

Steel Machinability Rating Chart

Machinability ratings for plain carbon, free-cutting and alloy steels on the 1212 steel basis, printed with the hardness range each rating applies to. Reference summary of published machinability tables and not an Aobo Steel standard.

Reference only. Aobo Steel supplies free-cutting, carbon and alloy steel bar and does not provide machining services. The ratings below are shop comparisons taken from published tables, and tooling, rigidity and finish requirement move them. Verify the values below against the applicable standard and the conditions in your own shop.

Plain carbon steels

Ratings on the 1212 steel basis, where 1212 is set at 100. Table 4 of the source.

SAE/AISI grade	Machinability rating	Hardness, HB
1212	100	175
1005	45	95
1006	50	95
1010	55	105
1015	60	111
1017	65	116
1019	70	131
1030	70	149
1038	65	163
1040	60	170
1045	55	179
1045	60	170
1050	45	197
1050	55	189
1065	60	183
1070	55	187
1075	48	192
1085	45	192
1095	45	197
1524	60	163
1536	55	187
1541	45	207
1547	40	207
1547	45	187

Source: ASM Handbook, Vol 1 (10th ed.), "Machinability of Steels", Table 4.

Free-cutting resulfurized and rephosphorized steels

Cutting speed as a percentage of the speed used on 1212 steel. Table 5 of the source.

Grade	Machinability rating, %	Hardness, HB
1117	90	137
1118	85	143
1137	70	197
1140	70	170
1141	70	212
1144	80	217
1146	70	187
1151	65	207
1212	100	—
1213	136	—
1215	136	—
12L14	160	163
12L14	190	137
12L14	235	137
12L14	295	137

Source: ASM Handbook, Vol 1 (10th ed.), "Machinability of Steels", Table 5.

How to read the tables

- 1212 = 100 rating basis
- 140 rating, cutting speed as a percentage of 1212 steel
- 179-235 hardness range at which the rating applies
- (b) footnote

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Alloy steels

Ratings for the through-hardening alloy grades, again against 1212 steel at 100. Table 6 of the source.

Grade	Machinability rating	Hardness, HB
1330	55	179–235
1340	50	183–241
1345	45	183–241
4024	75	156–207
4028	75	167–212
4042	65	179–229
4130	70	187–229
4140	65	187–229
41L40	85	185–230
4150	55	187–240
4340	50	187–240
4620	65	183–229
50B40	65	174–223
50B60	55	170–212
5130	70	174–212
5140	65	179–217
5160	55	179–217
51B60	55	179–217
50100	40	183–240
51100	40	183–240
52100	40	183–240
8115	65	163–202
81B45	65	179–223
8630	70	179–229
8620	65	179–235
86L20	85	—
8660	55	179–217
8645	65	184–217
86B45	65	184–217
8740	65	184–217

Source: ASM Handbook, Vol 1 (10th ed.), "Machinability of Steels", Table 6.

Notes

- (a) The machinability rating of 1212 steel is assigned at 100, and the ratings of the other grades are percentages of its cutting speed at the same tool life.
- (b) The hardness shown is the range the grade is normally supplied in, not a single value. Ratings measured outside that range do not transfer.
- (c) A rating is a shop comparison, not a specification. Tool material, tool geometry, coolant, rigidity and surface finish requirement all move the achievable cutting speed by more than the gaps between neighbouring grades in these tables.

Table notes

- The two tables use slightly different bases and are printed here as the source gives them. Table 5 is a cutting speed percentage against 1212 steel, while Tables 4 and 6 are ratings on the same 1212 basis. Do not read a number from one table against a number from another without checking which basis it uses. Some grades appear more than once because the rating is quoted for more than one condition, and the hardness column tells those rows apart.
- Hardness is the supplied condition of the bar. A prehardened or cold-drawn item moves down the table, and an annealed item moves up it. Confirm the delivery hardness with the material test certificate or ask Aobo Steel for the condition that suits the part.
- Composition data is for general reference only. Actual values vary by standard, mill, and heat number. Confirm against the material test certificate (MTC) or contact Aobo Steel.

Aobo Steel, tool steel supplier

Aobo Steel supplies forged tool steel and free-cutting engineering steels from Huangshi, Hubei, China, where the local supply chain covers ESR melting, vacuum degassing and LF refining, forging, hot rolling, turned and peeled bar, heat treatment and third party inspection. We have worked in steel since 2003 and supply to order in cold work grades such as D2, D3 and O1, hot work grades such as H10 and H13, stainless grades 420, 440C and 4Cr13, and carbon and alloy bar.

Reference data compiled from ASM Handbook, Vol 1 (10th ed.), "Machinability of Steels", Tables 4, 5 and 6, and from the Aobo Steel steel machinability rating chart.

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