

ISO 4957 Tool Steel Grades

ISO 4957 names every tool steel grade itself, and that name does not always map onto the AISI grade a supplier quotes back. The tables below give all 48 grades of ISO 4957:1999, with the specified composition, the European EN 10027-2 number and the comparable JIS grade, and then the annealed and hardened hardness with the hardening and tempering schedule the standard sets for each one.

Reference only. This is a reference summary of a published standard and it is not a specification of ours. A purchase is made against ISO 4957 and the test certificate that comes with the heat, not against a table on a sheet. Where a drawing calls up an ISO name and the mill produces to AISI or GB, the two have to be reconciled before the steel is ordered.

The four families of ISO 4957

Family	Grades	Carbon, %	Where it is used
Non-alloy cold-work	6	0.42-1.25	Hand tools, gauges, woodworking and other low-temperature cutting that does not need alloy carbides.
Alloy cold-work	17	0.18-2.30	Blanking and forming dies, cold extrusion, thread rolling, and the P series plastic mold cavities and holders.
Alloy hot-work	9	0.25-0.60	Die casting dies and cores, forging and extrusion tooling, hot shear blades, and holders that run hot.
High-speed	16	0.73-1.40	Drills, taps, milling cutters, hobs, broaches and saws, where hardness has to hold up to about 600 °C.

Grade counts and carbon ranges as set by ISO 4957:1999. The carbon range is the span across the family, not the range of any one grade.

