

Alloy Steel Composition Chart

Chemical composition limits for the SAE-AISI low-alloy grades, quoted as ladle or cast analysis in weight percent. The card carries the manganese, molybdenum, chromium and nickel series, with the SAE potential standard PS grades in a second table. Reference summary of published alloy steel composition tables and not an Aobo Steel standard.

Reference only. Aobo Steel supplies alloy steel bar and plate to order and does not provide heat treatment services. The limits below are ladle or cast 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.

Low-alloy steel bars, billets and forgings

Composition limits for billets, blooms, slabs and hot-rolled or cold-finished bars. Slightly wider ranges apply to plate. Table 19 of the source.

SAE-AISI	UNS	C	Mn	P	S	Si	Ni	Cr	Mo	V
1330	G13300	0.28–0.33	1.60–1.90	0.035	0.040	0.15–0.35	—	—	—	—
1335	G13350	0.33–0.38	1.60–1.90	0.035	0.040	0.15–0.35	—	—	—	—
1340	G13400	0.38–0.43	1.60–1.90	0.035	0.040	0.15–0.35	—	—	—	—
1345	G13450	0.43–0.48	1.60–1.90	0.035	0.040	0.15–0.35	—	—	—	—
4023	G40230	0.20–0.25	0.70–0.90	0.035	0.040	0.15–0.35	—	—	—	—
4024	G40240	0.20–0.25	0.70–0.90	0.035	0.035–0.050	0.15–0.35	—	—	0.20–0.30	—
4027	G40270	0.25–0.30	0.70–0.90	0.035	0.040	0.15–0.35	—	—	0.20–0.30	—
4028	G40280	0.25–0.30	0.70–0.90	0.035	0.035–0.050	0.15–0.35	—	—	0.20–0.30	—
4032	G40320	0.30–0.35	0.70–0.90	0.035	0.040	0.15–0.35	—	—	0.20–0.30	—
4037	G40370	0.35–0.40	0.70–0.90	0.035	0.040	0.15–0.35	—	—	0.20–0.30	—
4042	G40420	0.40–0.45	0.70–0.90	0.035	0.040	0.15–0.35	—	—	0.20–0.30	—
4047	G40470	0.45–0.50	0.70–0.90	0.035	0.040	0.15–0.35	—	—	0.20–0.30	—
4118	G41180	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.35	—	0.40–0.60	0.08–0.15	—
4130	G41300	0.28–0.33	0.40–0.60	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4135	G41350	0.33–0.38	0.70–0.90	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4137	G41370	0.35–0.40	0.70–0.90	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4140	G41400	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4142	G41420	0.40–0.45	0.75–1.00	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4145	G41450	0.41–0.48	0.75–1.00	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4147	G41470	0.45–0.50	0.75–1.00	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4150	G41500	0.48–0.53	0.75–1.00	0.035	0.040	0.15–0.35	—	0.80–1.10	0.15–0.25	—
4161	G41610	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.35	—	0.70–0.90	0.25–0.35	—
4320	G43200	0.17–0.22	0.45–0.65	0.035	0.040	0.15–0.35	1.65–2.00	0.40–0.60	0.20–0.30	—
4340	G43400	0.38–0.43	0.60–0.80	0.035	0.040	0.15–0.35	1.65–2.00	0.70–0.90	0.20–0.30	—
E4340 ^(b)	G43406	0.38–0.43	0.65–0.85	0.025	0.025	0.15–0.35	1.65–2.00	0.70–0.90	0.20–0.30	—
4422	G44220	0.20–0.25	0.70–0.90	0.035	0.040	0.15–0.35	—	—	0.35–0.45	—
4427	G44270	0.24–0.29	0.70–0.90	0.035	0.040	0.15–0.35	—	—	0.35–0.45	—
4615	G46150	0.13–0.18	0.45–0.65	0.035	0.040	0.15–0.25	1.65–2.00	—	0.20–0.30	—
4617	G46170	0.15–0.20	0.45–0.65	0.035	0.040	0.15–0.35	1.65–2.00	—	0.20–0.30	—
4620	G46200	0.17–0.22	0.45–0.65	0.035	0.040	0.15–0.35	1.65–2.00	—	0.20–0.30	—
4626	G46260	0.24–0.29	0.45–0.65	0.035	0.04 max	0.15–0.35	0.70–1.00	—	0.15–0.25	—
4718	G47180	0.16–0.21	0.70–0.90	—	—	—	0.90–1.20	0.35–0.55	0.30–0.40	—
4720	G47200	0.17–0.22	0.50–0.70	0.035	0.040	0.15–0.35	0.90–1.20	0.35–0.55	0.15–0.25	—
4815	G48150	0.13–0.18	0.40–0.60	0.035	0.040	0.15–0.35	3.25–3.75	—	0.20–0.30	—
4817	G48170	0.15–0.20	0.40–0.60	0.035	0.040	0.15–0.35	3.25–3.75	—	0.20–0.30	—
4820	G48200	0.18–0.23	0.50–0.70	0.035	0.040	0.15–0.35	3.25–3.75	—	0.20–0.30	—
50B40 ^(c)	G50401	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.35	—	0.40–0.60	—	—
50B44 ^(c)	G50441	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.35	—	0.40–0.60	—	—

Source: ASM Handbook, Vol 1 (10th ed.), "Classification and Designation of Carbon and Low-Alloy Steels", Table 19.

