

BUREAU OF INDIAN STANDARDS

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Draft AMENDMENT NO. 1

TO

IS 3748 : 2022 Tool Steels — Specification

ICS No. 77.140.35

Alloy Steels and Forging Sectional Committee, MTD 16

Last date of comments: **20 Feb 2025**

(Page 4, Clause 7.2 Para 1) Insert the following at the end:

‘Besides this tool steel may be supplied in chemical composition and mechanical properties as agreed between the purchaser and manufacturer. In this case the designation of steel shall be done as per ISO/TS 4949.’

(Page 11, Table 4) — Substitute the existing Table 4:

‘Table 4 — Chemical composition (cast analysis) for alloy cold-work tool steels, annealed hardness, austenitizing temperature and hardness in the hardened and tempered condition

(Clause 7.2)

SI No.	Steel name	Mass fraction ^a , %								Hardness (annealed) ^b +A HBW <i>max</i>	Hardening test			Hard- ness HRC <i>min</i>
		C	Si	Mn	Cr	Mo	Ni	V	W		Austenitizing temperature °C (±10 °C)	Quenchin g medium ^c	Tempering temperatur °C (±10 °C) ^e	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
i.	105V	1.00 to 1.10	0.10 to 0.30	0.10 to 0.40	—	—	—	0.10 to 0.20	—		790	W	180	61
ii.	50WCrV8	0.45 to 0.55	0.70 to 1.00	0.15 to 0.45	0.90 to 1.20	—	—	0.10 to 0.20	1.70 to 2.20		212	0	180	56
iii.	60WCrV8	0.55 to 0.65	0.70 to 1.00	0.15 to 0.45	0.90 to 1.20	—	—	0.10 to 0.20	1.70 to 2.20		229	0	180	58

Sl No.	Steel name	Mass fraction ^a , %								Hardness (annealed) ^b +A HBW <i>max</i>	Hardening test			
		C	Si	Mn	Cr	Mo	Ni	V	W		Austenitizing temperature °C (±10 °C)	Quenching medium ^c	Tempering temperature ^e °C (±10 °C)	Hard- ness HRC <i>min</i>
iv.	102Cr6	0.95 to 1.10	0.15 to 0.35	0.25 to 0.45	1.35 to 1.65	—	—	—	—		229	0	180	60
v.	21MnCr5	0.18 to 0.24	0.15 to 0.35	1.10 to 1.40	1.00 to 1.30	—	—	—	—		223	—d	—d	—d
vi.	70MnMoCr8	0.65 to 0.75	0.10 to 0.50	1.80 to 2.50	0.90 to 1.20	0.90 to 1.40	—	—	—	248	217	A	180	58
vii.	90MnCrV8	0.85 to 0.95	0.10 to 0.40	1.80 to 2.20	0.20 to 0.50	—	—	0.05 to 0.20	—	229	790	0	180	60
viii.	X93MnCrW5 (O1)	0.85 to 1.00	0.10 to 0.50	1.00 to 1.40	0.40 to 0.70	—	—	0.30 max	0.40 - 0.60	212	802	O	204	63
ix.	95MnWCr5	0.90 to 1.00	0.10 to 0.40	1.05 to 1.35	0.40 to 0.65	—	—	0.05 to 0.20	0.40 to 0.70	229	800	0	180	60
x.	X99CrMoV5 (A2)	0.95 to 1.05	0.10 to 0.50	0.40 to 1.00	4.75 to 5.50	0.90 to 1.40	—	0.15 to 0.50	—	248	954	A	204	60
xi.	X100CrMoV5	0.95 to 1.05	0.10 to 0.40	0.40 to 0.80	4.8 to 5.5	0.90 to 1.20	—	0.15 to 0.35	—	241	970	A	180	60
xii.	X150CrMoV12 (D2)	1.40 to 1.60	0.10 to 0.60	0.10 to 0.60	11.00 to 13.00	0.70 to 1.20	—	0.50 to 1.10	—	255	1010	A	204	59
xiii.	X153CrMoV12	1.45 to 1.60	0.10 to 0.60	0.20 to 0.60	11.0 to 13.0	0.70 to 1.00	—	0.70 to 1.00	—	255	1 020	A	180	61
xiv.	X210Cr12	1.90 to 2.20	0.10 to 0.60	0.20 to 0.60	11.0 to 13.0	—	—	—	—	248	970	0	180	62
xv.	X210CrW12	2.00 to 2.30	0.10 to 0.40	0.30 to 0.60	11.0 to 13.0	—	—	-	0.60-0.80	255	970	0	180	62
xvi.	X217CrVW12 (D3)	2.00 to 2.35	0.10 to 0.60	0.10 to 0.60	11.00 to 13.50	—	—	1.00 max	1.00 max	255	968	O	204	61
xvii.	35CrMo7 ^e	0.30 to 0.40	0.30 to 0.70	0.60 to 1.00	1.50 to 2.00	0.35 to 0.55	—	—	—	—e	—	—	—	—e
xviii.	40CrMnNiMo8-6-4 ^{e,f}	0.35 to 0.45	0.20 to 0.40	1.30 to 1.60	1.80 to 2.10	0.15 to 0.25	0.90 to 1.20 ^f	—	—	—e	—	—	—	—e
xix.	45NiCrMo16	0.40 to 0.50	0.10 to 0.40	0.20 to 0.50	1.20 to 1.50	0.15 to 0.35	3.80 to 4.30	—	—	285	850	0	180	52
xx.	X40Cr14 ^g	0.36 to 0.42	≤ 1.00	≤ 1.00	12.5 to 14.5	—	—	—	—	241	1 010	0	180	52