Chemical composition of the ISO 4957 grades

ISO 4957 Tool Steel Grades

Steel name	C	Si	Mn	Cr	Mo	Ni	V	W	Co	EN 10027-2:1992	JIS
Non-alloy cold-work tool steels											
C45U	0.42-0.50	0.15-0.40	0.60-0.80	—	—	—	—	—	—	1.1730	—
C70U	0.65-0.75	0.10-0.30	0.10-0.40	—	—	—	—	—	—	1.1520	SK7
C80U	0.75-0.85	0.10-0.30	0.10-0.40	—	—	—	—	—	—	1.1525	SK6
C90U	0.85-0.95	0.10-0.30	0.10-0.40	—	—	—	—	—	—	1.1535	SK5, SK4
C105U	1.00-1.10	0.10-0.30	0.10-0.40	—	—	—	—	—	—	1.1545	SK3
C120U	1.15-1.25	0.10-0.30	0.10-0.40	—	—	—	—	—	—	1.1555	SK2
Alloy cold-work tool steels											
105V	1.00-1.10	0.10-0.30	0.10-0.40	—	—	—	0.10-0.20	—	—	1.2834	SKS43
50WCrV8	0.45-0.55	0.70-1.00	0.15-0.45	0.90-1.20	—	—	0.10-0.20	1.70-2.20	—	1.2549	—
60WCrV8	0.55-0.65	0.70-1.00	0.15-0.45	0.90-1.20	—	—	0.10-0.20	1.70-2.20	—	1.2550	—
102Cr6	0.95-1.10	0.15-0.35	0.25-0.45	1.35-1.65	—	—	—	—	—	1.2067	—
21MnCr5	0.18-0.24	0.15-0.35	1.10-1.40	1.00-1.30	—	—	—	—	—	1.2162	—
70MnMoCr8	0.65-0.75	0.10-0.50	1.80-2.50	0.90-1.20	0.90-1.40	—	—	—	—	1.2824	—
90MnCrV8	0.85-0.95	0.10-0.40	1.80-2.20	0.20-0.50	—	—	0.05-0.20	—	—	1.2842	—
95MnWCr5	0.90-1.00	0.10-0.40	1.05-1.35	0.40-0.65	—	—	0.05-0.20	0.40-0.70	—	1.2825	—
X100CrMoV5	0.95-1.05	0.10-0.40	0.40-0.80	4.80-5.50	0.90-1.20	—	0.15-0.35	—	—	1.2363	SKD12
X153CrMoV12	1.45-1.60	0.10-0.60	0.20-0.60	11.00-13.00	0.70-1.00	—	0.70-1.00	—	—	1.2379	—
X210Cr12	1.90-2.20	0.10-0.60	0.20-0.60	11.00-13.00	—	—	—	—	—	1.2080	—
X210CrW12	2.00-2.30	0.10-0.40	0.30-0.60	11.00-13.00	—	—	—	0.60-0.80	—	1.2436	—
35CrMo7	0.30-0.40	0.30-0.70	0.60-1.00	1.50-2.00	0.35-0.55	—	—	—	—	1.2302	—
40CrMnNiMo8-6-4	0.35-0.45	0.20-0.40	1.30-1.60	1.80-2.10	0.15-0.25	0.90-1.20	—	—	—	1.2738	—
45NiCrMo16	0.40-0.50	0.10-0.40	0.20-0.50	1.20-1.50	0.15-0.35	3.80-4.30	—	—	—	1.2767	—
X40Cr14	0.36-0.42	1.00 max	1.00 max	12.50-14.50	—	—	—	—	—	1.2083	—
X38CrMo16	0.33-0.45	1.00 max	1.00 max	15.50-17.50	0.80-1.30	1.00 max	—	—	—	1.2316	—
Alloy hot-work tool steels											
55NiCrMoV7	0.50-0.60	0.10-0.40	0.60-0.90	0.80-1.20	0.35-0.55	1.50-1.80	0.05-0.15	—	—	1.2714	SKT4
32CrMoV12-28	0.28-0.35	0.10-0.40	0.15-0.45	2.70-3.20	2.50-3.00	—	0.40-0.70	—	—	1.2365	SKD7
X37CrMoV5-1	0.33-0.41	0.80-1.20	0.25-0.50	4.80-5.20	1.10-1.50	—	0.30-0.50	—	—	1.2343	SKD6
X38CrMoV5-3	0.35-0.40	0.30-0.50	0.30-0.50	4.80-5.20	2.70-3.20	—	0.40-0.60	—	—	1.2367	—
X40CrMoV5-1	0.35-0.42	0.80-1.20	0.25-0.50	4.80-5.50	1.20-1.50	—	0.85-1.15	—	—	1.2344	SKD61
50CrMoV13-15	0.45-0.55	0.20-0.80	0.50-0.90	3.00-3.50	1.30-1.70	—	0.15-0.35	—	—	1.2355	—
X30WCrV9-3	0.25-0.35	0.10-0.40	0.15-0.45	2.50-3.20	—	—	0.30-0.50	8.50-9.50	—	1.2581	SKD5
X35CrWMoV5	0.32-0.40	0.80-1.20	0.20-0.50	4.75-5.50	1.25-1.60	—	0.20-0.50	1.10-1.60	—	1.2605	SKD62
38CrCoWV18-17-17	0.35-0.45	0.15-0.50	0.20-0.50	4.00-4.70	0.30-0.50	—	1.70-2.10	3.80-4.50	4.00-4.50	1.2661	SKD8
High-speed tool steels											
HS0-4-1	0.77-0.85	0.65 max	0.40 max	3.90-4.40	4.00-4.50	—	0.90-1.10	—	—	1.3325	—
HS1-4-2	0.85-0.95	0.65 max	0.40 max	3.60-4.30	4.10-4.80	—	1.70-2.20	0.80-1.40	—	1.3326	—
HS18-0-1	0.73-0.83	0.45 max	0.40 max	3.80-4.50	—	—	1.00-1.20	17.20-18.70	—	1.3355	SKH2
HS2-9-2	0.95-1.05	0.70 max	0.40 max	3.50-4.50	8.20-9.20	—	1.70-2.20	1.50-2.10	—	1.3348	SKH58
HS1-8-1	0.77-0.87	0.70 max	0.40 max	3.50-4.50	8.00-9.00	—	1.00-1.40	1.40-2.00	—	1.3327	—
HS3-3-2	0.95-1.03	0.45 max	0.40 max	3.80-4.50	2.50-2.90	—	2.20-2.50	2.70-3.00	—	1.3333	—
HS6-5-2	0.80-0.88	0.45 max	0.40 max	3.80-4.50	4.70-5.20	—	1.70-2.10	5.90-6.70	—	1.3339	SKH51
HS6-5-2C	0.86-0.94	0.45 max	0.40 max	3.80-4.50	4.70-5.20	—	1.70-2.10	5.90-6.70	—	1.3343	—
HS6-5-3	1.15-1.25	0.45 max	0.40 max	3.80-4.50	4.70-5.20	—	2.70-3.20	5.90-6.70	—	1.3344	SKH53
HS6-5-3C	1.25-1.32	0.70 max	0.40 max	3.80-4.50	4.70-5.20	—	2.70-3.20	5.90-6.70	—	1.3345	—
HS6-6-2	1.00-1.10	0.45 max	0.40 max	3.80-4.50	5.50-6.50	—	2.30-2.60	5.90-6.70	—	1.3350	SKH52
HS6-5-4	1.25-1.40	0.45 max	0.40 max	3.80-4.50	4.20-5.00	—	3.70-4.20	5.20-6.00	—	1.3351	SKH54
HS6-5-2-5	0.87-0.95	0.45 max	0.40 max	3.80-4.50	4.70-5.20	—	1.70-2.10	5.90-6.70	4.50-5.00	1.3243	SKH55
HS6-5-3-8	1.23-1.33	0.70 max	0.40 max	3.80-4.50	4.70-5.30	—	2.70-3.20	5.90-6.70	8.00-8.80	1.3244	—
HS10-4-3-10	1.20-1.35	0.45 max	0.40 max	3.80-4.50	3.20-3.90	—	3.00-3.50	9.00-10.00	9.50-10.50	1.3207	SKH57
HS2-9-1-8	1.05-1.15	0.70 max	0.40 max	3.80-4.50	9.00-10.00	—	0.90-1.30	1.20-1.90	7.50-8.50	1.3247	SKH59

