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Chemical Compositions of SAE Wrought Stainless Steels

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an American National Standard

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Not applicable.

RELATIONSHIP OF SAE STANDARD TO ISO STANDARD:

Not applicable.

REFERENCE SECTION:

SAE J412, General Characteristics and Heat Treatments of Steels

APPLICATION:

Sponsor to supply.

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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

MATERIALS STANDARD

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SAE J405

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CHEMICAL COMPOSITIONS OF SAE WROUGHT STAINLESS STEELS

The chemical composition of standard types of wrought stainless steels are listed in Tables 1, 2, and 3. The 302XX series designates nickel-chromium manganese, corrosion resistant types, nonhardenable by thermal treatment (Table 1). The 303XX series are nickel-chromium, corrosion resistant steels, nonhardenable by thermal treatment (Table 1). The 514XX series, however, include both a hardenable, martensitic chromium steel (Table 2), and a nonhardenable, ferritic, chromium steel (Table 3). Table 4 lists proprietary and modifications of standard types to which elements have been added to provide special machinability characteristics. In order to avoid confusion with the AISI designations, the use of a suffix to denote a free machining steel or a variation in the carbon or silicon range has been retained. Therefore, the footnotes should be carefully followed. Reference to SAE J412 is suggested for general information and usage of these types of materials.

Ø TABLE 1--WROUGHT CHROMIUM-NICKEL AUSTENITIC STEELS (NOT HARDENABLE BY THERMAL TREATMENT)

SAE No.[a]	Chemical Composition Limits, %								AISI Type	UNS
	C Max	Mn Max	Si Max	P Max	S Max	Cr Range	Ni Range	Other Elements		
30201	0.15	5.5 - 7.5	1.00	0.060	0.030	16.00-18.00	3.50- 5.50	N, 0.25 max	201	S20100
30202	0.15	7.5 - 10.0	1.00	0.060	0.030	17.00-19.00	4.00- 6.00	N, 0.25 max	202	S20200
30301	0.15	2.00	1.00	0.045	0.030	16.00-18.00	6.00- 8.00	--	301	S30100
30302	0.15	2.00	1.00	0.045	0.030	17.00-19.00	8.00-10.00	--	302	S30200
30302B	0.15	2.00	2.00-3.00	0.045	0.030	17.00-19.00	8.00-10.00	--	302B	S30215
30303	0.15	2.00	1.00	0.20	0.15 min	17.00-19.00	8.00-10.00	Zr or Mo, 0.60 max[c]	303	S30300
30303 Se	0.15	2.00	1.00	0.20	0.06	17.00-19.00	8.00-10.00	Se, 0.15 min	303 Se	S30323
30304	0.08	2.00	1.00	0.045	0.030	18.00-20.00	8.00-10.50	--	304	S30400
30304L	0.03	2.00	1.00	0.045	0.030	18.00-20.00	8.00-12.00	--	304L	S30403
30305	0.12	2.00	1.00	0.045	0.030	17.00-19.00	10.50-13.00	--	305	S30500
30308	0.08	2.00	1.00	0.045	0.030	19.00-21.00	10.00-12.00	--	308	S30800
30309	0.20	2.00	1.00	0.045	0.030	22.00-24.00	12.00-15.00	--	309	S30900
30309S	0.08	2.00	1.00	0.045	0.030	22.00-24.00	12.00-15.00	--	309S	S30908
30310	0.25	2.00	1.50	0.045	0.030	24.00-26.00	19.00-22.00	--	310	S31000
30310S	0.08	2.00	1.50	0.045	0.030	24.00-26.00	19.00-22.00	--	310S	S31008
30314	0.25	2.00	1.50-3.00	0.045	0.030	23.00-26.00	19.00-22.00	--	314	S31400
30316	0.08	2.00	1.00	0.045	0.030	16.00-18.00	10.00-14.00	Mo, 2.00-3.00	316	S31600
30316L[d]	0.03	2.00	1.00	0.045	0.030	16.00-18.00	10.00-14.00	Mo, 2.00-3.00	316L	S31603
30317	0.08	2.00	1.00	0.045	0.030	18.00-20.00	11.00-15.00	Mo, 3.00-4.00	317	S31700
30321[e]	0.08	2.00	1.00	0.045	0.030	17.00-19.00	9.00-12.00	Ti, 5 X C min	321	S32100
30330	0.15	2.00	1.50[b]	0.045	0.04	14.00-17.00	33.00-37.00	--	--	--
30347	0.08	2.00	1.00	0.045	0.030	17.00-19.00	9.00-13.00	Cb-Ta, 10 X C min	347	S34700
30348	0.08	2.00	1.00	0.045	0.030	17.00-19.00	9.00-13.00	Cb-Ta, 10 X C min; Ta, 0.10 max	348	S34800
30384	0.08	2.00	1.00	0.045	0.030	15.00-17.00	17.00-19.00	--	384	S38400
30385	0.08	2.00	1.00	0.045	0.030	11.50-13.50	14.00-16.00	--	385	S38500

[a]The suffixes with grade numbers denote: B--2.00-3.00 silicon range; Se--a free machining steel with selenium addition; L--extra low carbon grade; S--lower carbon grade.
[b]To minimize carbon or nitrogen pick-up 0.75-1.50 Si is recommended for high temperature application involving carbon or nitrogen atmosphere.
[c]At producer's option; reported only when intentionally added.
[d]10.0-15.0 Ni permitted for tubular products.
[e]9.0-13.0 Ni permitted for tubular products.