SI No.	Steel name	Mass fraction ^a , %								Hardness (annealed) ^b +A HBW <i>max</i>	Hardening test			
		C	Si	Mn	Cr	Mo	Ni	V	W		Austenitizing temperature °C (±10 °C)	Quenching medium ^c	Tempering temperature ^e °C (±10 °C)	Hard- ness HRC <i>min</i>
xxi.	X38CrMo16 ^{e,f}	0.33 to 0.45	≤ 1.00	≤ 1.50	15.5 to 17.5	0.80 to 1.30	≤ 1.00	—	—	— ^e	—	—	—	— ^e

Elements not quoted in this table shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition from scrap or other materials used in manufacture, of such elements which affect the hardenability, mechanical properties and applicability.

- a For all steels: phosphorus ≤ 0.030 % and sulfur ≤ 0.030 % (*see*, however, footnote f).
- b Hardness in the cold drawn condition (+A +C) may be 20 HBW higher than in the annealed condition (+A).
- c Quenching medium: A = air, O = oil, & W = water.
- d This material when carburized, quenched and tempered should achieve a surface hardness of 60 HRC.
- e This steel is normally supplied in the quenched and tempered condition with a hardness of approximately 300 HBW.
- f By agreement, sulfur may be increased to between 0.050 % and 0.100 % and Ni may be omitted.
- g This steel may also be supplied in the pre-heated condition with a hardness of approximately 300 HBW.^g

(Page 12, Table 5) — Substitute the existing Table 5:

**‘Table 5—Permissible deviations between specified cast analysis and product analysis for alloy cold-work tool steels (*see* Table 4)
(Clause 7.2)**

SI No.	Steel name	Permissible Deviation ^g , Mass fraction ^a , %									
		C	Si	Mn	P	S	Cr	Mo	Co	V	W
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
i.	105V	±0.03	±0.03	±0.04	±0.005	±0.005	-	-	-	±0.02	-
ii.	50WCrV8	±0.03	±0.05	±0.04	±0.005	±0.005	±0.05	-	-	±0.02	±0.07
iii.	60WCrV8	±0.03	±0.05	±0.04	±0.005	±0.005	±0.05	-	-	±0.02	±0.07

