

PS- ISO 14737:_____
ICS No. _____

PAKISTAN STANDARD FOR:

Carbon and low alloy cast steels for general applications

(IDT: ISO 14737:2021)



Draft Pakistan Standard
Not For Sale, PSQCA (C)

FOREWORD

- 0.1 International Standards are widely adopted at the regional or national level and applied by manufacturers, trade organizations, purchasers, consumers, testing laboratories, authorities and other interested parties. Since these standards generally reflect the best experience of industry, researchers, consumers and regulators worldwide, and cover common needs in a variety of countries, they constitute one of the important bases for the removal of technical barriers to trade. This has been explicitly acknowledged in the Agreement on Technical Barriers to Trade of the World Trade Organization (WTO TBT Agreement).
- 0.2 Pakistan being the signatory of TBT/WTO agreement has also re-align its Standard Development activities to meet the opportunities as well as challenges of globalization.
- 0.3 This Pakistan Standard was adopted by the Authority of the Pakistan Standards & Quality Control Authority, (National Standards Body of Islamic Republic of Pakistan), after the draft prepared by the Mechanical Technical Committee (MTC-05): “Metal Alloys and Testing” which is finally recommended by the National Standards Committee of Mechanical on _____
- 0.4 This Pakistan Standard No. PS-ISO:14737:_____ is identical to ISO 14737:2021 for “Carbon and low alloy cast steels for general applications” which is acknowledged with thanks.
- 0.5 This Standard is subject to periodical review in order to keep pace with development in technology. Any suggestion for improvement will be recorded and placed before the revising committee in due course.

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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).

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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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 in 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.

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Table 1 — Chemical composition, mass fraction in %

