INTERNATIONAL STANDARD

ISO 14737

Second edition
2015-12-15

Carbon and low alloy cast steels for general applications

Aciers moulés au carbone et faiblement alliés d'usage général

Reference number
ISO 14737:2015(E)

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

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 (see 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 (see 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 The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 11, *Steel castings*.

This second edition cancels and replaces the first edition (ISO 14737:2003) and ISO 3755, of which it constitutes a technical revision. Notably, the following changes have been made to the previous edition:

— *carbon* has replaced *non-alloy* in the title of the standard;

— grades G21Mn5 and G50CrMo4 have been deleted;

— Annexes A and B have been replaced;

— new values and grade numbers have been added to Tables 1 and 2 and Annex A.

Carbon and low alloy cast steels for general applications

1 Scope

This International Standard specifies requirements for carbon and low alloy cast steel grades for general applications.

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

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 148-1, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

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

ISO 6892-1, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature*

3 General conditions for delivery

Steel castings supplied in accordance with this International Standard shall conform to the applicable requirements of ISO 4990, including the supplementary requirements that are indicated in the inquiry and purchase order.

4 Chemical composition

The chemical composition shall conform to the values given in Table 1.

5 Heat treatment

The type of heat treatment is left to the discretion of the manufacturer unless otherwise agreed upon at the time of inquiry and order. The information for heat treatment described in Table 2 is for information only.

6 Mechanical properties

Mechanical properties are given in Table 2 and shall be subject to an agreement at the time of inquiry and order.

Unless otherwise specified (see ISO 4990), the thickness of the test block shall be 28 mm minimum.

Properties at thicknesses greater than the maximum thickness in Table 2 may be lower and are subject to an agreement between manufacturer and purchaser.

7 Test methods

7.1 The tensile test shall be performed in accordance with ISO 6892-1.

7.2 The impact test shall be performed in accordance with ISO 148-1.

8 Supplementary requirements

A list of supplementary requirements which may be used at the option of the purchaser is given in ISO 4990.

9 Marking

Marking shall be as specified in ISO 4990.

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

Grade designation		C	Si	Mn	P	S	Cr	Mo	Ni	V	Cu
Name	Number										
GE 200	1.0420	—	—	—	0,035	0,030	0,30	0,12	0,40	0,03	0,30
GS 200	1.0449	0,18	0,60	1,20	0,030	0,025	0,30	0,12	0,40	0,03	0,30
GE 240	1.0446	—	—	—	0,035	0,030	0,30	0,12	0,40	0,03	0,30
GS 240	1.0455	0,23	0,60	1,20	0,030	0,025	0,30	0,12	0,40	0,03	0,30
GS 270	1.0454	0,24	0,60	1,30	0,030	0,025	0,30[a]	0,12[a]	0,40[a]	0,03[a]	0,30[a]
GS 340	1.0467	0,30	0,60	1,50	0,030	0,025	0,30[a]	0,12[a]	0,40[a]	0,03[a]	0,30[a]
G28Mn6	1.1165	0,25 to 0,32	0,60	1,20 to 1,80	0,035	0,030	0,30	0,15	0,40	0,05	0,30
G28MnMo6	1.5433	0,25 to 0,32	0,60	1,20 to 1,60	0,025	0,025	0,30	0,20 to 0,40	0,40	0,05	0,30
G20Mo5	1.5419	0,15 to 0,23	0,60	0,50 to 1,00	0,025	0,020[b]	0,30	0,40 to 0,60	0,40	0,05	0,30
G10MnMoV6–3	1.5410	0,12 max.	0,60	1,20 to 1,80	0,025	0,020	0,30	0,20 to 0,40	0,40	0,05 to 0,10	0,30
G20NiCrMo2–2	1.6741	0,18 to 0,23	0,60	0,60 to 1,00	0,035	0,030	0,40 to 0,60	0,15 to 0,25	0,40 to 0,70	0,05	0,30
G25NiCrMo2–2	1.6744	0,23 to 0,28	0,60	0,60 to 1,00	0,035	0,030	0,40 to 0,60	0,15 to 0,25	0,40 to 0,70	0,05	0,30
G30NiCrMo2–2	1.6778	0,28 to 0,33	0,60	0,60 to 1,00	0,035	0,030	0,40 to 0,60	0,15 to 0,25	0,40 to 0,70	0,05	0,30
G17CrMo5–5	1.7357	0,15 to 0,20	0,60	0,50 to 1,00	0,025	0,020[b]	1,00 to 1,50	0,45 to 0,65	0,40	0,05	0,30
G17CrMo9–10	1.7379	0,13 to 0,20	0,60	0,50 to 0,90	0,025	0,020[b]	2,00 to 2,50	0,90 to 1,20	0,40	0,05	0,30
G26CrMo4	1.7221	0,22 to 0,29	0,60	0,50 to 0,80	0,025	0,020[b]	0,80 to 1,20	0,15 to 0,30	0,40	0,05	0,30
G34CrMo4	1.7230	0,30 to 0,37	0,60	0,50 to 0,80	0,025	0,020[b]	0,80 to 1,20	0,15 to 0,30	0,40	0,05	0,30
G42CrMo4	1.7231	0,38 to 0,45	0,60	0,60 to 1,00	0,025	0,020[b]	0,80 to 1,20	0,15 to 0,30	0,40	0,05	0,30
G30CrMoV6–4	1.7725	0,27 to 0,34	0,60	0,60 to 1,00	0,025	0,020[b]	1,30 to 1,70	0,30 to 0,50	0,40	0,05 to 0,15	0,30
G35CrNiMo6–6	1.6579	0,32 to 0,38	0,60	0,60 to 1,00	0,025	0,020[b]	1,40 to 1,70	0,15 to 0,35	1,40 to 1,70	0,05	0,30
G30NiCrMo7–3	1.6572	0,28 to 0,33	0,60	0,60 to 0,90	0,035	0,030	0,70 to 0,90	0,20 to 0,30	1,65 to 2,00	0,05	0,30
G40NiCrMo7–3	1.6573	0,38 to 0,43	0,60	0,60 to 0,90	0,035	0,030	0,70 to 0,90	0,20 to 0,30	1,65 to 2,00	0,05	0,30
G32NiCrMo8–5-4	1.6570	0,28 to 0,35	0,60	0,60 to 1,00	0,020	0,015	1,00 to 1,40	0,30 to 0,50	1,60 to 2,10	0,05	0,30