iv.	102Cr6	±0.03	±0.03	±0.04	±0.005	±0.005	±0.07	-	-	-	-
v.	21MnCr5	±0.03	±0.03	±0.08	±0.005	±0.005	±0.05	-	-	-	-
vi.	70MnMoCr8	±0.03	±0.03	±0.08	±0.005	±0.005	±0.05	±0.05	-	-	-
vii.	90MnCrV8	±0.03	±0.03	±0.08	±0.005	±0.005	±0.05	-	-	±0.02	-
viii.	X93MnCrW5 (O1)	±0.03	±0.03	±0.06	±0.005	±0.005	±0.05	-	-	±0.02	±0.04
ix.	95MnWCr5	±0.03	±0.03	±0.06	±0.005	±0.005	±0.05	-	-	±0.02	±0.04
x.	X99CrMoV5 (A2)	±0.03	±0.03	±0.06	±0.005	±0.005	±0.05	-	-	±0.02	±0.04
xi.	X100CrMoV5	±0.03	±0.03	±0.04	±0.005	±0.005	±0.10	±0.05	-	±0.03	-
xii.	X150CrMoV12 (D2)	±0.03	±0.03	±0.04	±0.005	±0.005	±0.15	±0.05	-	±0.04	-
xiii.	X153CrMoV12	±0.03	±0.03	±0.04	±0.005	±0.005	±0.15	±0.05	-	±0.04	-
xiv.	X210Cr12	±0.03	±0.03	±0.04	±0.005	±0.005	±0.15		-	-	-
xv.	X210CrW12	±0.03	±0.03	±0.04	±0.005	±0.005	±0.15		-	-	±0.04
xvi.	X217CrVW12 (D3)	±0.03	±0.03	±0.04	±0.005	±0.005	±0.15		-	-	±0.04
xvii.	35CrMo7	±0.03	±0.03	±0.04	±0.005	±0.005	±0.07	±0.05	-	-	-
xviii.	40CrMnNi- Mo8-6-4 ^b	±0.03	±0.03	±0.08	±0.005	±0.005	±0.07	±0.03	±0.07	-	-
xix.	45NiCrMo16	±0.03	±0.03	±0.04	±0.005	±0.005	±0.07	±0.03	±0.07	-	-
xx.	X40Cr14 ^g	±0.03	±0.05	±0.04	±0.005	±0.005	±0.15	-	-	-	-
xxi.	X38CrMo16	±0.03	±0.05	±0.04	±0.005	±0.005	±0.15	±0.05	±0.07	-	-

a) The deviations, other than when maxima only are specified, apply either above or below the specified limits of the range but not both above and below for the same element From different sample products from the same cast. When maxima only are specified the deviations are positive only. The values are valid only if the samples are selected in Accordance with ISO 14284, so that they represent the average composition of the cross – section of the product.

b) If arrange for the sulfur content of this grade is agreed, the permissible deviation shall be ±0.010%'

(Page 13, Table 6) — Substitute the existing Table 6:

'Table 6 — Chemical composition (cast analysis) for hot-work tool steels, annealed hardness, austenitizing temperature and hardness in the quenched and tempered condition

(Clause 7.2)

Sl No.	Steel name	Mass fraction ^a %								Hardness (annealed) ^b +A HBW max	Hardening test			
		C	Si	Mn	Cr	Mo	V	W	Others		Austenitizing temperature °C (±10 °C)	Quenching medium ^c	Tempering temperature ^e °C (±10 °C)	Hardness HRC min
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
i.	55NiCrMoV7 ^{de}	0.50 to 0.60	0.10 to 0.40	0.60 to 0.90	0.80 to 1.20	0.35 to 0.55	0.05 to 0.15	—	Ni: 1.50 to 1.80	248 e	850	O	500	42

Sl No.	Steel name	Mass fraction ^a %								Hardness (annealed) ^b +A HBW	Hardening test			
		C	Si	Mn	Cr	Mo	V	W	Others		Austenitizing temperature	Quenching medium ^c	Tempering temperature ^e	Hardness HRC
ii.	32CrMoV12-28	0.28 to 0.35	0.10 to 0.40	0.15 to 0.45	2.70 to 3.2	2.50 to 3.00	0.40 to 0.70	—	—	229	1 040	O	550	46
iii.	X37CrMoV5-1	0.33 to 0.41	0.80 to 1.20	0.25 to 0.50	4.8 to 5.5	1.10 to 1.50	0.30 to 0.50	—	—	229	1 020	A	550	48
iv.	X38CrMoSi5-1-1 (H11)	0.33 to 0.43	0.80 to 1.25	0.20 to 0.60	4.75 to 5.50	1.10 to 1.60	0.30 to 0.60	—	—	235	1010	O/A	552	53
v.	X38CrMoV5-3	0.35 to 0.40	0.30 to 0.50	0.30 to 0.50	4.8 to 5.2	2.70 to 3.2	0.40 to 0.60	—	—	229	1 040	O	550	50
vi.	X38CrMoSi5-1-1 (H13)	0.32 to 0.45	0.80 to 1.25	0.20 to 0.60	4.75 to 5.50	1.10 to 1.75	0.80 to 1.20	—	—	235	1010	O/A	552	52
vii.	X40CrMoV5-1	0.35 to 0.42	0.80 to 1.20	0.25 to 0.50	4.8 to 5.5	1.20 to 1.50	0.85 to 1.15	—	—	229	1 020	O	550	50
viii.	50CrMoV13-15	0.45 to 0.55	0.20 to 0.80	0.50 to 0.90	3.0 to 3.5	1.30 to 1.70	0.15 to 0.35	—	—	248	1 010	O	510	56
ix.	50CrMoSi13-15-2 (S7)	0.45 to 0.55	0.20 to 1.00	0.20 to 0.90	3.00 to 3.50	1.30 to 1.80	0.35 max	—	—	229	954	O/A	204	56
x.	X30WCrV9-3	0.25 to 0.35	0.10 to 0.40	0.15 to 0.45	2.5 to 3.2	—	0.30 to 0.50	8.5 to 9.5	—	241	1 150	O	600	48
xi.	X31WCrV9-3 (H21)	0.26 to 0.36	0.15 to 0.50	0.15 to 0.40	3.00 to 3.75	—	0.30 to 0.60	8.50 to 10.00	—	241	1191	O/A	552	52
xii.	X35CrWMo5 (H12)	0.30 to 0.40	0.80 to 1.25	0.20 to 0.60	4.75 to 5.50	1.25 to 1.75	0.20 to 0.50	1.00–1.70	—	235	1010	O/A	552	53
xiii.	X35CrWMoV5	0.32 to 0.40	0.80 to 1.20	0.20 to 0.50	4.75 to 5.5	1.25 to 1.60	0.20 to 0.50	1.10 to 1.60	—	229	1 020	O	550	48
xiv.	38CrCoWV18-17-17	0.35 to 0.45	0.15 to 0.50	0.20 to 0.50	4.0 to 4.7	0.30 to 0.50	1.70 to 2.10	3.8 to 4.5	Co: 4.0 to 4.5	260	1 120	O	600	48
xv.	39CrCoWV18-17-17 (H19)	0.32 to 0.45	0.15 to 0.50	0.20 to 0.50	4.00 to 4.75	0.30 to 0.55	1.75 to 2.20	3.75 to 4.50	Co: 4.0–4.5	241	1191	O/A	552	55