Grade designation Name	Grade designation Number	C	Si	Mn	P	S	Cr	Mo	Ni	V	Cu
GE200	1.0420	—	—	—	0,035	0,030	0,30 ^a	0,12 ^a	0,40 ^a	0,03 ^a	0,30 ^a
GS200	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
GE240	1.0446	—	—	—	0,035	0,030	0,30 ^a	0,12 ^a	0,40 ^a	0,03 ^a	0,30 ^a
GS240	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
GS270	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
GS340	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	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				
			Normalizing or Austenitizing °C	Tempering °C	Thickness <i>t</i> mm	<i>R</i> _{p0,2} min. MPa	<i>R</i> _m MPa	<i>A</i> min. %	<i>KV</i> min. J
Name	No.								
GE200	1.0420	+N	900 to 980		≤ 300	200	380 to 530	25	27
GS200	1.0449	+N	900 to 980		≤ 100	200	380 to 530	25	35
GE240	1.0446	+N	900 to 980		≤ 300	240	450 to 600	22	27
GS240	1.0455	+N	880 to 980		≤ 100	240	450 to 600	22	31
GS270	1.0454	+N	880 to 960		≤ 100	270	480 to 630	18	27
GS340	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
		+QT2		580 to 630	≤ 100	480	670 to 830	10	31
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 < <i>t</i> ≤ 100	350	480 to 630	22	60
					100 < <i>t</i> ≤ 150	330	480 to 630	20	60
					150 < <i>t</i> ≤ 250	330	450 to 600	18	60
		QT2		≤ 50	500	600 to 750	18	60	
				50 < <i>t</i> ≤ 100	400	550 to 700	18	60	
				100 < <i>t</i> ≤ 150	380	500 to 650	18	60	
				150 < <i>t</i> ≤ 250	350	460 to 610	18	60	
QT3 ^a	740 to 760 + 600 to 650	<i>t</i> ≤ 100	400	520 to 650	22	27 ^b 60			
G20NiCrMo2-2	1.6741	+NT	900 to 980	610 to 660	<i>t</i> ≤ 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	<i>t</i> ≤ 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
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		Symbol ^c	Heat treatment		Mechanical properties							
			Normalizing or Austenitizing °C	Tempering °C	Thickness <i>t</i> mm	<i>R</i> _{p0,2} min. MPa	<i>R</i> _m MPa	<i>A</i> min. %	<i>KV</i> min. J			
Name	No.											
G30NiCrMo2-2	1.6778	+NT	900 to 980	600 to 650	<i>t</i> ≤ 100	270	630 to 780	18	10			
		+QT1		600 to 650		540				820 to 970	14	25
		+QT2		550 to 600		630						
G17CrMo5-5	1.7357	+QT	920 to 960	680 to 730	<i>t</i> ≤ 100	315	490 to 690	20	27			
G17CrMo9-10	1.7379	+QT	930 to 970	680 to 740	<i>t</i> ≤ 150	400	590 to 740	18	40			
G26CrMo4	1.7221	+QT1	880 to 950	600 to 650	<i>t</i> ≤ 100	450	600 to 750	16	40			
		100 < <i>t</i> ≤ 250		300	550 to 700	14	27					
		+QT2	880 to 950	550 to 600	<i>t</i> ≤ 100	550	700 to 850	10	18			
G34CrMo4	1.7230	+NT	880 to 950	600 to 650	<i>t</i> ≤ 100	270	630 to 780	16	10			
		100 < <i>t</i> ≤ 150			540	700 to 850	12	35				
		+QT1		150 < <i>t</i> ≤ 250	330	620 to 770	10	16				
		+QT2		550 to 600	<i>t</i> ≤ 100	650	830 to 980	10	27			
G42CrMo4	1.7231	+NT	900 to 980	630 to 680	<i>t</i> ≤ 100	300	700 to 850	15	10			
		600				800 to 950	12	31				
		+QT1	880 to 950	600 to 650	100 < <i>t</i> ≤ 150	550	700 to 850	10	27			
		150 < <i>t</i> ≤ 250		350	650 to 800	10	16					
+QT2	550 to 600	<i>t</i> ≤ 100	700	850 to 1 000	10	27						
G30CrMoV6-4	1.7725	+QT1	880 to 950	600 to 650	<i>t</i> ≤ 100	700	850 to 1 000	14	45			
					100 < <i>t</i> ≤ 150	550	750 to 900	12	27			
		150 < <i>t</i> ≤ 250		350	650 to 800	12	20					
		+QT2		530 to 600	<i>t</i> ≤ 100	750	900 to 1 100	12	31			
G35CrNiMo6-6	1.6579	+N	860 to 920	600 to 650	<i>t</i> ≤ 150	550	800 to 950	12	31			
					150 < <i>t</i> ≤ 250	500	750 to 900	12	31			
		QT1			<i>t</i> ≤ 100	700	850 to 1 000	12	45			
					100 < <i>t</i> ≤ 150	650	800 to 950	12	35			
					150 < <i>t</i> ≤ 250	650	800 to 950	12	30			
		+QT2			510 to 560	<i>t</i> ≤ 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		Symbol ^c	Heat treatment		Thickness <i>t</i> mm	Mechanical properties			
			Normalizing or Austenitizing °C	Tempering °C		<i>R</i> _{p0,2} min. MPa	<i>R</i> _m MPa	<i>A</i> min. %	<i>KV</i> min. J
Name	No.								
G30NiCrMo7-3	1.6572	+NT	900 to 980	630 to 680	<i>t</i> ≤ 100	550	760 to 900	12	10
		+QT1		580 to 630		690	930 to 1 100	10	25
		+QT2				795	1 030 to 1 200	8	25
G40NiCrMo7-3	1.6573	+NT	900 to 980	630 to 680	<i>t</i> ≤ 100	585	860 to 1 100	10	10
		+QT1		580 to 630		760	1 000 to 1 140	8	25
		+QT2				795	1 030 to 1 200	8	25
G32NiCr-Mo8-5-4	1.6570	+QT1	880 to 920	600 to 650	<i>t</i> ≤ 100	700	850 to 1 000	16	50
					100 < <i>t</i> ≤ 250	650	820 to 970	14	35
		+QT2		500 to 550	<i>t</i> ≤ 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 temperature
Name	Number	°C	°C max.	°C
GE200	1.0420	20 to 150	350	None
GS200	1.0449			
GE240	1.0446			
GS240	1.0455			
GS270	1.0454			
GS340	1.0467	150 to 300	400	≥620
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	100 to 200		b
G25NiCrMo2-2	1.6744			
G30NiCrMo2-2	1.6778			
G17CrMo5-5	1.7357	150 to 250		≥650 ^b
G17CrMo9-10	1.7379	150 to 300		>680 ^b
G26CrMo4	1.7221			
G34CrMo4	1.7230	200 to 350		b
G42CrMo4	1.7231			
G30CrMoV6-4	1.7725			
G35CrNiMo6-6	1.6579	200 to 350		
G30NiCrMo7-3	1.6572			
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.

Annex B (informative)

UNS cast grades similar to ISO cast grades

Table B.1 — UNS cast grades similar to ISO cast grades

Name	Grade designation		UNS number (similar grade) ^a
		Number	
GE200		1.0420	J03000
GS200		1.0449	J02001
GE240		1.0446	J03000
GS240		1.0455	J02003
GS270		1.0454	J02503
GS340		1.0467	J03003
G28Mn6		1.1165	—
G28MnMo6		1.5433	—
G20Mo5		1.5419	—
G10MnMoV6-3		1.5410	—
G20NiCrMo2-2		1.6741	J12047, J12095
G25NiCrMo2-2		1.6744	J12595
G30NiCrMo2-2		1.6778	J13095
G17CrMo5-5		1.7357	—
G17CrMo9-10		1.7379	—
G26CrMo4		1.7221	J13502
G34CrMo4		1.7230	J14047, J23259
G42CrMo4		1.7231	—
G30CrMoV6-4		1.7725	—
G35CrNiMo6-6		1.6579	—
G30NiCrMo7-3		1.6572	J23259
G40NiCrMo7-3		1.6573	J24053
G32NiCrMo8-5-4		1.6570	—

NOTE The grade designations including the names and the numbers follow the rules of EN 10027-1 and EN 10027-2.

^a The similar UNS (Unified Numbering System) grades may not be equivalent to the grades in this document.

Bibliography

- [1] EN 10027-1, *Designation systems for steels — Part 1: Steel names*
- [2] EN 10027-2, *Designation systems for steels — Part 2: Numerical system*

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