Single values indicate maximums.

[a] Cr + Mo + Ni + V + Cu max. 1,00 %.

[b] For castings of ruling thickness < 28 mm, S ≤ 0,030 % is permitted.

Table 2 — Mechanical properties at room temperature (heat treatment for information only)

Grade designation		Heat treatment			Mechanical properties				
Name	No.	Symbol[c]	Normalizing or Austenitizing °C	Tempering °C	Thickness t mm	$R_{p0,2}$ min. MPa	Rm MPa	A min. %	KV min. J
GE 200	1.0420	+N	900 to 980		≤ 300	200	380 to 530	25	27
GS 200	1.0449	+N	900 to 980		≤ 100	200	380 to 530	25	35
GE 240	1.0446	+N	900 to 980		≤ 300	240	450 to 600	22	27
GS 240	1.0455	+N	880 to 980		≤ 100	240	450 to 600	22	31
GS 270	1.0454	+N	880 to 960		≤ 100	270	480 to 630	18	27
GS 340	1.0467	+N	880 to 960		≤ 100	340	550 to 700	15	20
G28Mn6	1.1165	+N	880 to 950		≤ 250	260	520 to 670	18	27
		+QT1		630 to 680	≤ 100	450	600 to 750	14	35
		+QT2		580 to 630	≤ 50	550	700 to 850	10	31
G28MnMo6	1.5433	+QT1	880 to 950	630 to 680	≤ 50	500	700 to 850	12	35
					≤ 100	480	670 to 830	10	31
		+QT2		580 to 630	≤ 100	590	850 to 1 000	8	27
G20Mo5	1.5419	+QT	920 to 980	650 to 730	≤ 100	245	440 to 590	22	27
G10MnMoV6-3	1.5410	QT1	950 to 980	640 to 660	≤ 50	380	500 to 650	22	60
					50 < t ≤ 100	350	480 to 630	22	60
					100 < t ≤ 150	330	480 to 630	20	60
					150 < t ≤ 250	330	450 to 600	18	60
		QT2			50 < t ≤ 100	500	600 to 750	18	60
					50 < t ≤ 100	400	550 to 700	18	60
					100 < t ≤ 150	380	500 to 650	18	60
					150 < t ≤ 250	350	460 to 610	18	60
		QT3[a]		740 to 760 + 600 to 650	t ≤ 100	400	520 to 650	22	27[b]
									60
G20NiCrMo2-2	1.6741	+NT	900 to 980	610 to 660	t ≤ 100	200	550 to 700	18	10
		+QT1		600 to 650		430	700 to 850	15	25
		+QT2		500 to 550		540	820 to 970	12	25
G25NiCrMo2-2	1.6744	+NT	900 to 980	580 to 630	t ≤ 100	240	600 to 750	18	10
		+QT1		500 to 650		500	750 to 900	15	25
		+QT2		550 to 500		600	850 to 1 000	12	25
G30NiCrMo2-2	1.6778	+NT	900 to 980	600 to 650	t ≤ 100	270	630 to 780	18	10
		+QT1		600 to 650		540	820 to 970	14	25
		+QT2		550 to 600		630	900 to 1 050	11	25

Normalise +N

Normalise and temper +NT

Quench and temper +QT

[a] Double temper.

[b] –20 °C test temperature.

[c] Number 1, 2 or 3 after "T" indicates a different tempering temperature.

