrSi38-19	1.4865		27	10	3	
GX12NiCrSiNb35-26	1.4851	65	35	16	5,4	
GX40NiCrSiNb35-26	1.4852	65	49	24	9	2,3
GX42NiCrSiNbTi35-25	1.4838		50	28	14	4
GX42NiCrWSi35-25-5	1.4836		35	16,5	6,6	1,7
GX42NiCrSiNbTi45-35	1.4839	84	42	24	11	4
GX50NiCrCoW35-25-15-5	1.4869		49	25	9,8	3
G-NiCr28W	2.4879		36	17	7,4	2,6
G-NiCr28WCo	2.4881		36	17	8	3
G-NiCr50Nb	2.4680		28,5	13	3,8	

## Annex B (informative)

### Table of physical properties ([Table B.1](#))

**Table B.1 — Physical properties**

Grade designation		Density kg/dm <sup>3</sup> at 20 °C	Specific heat capac- ity J/(kg K) at 20 °C	Thermal conductivity W/(m K) at				Thermal expansion 10 <sup>-6</sup> K <sup>-1</sup> at		
				20 °C	100 °C	800 °C	1 000 °C	400 °C	800 °C	1 000 °C
Name	Number									
GX25CrNiSi18-9	1.4825	7,8	500	14,8	15,5	26	30	17,4	18,3	18,8
GX40CrNiSi25-12	1.4837	7,8	500	14	15	25,4	28,8	17,5	18,4	19,3
GX40CrNiSi25-20	1.4848	7,8	500	14,6	16,7	25	28	17	18	19
GX40CrNiSiNb24-24	1.4855	8,0	500	14,0	15,5	25,5	27,7	16,8	18,0	18,5
GX10NiCrSiNb32-20	1.4859	8,0	500	12,8	13,0	25,1		17,6	18,7	19,5
GX40NiCrSi38-19	1.4865	8,0	500	12,0	12,3	23,3	26,5	15,3	17,0	17,6
GX12NiCrSiNb35-26	1.4851	8,0	500	12,8	13,0	25,1		17,6	18,7	19,5
GX40NiCrSiNb35-26	1.4852	8,0	500	12,8	13,0	23,5	27,7	16	17,8	18,6
GX42NiCrSiNbTi35-25	1.4838	8,0	500	12,8	13,0	23,5	27,7	16,0	17,0	18,5
GX42NiCrWSi35-25-5	1.4836	8,3	500	12,7	13,0	23,4	28,0	16,2	17,4	18,6
GX42NiCrSiNbTi45-35	1.4839	8,0	500	12,0	12,2	30,6	36,1	14,3	15,3	15,7
GX40NiCrCoW35-25-15-5	1.4869	8,2	500	10,0	12,6	27,0	28,0	16,9	17,2	17,3
G-NiCr28W	2.4879	8,2	500	11,0	11,3	30,6	36,1	14,3	15,3	15,7
G-NiCr28WCo	2.4881	8,2	500	11,0	11,3	30,6	36,1	14,4	15,7	16,3
G-NiCr50Nb	2.4680	8,0	450	12,7	14,2	26,8	31,2	13	15	15

## Annex C (informative)

### UNS cast grades similar<sup>1)</sup> to ISO cast grades

**Table C.1 — UNS cast grades similar to ISO cast grades**

Grade designation		UNS number
Name	Number	(similar grade)
GX25CrNiSi18-9	1.4825	J92603 (HF)
GX40CrNiSi25-12	1.4837	J93503 (HH)
GX40CrNiSi25-20	1.4848	J94204 (HK 40)
GX40CrNiSiNb24-24	1.4855	
GX10NiCrSiNb32-20	1.4859	N08151 (CT15C)
GX40NiCrSi38-19	1.4865	N08004 (HU)
GX12NiCrSiNb35-26	1.4851	
GX40NiCrSiNb35-26	1.4852	N28702
GX42NiCrSiNbTi35-25	1.4838	
GX42NiCrWSi35-25-5	1.4836	
GX42NiCrSiNbTi45-35	1.4839	
GX45NiCrCoW35-25-15-5	1.4869	
G-NiCr28W	2.4879	
G-NiCr28WCo	2.4881	
G-NiCr50Nb	2.4680	R20501

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.

## Bibliography

- [1] EN 10027-1, *Designation system for steels – Part 1: Steel names*
- [2] EN 10027-2, *Designation system for steels – Part 2: Steel numbers*







# British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

## About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

## Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at [bsigroup.com/standards](http://bsigroup.com/standards) or contacting our Customer Services team or Knowledge Centre.

## Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at [bsigroup.com/shop](http://bsigroup.com/shop), where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

## Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to [bsigroup.com/subscriptions](http://bsigroup.com/subscriptions).

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

**PLUS** is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit [bsigroup.com/shop](http://bsigroup.com/shop).

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email [bsmusales@bsigroup.com](mailto:bsmusales@bsigroup.com).

## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

## Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

## Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

## Useful Contacts:

### Customer Services

**Tel:** +44 845 086 9001

**Email (orders):** [orders@bsigroup.com](mailto:orders@bsigroup.com)

**Email (enquiries):** [cservices@bsigroup.com](mailto:cservices@bsigroup.com)

### Subscriptions

**Tel:** +44 845 086 9001

**Email:** [subscriptions@bsigroup.com](mailto:subscriptions@bsigroup.com)

### Knowledge Centre

**Tel:** +44 20 8996 7004

**Email:** [knowledgecentre@bsigroup.com](mailto:knowledgecentre@bsigroup.com)

### Copyright & Licensing

**Tel:** +44 20 8996 7070

**Email:** [copyright@bsigroup.com](mailto:copyright@bsigroup.com)



...making excellence a habit.™