Low-alloy steel bars, billets and forgings, continued

SAE-AISI	UNS	C	Mn	P	S	Si	Ni	Cr	Mo	V
5046	G50460	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.35	—	0.20–0.35	—	—
50B46 ^(c)	G50461	0.44–0.49	0.75–1.00	0.035	0.040	0.15–0.35	—	0.20–0.35	—	—
50B50 ^(c)	G50501	0.48–0.53	0.75–1.00	0.035	0.040	0.15–0.35	—	0.40–0.60	—	—
5060	G50600	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.35	—	0.40–0.60	—	—
50B60 ^(c)	G50601	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.35	—	0.40–0.60	—	—
5115	G51150	0.13–0.18	0.70–0.90	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
5117	G51170	0.15–0.20	0.70–0.90	0.040	0.040	0.15–0.35	—	0.70–0.90	—	—
5120	G51200	0.17–0.22	0.70–0.90	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
5130	G51300	0.28–0.33	0.70–0.90	0.035	0.040	0.15–0.35	—	0.80–1.10	—	—
5132	G51320	0.30–0.35	0.60–0.80	0.035	0.040	0.15–0.35	—	0.75–1.00	—	—
5135	G51350	0.33–0.38	0.60–0.80	0.035	0.040	0.15–0.35	—	0.80–1.05	—	—
5140	G51400	0.38–0.43	0.70–0.90	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
5147	G51470	0.46–0.51	0.70–0.95	0.035	0.040	0.15–0.35	—	0.85–1.15	—	—
5150	G51500	0.48–0.53	0.70–0.90	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
5155	G51550	0.51–0.59	0.70–0.90	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
5160	G51600	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
51B60 ^(c)	G51601	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
50100 ^(b)	G50986	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.35	—	0.40–0.60	—	—
51100 ^(b)	G51986	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.35	—	0.90–1.15	—	—
52100 ^(b)	G52986	0.98–1.10	0.25–0.45	0.025	0.025	0.15–0.35	—	1.30–1.60	—	—
6118	G61180	0.16–0.21	0.50–0.70	0.035	0.040	0.15–0.35	—	0.50–0.70	—	0.10–0.15
6150	G61500	0.48–0.53	0.70–0.90	0.035	0.040	0.15–0.35	—	0.80–1.10	—	0.15 min
8115	G81150	0.13–0.18	0.70–0.90	0.035	0.040	0.15–0.35	0.20–0.40	0.30–0.50	0.08–0.15	—
81B45 ^(c)	G81451	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.35	0.20–0.40	0.35–0.55	0.08–0.15	—
8615	G86150	0.13–0.18	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8617	G86170	0.15–0.20	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8620	G86200	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8622	G86220	0.20–0.25	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8625	G86250	0.23–0.28	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8627	G86270	0.25–0.30	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8630	G86300	0.28–0.33	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8637	G86370	0.35–0.40	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8640	G86400	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8642	G86420	0.40–0.45	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8645	G86450	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
86B45 ^(c)	G86451	0.43–0.48	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8650	G86500	0.48–0.53	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8655	G86550	0.51–0.59	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8600	G86600	0.56–0.64	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.15–0.25	—
8720	G87200	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.20–0.30	—
8740	G87400	0.38–0.43	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.20–0.30	—
8822	G88220	0.20–0.25	0.75–1.00	0.035	0.040	0.15–0.35	0.40–0.70	0.40–0.60	0.30–0.40	—
9254	G92540	0.51–0.59	0.60–0.80	0.035	0.040	1.20–1.60	—	0.60–0.80	—	—
9260	G92600	0.56–0.64	0.75–1.00	0.035	0.040	1.80–2.20	—	—	—	—
9310 ^(b)	G93106	0.08–0.13	0.45–0.65	0.025	0.025	0.15–0.35	3.00–3.50	1.00–1.40	0.08–0.15	—
94B15 ^(c)	G94151	0.13–0.18	0.75–1.00	0.035	0.040	0.15–0.35	0.30–0.60	0.30–0.50	0.08–0.15	—
94B17 ^(c)	G94171	0.15–0.20	0.75–1.00	0.035	0.040	0.15–0.35	0.30–0.60	0.30–0.50	0.08–0.15	—
94B30 ^(c)	G94301	0.28–0.33	0.75–1.00	0.035	0.040	0.15–0.35	0.30–0.60	0.30–0.50	0.08–0.15	—