Elements not quoted in this table shall not be intentionally added to the steel without the agreement of the purchaser, other than for the purpose of finishing the heat. All reasonable precautions shall be taken to prevent the addition from scrap or other materials used in manufacture, of such elements which affect the hardenability, mechanical properties and applicability.

a For all steels (unless otherwise specified), phosphorus ≤ 0.030 % and sulfur ≤ 0.020 %.

b Hardness in the cold drawn condition (+A+C) may be 20 HBW higher than in the annealed condition (+A).

c Quenching medium: O = oil. Usual quenching media for tools are air, gas or salt bath.

d The sulfur content for this grade is ≤ 0.030 % .

e For greater dimensions, this steel is normally supplied in the quenched and tempered condition with a hardness of approximately 380 HBW.

f This value applies for smaller dimensions only.'

(Page 14, Table 7) — Substitute the existing Table 7:

‘Table 7—Permissible deviations between specified cast analysis and product analysis for hot-work tool steels (see Table 6)
(Clause 7.2)

SI No. (1)	Steel name (2)	Permissible deviations, mass fraction ^a %							Ni (10)	Co (11)	V (12)	W
		C (3)	Si (4)	Mn (5)	P (6)	S (7)	Cr (8)	Mo (9)				
i.	55NiCrMoV7 ^{de}	±0.02	±0.03	±0.04	±0.005	±0.005	±0.05	±0.04	±0.07	-	±0.02	-
ii.	32CrMoV12-28	±0.02	±0.03	±0.04	±0.005	±0.005	±0.10	±0.10	-	-	±0.04	-
iii.	X37CrMoV5-1	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.04	-
iv.	X38CrMoSi5-1-1 (H11)	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.04	-
v.	X38CrMoV5-3	±0.02	±0.03	±0.04	±0.005	±0.005	±0.10	±0.10	-	-	±0.04	-
vi.	X38CrMoSi5-1-1 (H13)	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.05	-
vii.	X40CrMoV5-1	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.05	-
viii.	50CrMoV13-15	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.04	-
ix.	50CrMoSi13-15-2 (S7)	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.04	-
x.	X30WCrV9-3	±0.02	±0.03	±0.04	±0.005	±0.005	±0.10	-	-	-	±0.04	±0.10
xi.	X31WCrV9-3 (H21)	±0.02	±0.03	±0.04	±0.005	±0.005	±0.10	-	-	-	±0.04	±0.10
xii.	X35CrWMo5 (H12)	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.04	±0.07
xiii.	X35CrWMoV5	±0.02	±0.05	±0.04	±0.005	±0.005	±0.10	±0.05	-	-	±0.04	±0.07
xiv.	38CrCoWV18-17-17	±0.02	±0.03	±0.04	±0.005	±0.005	±0.10	±0.10	-	±0.10	±0.10	±0.10
xv.	39CrCoWV18-17-17 (H19)	±0.02	±0.03	±0.04	±0.005	±0.005	±0.10	±0.10	-	±0.10	±0.10	±0.10

NOTE The deviations, other than when maxima only are specified, apply either above or below the specified limits of the range but not both above and below for the same element from different sample products from the same cast. When maxima only are specified the deviations are positive only. The values are valid only if the samples are selected in accordance with ISO 14284, so that they represent the average composition of the cross-section of the product.’

