

Carbon Steel Composition Chart

Chemical composition limits for the SAE-AISI 10xx, 11xx, 12xx and 15xx carbon steel grades, quoted as cast or heat analysis in weight percent, grouped by product form. Reference summary of published carbon steel composition tables and not an Aobo Steel standard.

Reference only. Aobo Steel supplies carbon and alloy steel in bar and plate form. The limits below are cast or heat analysis values and product analysis tolerances are set by the governing standard. Verify the values below against the applicable standard and the material test certificate.

Carbon steel bars, billets and forgings

SAE-AISI	UNS	C	Mn	P max	S max
1005	G10050	0.06 max	0.35 max	0.040	0.050
1006	G10060	0.08 max	0.25–0.40	0.040	0.050
1008	G10080	0.10 max	0.30–0.50	0.040	0.050
1010	G10100	0.08–0.13	0.30–0.60	0.040	0.050
1012	G10120	0.10–0.15	0.30–0.60	0.040	0.050
1013	G10130	0.11–0.16	0.50–0.80	0.040	0.050
1015	G10150	0.13–0.18	0.30–0.60	0.040	0.050
1016	G10160	0.13–0.18	0.60–0.90	0.040	0.050
1017	G10170	0.15–0.20	0.30–0.60	0.040	0.050
1018	G10180	0.15–0.20	0.60–0.90	0.040	0.050
1019	G10190	0.15–0.20	0.70–1.00	0.040	0.050
1020	G10200	0.18–0.23	0.30–0.60	0.040	0.050
1021	G10210	0.18–0.23	0.60–0.90	0.040	0.050
1022	G10220	0.18–0.23	0.70–1.00	0.040	0.050
1023	G10230	0.20–0.25	0.30–0.60	0.040	0.050
1025	G10250	0.22–0.28	0.30–0.60	0.040	0.050
1026	G10260	0.22–0.28	0.60–0.90	0.040	0.050
1029	G10290	0.25–0.31	0.60–0.90	0.040	0.050
1030	G10300	0.28–0.34	0.60–0.90	0.040	0.050
1035	G10350	0.32–0.38	0.60–0.90	0.040	0.050
1037	G10370	0.32–0.38	0.70–1.00	0.040	0.050
1038	G10380	0.35–0.42	0.60–0.90	0.040	0.050
1039	G10390	0.37–0.44	0.70–1.00	0.040	0.050
1040	G10400	0.37–0.44	0.60–0.90	0.040	0.050
1042	G10420	0.40–0.47	0.60–0.90	0.040	0.050
1043	G10430	0.40–0.47	0.70–1.00	0.040	0.050
1044	G10440	0.43–0.50	0.30–0.60	0.040	0.050
1045	G10450	0.43–0.50	0.60–0.90	0.040	0.050
1046	G10460	0.43–0.50	0.70–1.00	0.040	0.050
1049	G10490	0.46–0.53	0.60–0.90	0.040	0.050
1050	G10500	0.48–0.55	0.60–0.90	0.040	0.050
1053	G10530	0.48–0.55	0.70–1.00	0.040	0.050
1055	G10550	0.50–0.60	0.60–0.90	0.040	0.050
1059	G10590	0.55–0.65	0.50–0.80	0.040	0.050
1060	G10600	0.55–0.65	0.60–0.90	0.040	0.050
1064	G10640	0.60–0.70	0.50–0.80	0.040	0.050
1065	G10650	0.60–0.70	0.60–0.90	0.040	0.050
1069	G10690	0.65–0.75	0.40–0.70	0.040	0.050
1070	G10700	0.65–0.75	0.60–0.90	0.040	0.050
1074	G10740	0.70–0.80	0.50–0.80	0.040	0.050
1075	G10750	0.70–0.80	0.40–0.70	0.040	0.050
1078	G10780	0.72–0.85	0.30–0.60	0.040	0.050
1080	G10800	0.75–0.88	0.60–0.90	0.040	0.050
1084	G10840	0.80–0.93	0.60–0.90	0.040	0.050
1085	G10850	0.80–0.93	0.70–1.00	0.040	0.050
1086	G10860	0.80–0.93	0.30–0.50	0.040	0.050
1090	G10900	0.85–0.98	0.60–0.90	0.040	0.050
1095	G10950	0.90–1.03	0.30–0.50	0.040	0.050

Data source, ASM Handbook, Volume 1, Tables 12 to 18, Classification and Designation of Carbon and Low-Alloy Steels.