Table 2 *(continued)*

Grade designation		Heat treatment			Mechanical properties				
Name	No.	Symbol[c]	Normalizing or Austenitizing °C	Tempering °C	Thickness t mm	$R_{p0,2}$ min. MPa	R_m MPa	A min. %	KV min. J
G17CrMo5-5	1.7357	+QT	920 to 960	680 to 730	$t \leq 100$	315	490 to 690	20	27
G17CrMo9-10	1.7379	+QT	930 to 970	680 to 740	$t \leq 150$	400	590 to 740	18	40
G26CrMo4	1.7221	+QT1	880 to 950	600 to 650	$t \leq 100$	450	600 to 750	16	40
					$100 < t \leq 250$	300	550 to 700	14	27
		+QT2	880 to 950	550 to 600	$t \leq 100$	550	700 to 850	10	18
G34CrMo4	1.7230	+NT	880 to 950	600 to 650	$t \leq 100$	270	630 to 780	16	10
		+QT1				540	700 to 850	12	35
					$100 < t \leq 150$	480	620 to 770	10	27
					$150 < t \leq 250$	330	620 to 770	10	16
		+QT2		550 to 600	$t \leq 100$	650	830 to 980	10	27
G42CrMo4	1.7231	+NT	900 to 980	630 to 680	$t \leq 100$	300	700 to 850	15	10
		+QT1	880 to 950	600 to 650		600	800 to 950	12	31
					$100 < t \leq 150$	550	700 to 850	10	27
					$150 < t \leq 250$	350	650 to 800	10	16
		+QT2		550 to 600	$t \leq 100$	700	850 to 1 000	10	27
G30CrMoV6-4	1.7725	+QT1	880 to 950	600 to 650	$t \leq 100$	700	850 to 1 000	14	45
					$100 < t \leq 150$	550	750 to 900	12	27
					$150 < t \leq 250$	350	650 to 800	12	20
		+QT2		530 to 600	$t \leq 100$	750	900 to 1 100	12	31
G35CrNiMo6-6	1.6579	+N	860 to 920		$t \leq 150$	550	800 to 950	12	31
					$150 < t \leq 250$	500	750 to 900	12	31
		QT1		600 to 650	$t \leq 100$	700	850 to 1 000	12	45
					$100 < t \leq 150$	650	800 to 950	12	35
					$150 < t \leq 250$	650	800 to 950	12	30
		+QT2		510 to 560	$t \leq 100$	800	900 to 1 050	10	35
G30NiCrMo7-3	1.6572	+NT	900 to 980	630 to 680	$t \leq 100$	550	760 to 900	12	10
		+QT1				690	930 to 1 100	10	25
		+QT2		580 to 630		795	1 030 to 1 200	8	25
G40NiCrMo7-3	1.6573	+NT	900 to 980	630 to 680	$t \leq 100$	585	860 to 1 100	10	10
		+QT1				760	1 000 to 1 140	8	25
		+QT2		580 to 630		795	1 030 to 1 200	8	25

Normalise +N

Normalise and temper +NT

Quench and temper +QT

[a] Double temper.

[b] –20 °C test temperature.

[c] Number 1, 2 or 3 after "T" indicates a different tempering temperature.

Table 2 *(continued)*

Grade designation		Heat treatment			Mechanical properties				
Name	No.	Symbol[c]	Normalizing or Austenitizing °C	Tempering °C	Thickness t mm	$R_{p0,2}$ min. MPa	R_m MPa	A min. %	KV min. J
G32NiCrMo8-5-4	1.6570	+QT1	880 to 920	600 to 650	$t \leq 100$	700	850 to 1 000	16	50
					$100 < t \leq 250$	650	820 to 970	14	35
		+QT2		500 to 550	$t \leq 100$	950	1 050 to 1 200	10	35

Normalise +N

Normalise and temper +NT

Quench and temper +QT

[a] Double temper.

[b] –20 °C test temperature.

[c] Number 1, 2 or 3 after "T" indicates a different tempering temperature.

Annex A
(informative)

Guidance data for welding

Table A.1 — Guidance data for welding

Grade designation		Preheat temperature[a]	Interpass temperature	Post weld heat treatment
Name	Number	°C	°C max.	
GE200	1.0420	20 to 150	350	None
GS200	1.0449			
GE240	1.0446			
GS240	1.0455			
GS270	1.0454			≥ 620
GS 340	1.0467	150 to 300		
G28Mn6	1.1165	20 to 150		b
G28MnMo6	1.5433	150 to 300		b
G20Mo5	1.5419	20 to 200		≥ 650[b]
G10MnMoV6–3	1.5410	20 to 150		None
G20NiCrMo2–2	1.6741			b
G25NiCrMo2–2	1.6744	100 to 200		
G30NiCrMo2–2	1.6778	150 to 250		
G17CrMo5–5	1.7357			≥ 650[b]
G17CrMo9–10	1.7379			> 680[b]
G26CrMo4	1.7221	150 to 300		
G34CrMo4	1.7230	200 to 350		
G42CrMo4	1.7231			
G30CrMoV6–4	1.7725		400	b
G35CrNiMo6–6	1.6579			
G30NiCrMo7–3	1.6572	200 to 350		
G40NiCrMo7–3	1.6573			
G32NiCrMo8–5-4	1.6570	200 to 350		

[a] The preheating temperature is related to the geometry, the thickness of the casting and climatic conditions.

[b] The post weld heat treatment temperature shall be at least 20 °C, but not more than 50 °C below tempering temperature.