(Page 31, Annex C, Table C.1) — Substitute the existing table:

‘Table C.1—Designations of the steels given in Tables 2, 4, 6 and 8 and of comparable grades covered in various regional or national standards or designation systems

Steel designations in accordance with				
SI No.	This document	EN 10027-2	JIS	ASTM
(1)	(2)	(3)	(4)	(5)
I.	Non-alloy cold-work tool steels			
i.	C45U	1.1730	—	—
ii.	C70U	1.1520	SK65	—
iii.	C80U	1.1525	SK75	—
iv.	C90U	1.1535	SK85, SK95	—
v.	C105U	1.1545	SK105	—
vi.	C120U	1.1555	SK120	—
II.	Alloy cold – work tool steels			
i.	105V	1.2834	SKS43	—
ii.	50WCrV8	1.2549	—	—
iii.	60WCrV8	1.2550	—	—
iv.	102Cr6	1.2067	—	—
v.	21MnCr5	1.2162	—	—
vi.	70MnMoCr8	1.2824	—	—
vii.	90MnCrV8	1.2842	—	—
viii.	X93MnCrW5	—	—	(O1)
ix.	95MnWCr5	1.2825	—	—
x.	X99CrMoV5	—	—	(A2)
xi.	X100CrMoV5	1.2363	SKD12	—
xii.	X150CrMoV12	—	—	(D2)
xiii.	X153CrMoV12	1.2379	—	—
xiv.	X210Cr12	1.2080	—	—
xv.	X210CrW12	1.2436	—	—
xvi.	X217CrVW12	—	—	(D3)
xvii.	35CrMo7 ^e	1.2302	—	—
xviii.	40CrMnNiMo8-6-4 ^{e,f}	1.2738	—	—
xix.	45NiCrMo16	1.2767	—	—
xx.	X40Cr14 ^g	1.2083	—	—
xxi.	X38CrMo16 ^{e,f}	1.2316	—	—
III.	Hot – work tool steels			

i.	55NiCrMoV7 ^{d,e}	1.2714	SKT4	—
ii.	32CrMoV12-28	1.2365	SKD7	—
iii.	X37CrMoV5-1	1.2343	SKD6	—
iv.	X38CrMoSi5-1-1	—	—	(H11)
v.	X38CrMoV5-3	1.2367	—	—
vi.	X38CrMoSi5-1-1	—	—	(H13)
vii.	X40CrMoV5-1	1.2344	SKD61	—
viii.	50CrMoV13-15	1.2355	—	—
ix.	50CrMoSi13-15-2	—	—	(S7)
x.	X30WCrV9-3	1.2581	SKD5	—
xi.	X31WCrV9-3	—	—	(H21)
xii.	X35CrWMo5	—	—	(H12)
xiii.	X35CrWMoV5	1.2605	SKD62	—
xiv.	38CrCoWV18-17-17	1.2661	SKD8	—
xv.	39CrCoWV18-17-17	—	—	(H19)
IV.	High-speed tool steels			
i.	HSO-4-1	1.3325	—	—
ii.	HS1-4-2	1.3326	—	—
iii.	HS18-0-1	1.3355	SKH2	—
iv.	HS2-9-2	1.3348	SKH58	—
v.	HS1-8-1	1.3327	—	—
vi.	HS3-3-2	1.3333	—	—
vii.	HS6-5-2	1.3339	SKH51	—
viii.	HS6-5-2C	1.3343	—	—
ix.	HS6-5-3	1.3344	SKH53	—
x.	HS6-5-3C	1.3345	—	—
xi.	HS6-6-2	1.3350	SKH52	—
xii.	HS6-5-4	1.3351	SKH54	—
xiii.	HS6-5-2-5	1.3243	SKH55	—
xiv.	HS6-5-3-8	1.3244	—	—
xv.	HS10-4-3-10	1.3207	SKH57	—
xvi.	HS2-9-1-8	1.3247	SKH59'	—