Chemical composition of tool steels to ISO 4957:1999, with the comparable EN 10027-2:1992 and JIS grades, reproduced from Table 1 of the standard. Values are percent by mass. The JIS column is blank where the standard lists no direct comparable.

^a For all steels, phosphorus 0.030% max and sulfur 0.030% max.

^b By agreement, sulfur may be increased to between 0.050% and 0.100%, and Ni may be omitted.

^c For all steels, unless otherwise specified, phosphorus 0.030% max and sulfur 0.020% max.

^d The sulfur content for this grade is 0.030% max.

^e A sulfur range of 0.060-0.150% may be agreed at the time of enquiry and order for this grade, in which case a maximum of 0.8% Mn applies.

Hardness and hardening schedule of the ISO 4957 grades

ISO 4957 Tool Steel Grades

Steel name	Annealed hardness, HB max	Hardening temperature, °C (±10)	Quenching medium	Tempering temperature, °C (±10)	Hardness, HRC min.
Non-alloy cold-work tool steels					
C45U	207 ^c	810	W	180	54
C70U ^d	183	800	W	180	57
C80U ^d	192	790	W	180	58
C90U ^d	207	780	W	180	60
C105U ^d	212	780	W	180	61
C120U ^d	217	770	W	180	62
Alloy cold-work tool steels					
105V	212	790	W	180	61
50WCrV8	229	920	O	180	56
60WCrV8	229	910	O	180	58
102Cr6	223	840	O	180	60
21MnCr5	217 ^e	^e	^e	^e	^e
70MnMoCr8	248	835	A	180	58
90MnCrV8	229	790	O	180	60
95MnWCr5	229	800	O	180	60
X100CrMoV5	241	970	A	180	60
X153CrMoV12	255	1020	A	180	61
X210Cr12	248	970	O	180	62
X210CrW12	255	970	O	180	62
35CrMo7 ^f	^f	^f	^f	^f	^f
40CrMnNiMo8-6-4 ^f	^f	^f	^f	^f	^f
45NiCrMo16	285	850	O	180	52
X40Cr14 ^g	241	1010	O	180	52
X38CrMo16 ^f	^f	^f	^f	^f	^f
Alloy hot-work tool steels					
55NiCrMoV7	248 ^h	850	O	500	42 ⁱ
32CrMoV12-28	229	1,040	O	550	46
X37CrMoV5-1	229	1,020	O	550	48
X38CrMoV5-3	229	1,040	O	550	50
X40CrMoV5-1	229	1,020	O	550	50
50CrMoV13-15	248	1,010	O	510	56
X30WCrV9-3	241	1,150	O	600	48
X35CrWMoV5	229	1,020	O	550	48
38CrCoWV18-17-17	260	1,120	O	600	48
High-speed tool steels					
HS0-4-1	262 ^j	1,120	O ^k	560	60
HS1-4-2	262 ^j	1,180	O ^k	560	63
HS18-0-1	269 ^j	1,260	O ^k	560	63
HS2-9-2	269 ^j	1,200	O ^k	560	64
HS1-8-1	262 ^j	1,190	O ^k	560	63
HS3-3-2	255 ^j	1,190	O ^k	560	62
HS6-5-2	262 ^j	1,220	O ^k	560	64
HS6-5-2C	269 ^j	1,210	O ^k	560	64
HS6-5-3	269 ^j	1,200	O ^k	560	64
HS6-5-3C	269 ^j	1,180	O ^k	560	64
HS6-6-2	262 ^j	1,200	O ^k	560	64
HS6-5-4	269 ^j	1,210	O ^k	560	64
HS6-5-2-5	269 ^j	1,210	O ^k	560	64
HS6-5-3-8	302 ^j	1,180	O ^k	560	65
HS10-4-3-10	302 ^j	1,230	O ^k	560	66
HS2-9-1-8	277 ^j	1,190	O ^k	550	66

