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Carbon and low alloy cast steels for general applications

Aciers moulés au carbone et faiblement alliés d'usage général

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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).

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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

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

This third edition cancels and replaces the second edition (ISO 14737:2015), which has been technically revised. The main changes compared to the previous edition are as follows:

— New Note was inserted the Scope; previous Note 1 for Annex B was renumbered as Note 2;

— "Terms and Definitions" added as new Clause 3; subsequent Clauses were renumbered;

— Footnote "a" to limit Cr, Mo, Ni, V, and Cu was added to GE200, GS200, GE240, and GS240 in Table 1. This makes it consistent with EN 10293;

— Correction of thickness, *t*, for G10MnMoV6-3 in Table 2;

— Correction of tempering temperature range for G25NiCrMo2-2.

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.

Carbon and low alloy cast steels for general applications

1 Scope

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

NOTE 1 Annex A provides guidance on welding.

NOTE 2 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 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 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 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 General conditions for delivery

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

5 Chemical composition

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

6 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. Heat treatment described in Table 2 is for information only.

7 Mechanical properties

Mechanical properties are given in Table 2 and are 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.

8 Test methods

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

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

9 Supplementary requirements

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

10 Marking

Marking shall be as specified in ISO 4990.

Table 1 — Chemical composition, mass fraction in %

Grade designation		C	Si	Mn	P	S	Cr	Mo	Ni	V	Cu
Name	Number										
GE 200	1,0420	—	—	—	0,035	0,030	0,30[a]	0,12[a]	0,40[a]	0,03[a]	0,30[a]
GS 200	1,0449	0,18	0,60	1,20	0,030	0,025	0,30[a]	0,12[a]	0,40[a]	0,03[a]	0,30[a]
GE 240	1,0446	—	—	—	0,035	0,030	0,30[a]	0,12[a]	0,40[a]	0,03[a]	0,30[a]
GS 240	1,0455	0,23	0,60	1,20	0,030	0,025	0,30[a]	0,12[a]	0,40[a]	0,03[a]	0,30[a]
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 (Non-mandatory)

Grade designation		Symbol[c]	Heat treatment		Mechanical properties				
Name	No.		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	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		600 to 650		500	750 to 900	15	25
		+QT2		550 to 600		600	850 to 1 000	12	25
		+NT		600 to 650		270	630 to 780	18	10

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	Rm MPa	A min. %	KV min. J
G30NiCrMo2-2	1,6778	+QT1	900 to 980	600 to 650	$t \leq 100$	540	820 to 970	14	25
		+QT2		550 to 600		630	900 to 1 050	11	25
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

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	Rm MPa	A min. %	KV min. J
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
G32NiCr-Mo8-5-4	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.