Alloy Steel Composition Reference · Aobo Steel

SAE potential standard steels

SAE PS number	C	Mn	P max	S max	Si	Ni	Cr	Mo	B
PS 10	0.19–0.24	0.95–1.25	0.035	0.040	0.15–0.35	0.20–0.40	0.25–0.40	0.05–0.10	—
PS 15	0.18–0.23	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
PS 16	0.20–0.25	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
PS 17	0.23–0.28	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
PS 18	0.25–0.30	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
PS 19	0.18–0.23	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.08–0.15	0.0005–0.003
PS 20	0.13–0.18	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
PS 21	0.15–0.20	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
PS 24	0.18–0.23	0.75–1.00	0.035	0.040	0.15–0.35	—	0.45–0.65	0.20–0.30	—
PS 30	0.13–0.18	0.70–0.90	0.035	0.040	0.15–0.35	0.70–1.00	0.45–0.65	0.45–0.60	—
PS 31	0.15–0.20	0.70–0.90	0.035	0.040	0.15–0.35	0.70–1.00	0.45–0.65	0.45–0.60	—
PS 32	0.18–0.23	0.70–0.90	0.035	0.040	0.15–0.35	0.70–1.00	0.45–0.65	0.45–0.60	—
PS 33 ^(b)	0.17–0.24	0.85–1.25	0.035	0.040	0.15–0.35	0.20 min	0.20 min	0.05 min	—
PS 34	0.28–0.33	0.90–1.20	0.035	0.040	0.15–0.35	—	0.40–0.60	0.13–0.20	—
PS 36	0.38–0.43	0.90–1.20	0.035	0.040	0.15–0.35	—	0.45–0.65	0.13–0.20	—
PS 38	0.43–0.48	0.90–1.20	0.035	0.040	0.15–0.35	—	0.45–0.65	0.13–0.20	—
PS 39	0.48–0.53	0.90–1.20	0.035	0.040	0.15–0.35	—	0.45–0.65	0.13–0.20	—
PS 40	0.51–0.59	0.90–1.20	0.035	0.040	0.15–0.35	—	0.45–0.65	0.13–0.20	—
PS 54	0.19–0.25	0.70–1.05	0.035	0.040	0.15–0.35	—	0.40–0.70	0.05 min	—
PS 55	0.15–0.20	0.70–1.00	0.035	0.040	0.15–0.35	1.65–2.00	0.45–0.65	0.65–0.80	—
PS 56	0.080–0.13	0.70–1.00	0.035	0.040	0.15–0.35	1.65–2.00	0.445–0.65	0.65–0.80	—
PS 57	0.08 max	1.25 max	0.040	0.15–0.35	1.00 max	—	17.00–19.00	1.75–2.25	—
PS 58	0.16–0.21	1.00–1.30	0.035	0.040	0.15–0.35	—	0.45–0.65	—	—
PS 59	0.18–0.23	1.00–1.30	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
PS 61	0.23–0.28	1.00–1.30	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
PS 63	0.31–0.38	0.75–1.10	0.035	0.040	0.15–0.35	—	0.45–0.65	—	0.0005–0.003
PS 64	0.16–0.21	1.00–1.30	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
PS 65	0.21–0.26	1.00–1.30	0.035	0.040	0.15–0.35	—	0.70–0.90	—	—
PS 66 ^(c)	0.16–0.21	0.40–0.70	0.035	0.040	0.15–0.35	1.65–2.00	0.45–0.75	0.08–0.15	—
PS 67	0.42–0.49	0.80–1.20	0.035	0.040	0.15–0.35	—	0.85–1.20	0.25–0.35	—

Source: ASM Handbook, Vol 1 (10th ed.), "Classification and Designation of Carbon and Low-Alloy Steels", Table 20.

Table notes

- Three values in the source table are printed with a defect. Grade 4118 molybdenum is printed as 0.08-015 and is given here as 0.08-0.15, because a 15 % molybdenum range is not possible and the same chemistry is printed correctly for the 4118-type grades elsewhere in the table.
- Grades 4023 show a blank molybdenum cell and a blank vanadium cell where every other row carries the not-specified mark, and the row is reproduced as printed.
- Grade 8600 is printed against the UNS number G86600, which belongs to SAE 8660, and the row is reproduced as printed rather than renumbered.
- Two further values are reproduced exactly as the source prints them and look unusual. PS 56 carries 0.080-0.13 % C and 0.445-0.65 % Cr, and PS 57 carries 0.15-0.35 % sulfur under a column headed S max.
- Composition data is for general reference only. Actual values vary by standard, mill, and heat number.
- A dash in a cell means the element is not specified in the source table.

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 19 and 20, Classification and Designation of Carbon and Low-Alloy Steels, and from the Aobo Steel alloy steel composition chart.

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Scan to open the full alloy steel composition chart