Hardness and hardening method for tool steels to ISO 4957:1999, reproduced from Table 2 of the standard. The quenching medium letters are air, oil and water; the tempering temperature is a guide to the schedule that reaches the listed minimum hardness, and a higher or lower temper moves the hardness of the work.

^a Hardness in the cold drawn condition may be 20 HB higher than in the annealed condition.

^b Quenching medium is A for air, O for oil and W for water.

^c This grade is used in the non-heat-treated condition.

^d Steels C70U to C120U are, because of their chemical composition, shallow hardening steels. For diameters of 30 mm the hardness penetration depth is about 3 mm; through-hardening is only achieved in diameters up to 10 mm.

^e This material, when carburized, quenched and tempered, should reach a surface hardness of 60 HRC.

^f This steel is normally supplied in the quenched and tempered condition at about 300 HB.

^g This steel may also be supplied in the pre-heat-treated condition at about 300 HB.

^h For greater dimensions this steel is normally supplied quenched and tempered at about 380 HB.

ⁱ This value applies to smaller dimensions only.

^j Hardness in the annealed plus cold drawn condition may be 50 HB higher, and in the annealed plus cold rolled condition 70 HB higher, than in the annealed condition.

^k Reference hardening test, oil or salt bath. In case of dispute, oil only. The usual quenching media in practice are air, gas or salt bath.

How to read an ISO 4957 name

ISO 4957 Tool Steel Grades

ISO 4957 name	EN 10027-2	Normally quoted as
X153CrMoV12	1.2379	AISI D2
X210Cr12	1.2080	AISI D3
X210CrW12	1.2436	AISI D6
X100CrMoV5	1.2363	AISI A2
90MnCrV8	1.2842	AISI O2
X40CrMoV5-1	1.2344	AISI H13
X37CrMoV5-1	1.2343	AISI H11
55NiCrMoV7	1.2714	AISI L6
HS6-5-2	1.3339	AISI M2
HS6-5-2-5	1.3243	AISI M35
HS18-0-1	1.3355	AISI T1

The ISO 4957 names whose AISI equivalent is in common use, with the EN 10027-2 number as the standard prints it. Grades outside this short list are better matched on the equivalent grades page than by letter.

Aobo Steel, tool steel supplier

Aobo Steel supplies tool steel to distributors and mold, tool and die shops, including D2, D3, DC53, A2, O1, H13, H11, H10, H21, S7, M2, M42, L6, P20 and 420 and 440C stainless. Forged or hot rolled, annealed or pre-hardened, cut to your sizes, with test certificates.

Source, ISO 4957:1999 (BS EN ISO 4957:2000), Tool Steels, Tables 1 and 2, as reproduced in Handbook of Mechanical Alloy Design (G. E. Totten, L. Xie and K. Funatani, eds.), Marcel Dekker, 2004, Chapter 4 (Yang and Collins), pages 189 to 192.

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