Structural carbon steel

SAE-AISI	UNS	C	Mn	P max	S max
1006	G10060	0.08 max	0.45 max	0.040	0.050
1008	G10080	0.10 max	0.50 max	0.040	0.050
1009	G10090	0.15 max	0.60 max	0.040	0.050
1010	G10100	0.08–0.13	0.30–0.60	0.040	0.050
1012	G10120	0.10–0.15	0.30–0.60	0.040	0.050
1015	G10150	0.12–0.18	0.30–0.60	0.040	0.050
1016	G10160	0.12–0.18	0.60–0.90	0.040	0.050
1017	G10170	0.14–0.20	0.30–0.60	0.040	0.050
1018	G10180	0.14–0.20	0.60–0.90	0.040	0.050
1019	G10190	0.14–0.20	0.70–1.00	0.040	0.050
1020	G10200	0.17–0.23	0.30–0.60	0.040	0.050
1021	G10210	0.17–0.23	0.60–0.90	0.040	0.050
1022	G10220	0.17–0.23	0.70–1.00	0.040	0.050
1023	G10230	0.19–0.25	0.30–0.60	0.040	0.050
1025	G10250	0.22–0.28	0.30–0.60	0.040	0.050
1026	G10260	0.22–0.28	0.60–0.90	0.040	0.050
1030	G10300	0.27–0.34	0.60–0.90	0.040	0.050
1033	G10330	0.29–0.36	0.70–1.00	0.040	0.050
1035	G10350	0.31–0.38	0.60–0.90	0.040	0.050
1037	G10370	0.31–0.38	0.70–1.00	0.040	0.050
1038	G10380	0.34–0.42	0.60–0.90	0.040	0.050
1039	G10390	0.36–0.44	0.70–1.00	0.040	0.050
1040	G10400	0.36–0.44	0.60–0.90	0.040	0.050
1042	G10420	0.39–0.47	0.60–0.90	0.040	0.050
1043	G10430	0.39–0.47	0.70–1.00	0.040	0.050
1045	G10450	0.42–0.50	0.60–0.90	0.040	0.050
1046	G10460	0.42–0.50	0.70–1.00	0.040	0.050
1049	G10490	0.45–0.53	0.60–0.90	0.040	0.050
1050	G10500	0.47–0.55	0.60–0.90	0.040	0.050
1055	G10550	0.52–0.60	0.60–0.90	0.040	0.050
1060	G10600	0.55–0.66	0.60–0.90	0.040	0.050
1064	G10640	0.59–0.70	0.50–0.80	0.040	0.050
1065	G10650	0.59–0.70	0.60–0.90	0.040	0.050
1070	G10700	0.65–0.76	0.60–0.90	0.040	0.050
1074	G10740	0.69–0.80	0.50–0.80	0.040	0.050
1075	G10750	0.69–0.80	0.40–0.70	0.040	0.050
1078	G10780	0.72–0.86	0.30–0.60	0.040	0.050
1080	G10800	0.74–0.88	0.60–0.90	0.040	0.050
1084	G10840	0.80–0.94	0.60–0.90	0.040	0.050
1085	G10850	0.80–0.94	0.70–1.00	0.040	0.050
1086	G10860	0.80–0.94	0.30–0.50	0.040	0.050
1090	G10900	0.84–0.98	0.60–0.90	0.040	0.050
1095	G10950	0.90–1.04	0.30–0.50	0.040	0.050

Merchant quality bars

UNS	C	Mn	P max	S max
M1008	0.10 max	0.25–0.60	0.04	0.05
M1010	0.07–0.14	0.25–0.60	0.04	0.05
M1012	0.09–0.16	0.25–0.60	0.04	0.05
M1015	0.12–0.19	0.25–0.60	0.04	0.05
M1017	0.14–0.21	0.25–0.60	0.04	0.05
M1020	0.17–0.24	0.25–0.60	0.04	0.05
M1023	0.19–0.27	0.25–0.60	0.04	0.05
M1025	0.20–0.30	0.25–0.60	0.04	0.05
M1031	0.26–0.36	0.25–0.60	0.04	0.05
M1044	0.40–0.50	0.25–0.60	0.04	0.05

Carbon Steel Composition Reference · Aobo Steel

Free-cutting carbon steel, resulfurized

SAE-AISI	UNS	C	Mn	P max	S
1108	G11080	0.08–0.13	0.50–0.80	0.040	0.08–0.13
1110	G11100	0.08–0.13	0.30–0.60	0.040	0.08–0.13
1117	G11170	0.14–0.20	1.00–1.30	0.040	0.08–0.13
1118	G11180	0.14–0.20	1.30–1.60	0.040	0.08–0.13
1137	G11370	0.32–0.39	1.35–1.65	0.040	0.08–0.13
1139	G11390	0.35–0.43	1.35–1.65	0.040	0.13–0.20
1140	G11400	0.37–0.44	0.70–1.00	0.040	0.08–0.13
1141	G11410	0.37–0.45	1.35–1.65	0.040	0.08–0.13
1144	G11440	0.40–0.48	1.35–1.65	0.040	0.24–0.33
1146	G11460	0.42–0.49	0.70–1.00	0.040	0.08–0.13
1151	G11510	0.48–0.55	0.70–1.00	0.040	0.08–0.13

Free-cutting carbon steel, rephosphorized and resulfurized

SAE-AISI	UNS	C max	Mn	P	S	Pb
1211	G12110	0.13	0.60–0.90	0.07–0.12	0.10–0.15	—
1212	G12120	0.13	0.70–1.00	0.07–0.12	0.16–0.23	—
1213	G12130	0.13	0.70–1.00	0.07–0.12	0.24–0.33	—
1215	G12150	0.09	0.75–1.05	0.04–0.09	0.26–0.35	—
12L14	G12144	0.15	0.85–1.15	0.04–0.09	0.26–0.35	0.15–0.35

High-manganese carbon steel, bar and forging

SAE-AISI	UNS	C	Mn	P max	S max
1513	G15130	0.10–0.16	1.10–1.40	0.040	0.050
1522	G15220	0.18–0.24	1.10–1.40	0.040	0.050
1524	G15240	0.19–0.25	1.35–1.65	0.040	0.050
1526	G15260	0.22–0.29	1.10–1.40	0.040	0.050
1527	G15270	0.22–0.29	1.20–1.50	0.040	0.050
1536	G15360	0.30–0.37	1.20–1.50	0.040	0.050
1541	G15410	0.36–0.44	1.35–1.65	0.040	0.050
1548	G15480	0.44–0.52	1.10–1.40	0.040	0.050
1551	G15510	0.45–0.56	0.85–1.15	0.040	0.050
1552	G15520	0.47–0.55	1.20–1.50	0.040	0.050
1561	G15610	0.55–0.65	0.75–1.05	0.040	0.050
1566	G15660	0.60–0.71	0.85–1.15	0.040	0.050

High-manganese carbon steel, structural

SAE-AISI	UNS	C	Mn	P max	S max	Former SAE
1524	G15240	0.18–0.25	1.30–1.65	0.040	0.050	1024
1527	G15270	0.22–0.29	1.20–1.55	0.040	0.050	1027
1536	G15360	0.30–0.38	1.20–1.55	0.040	0.050	1036
1541	G15410	0.36–0.45	1.30–1.65	0.040	0.050	1041
1548	G15480	0.43–0.52	1.05–1.40	0.040	0.050	1048
1552	G15520	0.46–0.55	1.20–1.55	0.040	0.050	1052

Notes

- Four values in the source tables were printed with a decimal point missing or misplaced. They are corrected here and the printed form is given so the correction can be checked against the printed page.
- Grade 1006 sulfur is printed as 0.50 and is given as 0.050. Grade 1015 carbon is printed as 0.13–0.18 and is given as 0.13–0.18. Grade 1016 carbon is printed as 0.13–0.18 and is given as 0.13–0.18. Grade 1211 phosphorus is printed as 0.07–0.12 and is given as 0.07–0.12.
- Leaded carbon steels typically contain 0.15–0.35 % Pb and carry the letter L in the designation, as in 10L45. Boron steels contain 0.0005–0.003 % B and carry the letter B, as in 10B46.

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, Volume 1, Tables 12 to 18, Classification and Designation of Carbon and Low-Alloy Steels, and from the Aobo Steel carbon steel composition chart.

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Scan to open the full carbon steel composition chart with all 135 grades