Ø TABLE 2--WROUGHT STAINLESS MARTENSITIC CHROMIUM STEELS (HARDENABLE BY THERMAL TREATMENT)

SAE No.[a]	Chemical Composition Limits, %								AISI Type[a]	UNS
	C Max	Mn Max	Si Max	P Max	S Max	Cr Range	Ni Range	Other Elements		
51403	0.15	1.00	0.50	0.040	0.030	11.50-13.00	--	--	403	S40300
51410	0.15	1.00	1.00	0.040	0.030	11.50-13.50	--	--	410	S41000
51414	0.15	1.00	1.00	0.040	0.030	11.50-13.50	1.25-2.50	--	414	S41400
51416	0.15	1.25	1.00	0.06	0.15 min	12.00-14.00	--	Zr or Mo, 0.60 max[b]	416	S41600
51416 Se	0.15	1.25	1.00	0.06	0.06	12.00-14.00	--	Se, 0.15 min	416 Se	S41623
51420	Over 0.15	1.00	1.00	0.040	0.030	12.00-14.00	--	--	420	S42000
51420F	0.15 min	1.25	1.00	0.06	0.15 min	12.00-14.00	--	Mo, 0.60 max[b]	420F	S42020
51420F Se	0.30-0.40	1.25	1.00	0.06	0.06	12.00-14.00	--	Se, 0.15 min	--	S42023
51431	0.20	1.00	1.00	0.040	0.030	15.00-17.00	1.25-2.50	--	431	S43100
51440A	0.60-.075	1.00	1.00	0.040	0.030	16.00-18.00	--	Mo, 0.75 max	440A	S44002
51440B	0.75-0.95	1.00	1.00	0.040	0.030	16.00-18.00	--	Mo, 0.75 max	440B	S44003
51440C	0.95-1.20	1.00	1.00	0.040	0.030	16.00-18.00	--	Mo, 0.75 max	440C	S44004
51440F	0.95-1.20	1.25	1.00	0.06	0.15 min	16.00-18.00	--	Zr or Mo, 0.75 max[b]	--	--
51440F Se	0.95-1.20	1.25	1.00	0.06	0.06	16.00-18.00	--	Se, 0.15 min	--	--
51501	Over 0.10	1.00	1.00	0.040	0.030	4.00-6.00	--	Mo, 0.40-0.65	501	S50100
51502	0.10	1.00	1.00	0.04	0.030	4.00-6.00	--	Mo, 0.40-0.65	502	S50200

[a]Suffixes A, B, and C denote differing carbon ranges for the same grade; F--a free machining steel; Se--a free machining steel with selenium addition.

[b]At producer's option; reported only when intentionally added.

TABLE 3--WROUGHT STAINLESS FERRITIC CHROMIUM STEELS (NOT HARDENABLE BY THERMAL TREATMENT)

	Chemical Composition Limits, %									
SAE No.[a]	C Max	Mn Max	Si Max	P Max	S Max	Cr Range	Ni Range	Other Elements	AISI Type[a]	UNS
51405[h]	0.08	1.00	1.00	0.040	0.030	11.50-14.50	--	Al, 0.10-0.30	405	S40500
51409	0.08	1.00	1.00	0.045	0.045	10.50-11.75	0.50 max	Ti, 6 X C or max of 0.75, Fe, rem		S40900
51429	0.12	1.00	1.00	0.040	0.030	14.00-16.00	--	--	429	S42900
51430	0.12	1.00	1.00	0.040	0.030	16.00-18.00	--	--	430	S43000
51430F	0.12	1.25	1.00	0.060	0.15 min	16.00-18.00	--	Mo, 0.60 max[c]	430F	S43020
51430F Se	0.12	1.25	1.00	0.060	0.060	16.00-18.00	--	Se, 0.15 min	430F Se	S43023
51434	0.12	1.00	1.00	0.040	0.030	16.00-18.00	--	Mo, 0.75-1.25	434	S43400
51436	0.12	1.00	1.00	0.040	0.030	16.00-18.00	--	Mo, 0.75-1.25; Cb + Ta, 5 X C - 0.70	436	S43600
51439	0.07	1.00	1.00	0.040	0.030	17.00-19.00	0.50	Ti - 0.20+4(C+N) Min, 1.10 Max Al - 0.15 Max N - 0.04 Max	439	S43900
51439LL	0.014	1.00	1.00	0.040	0.030	17.00-19.00	0.50	Ti - 0.20+4(C+N) Min, 1.10 Max Al - 0.15 Max N - 0.04 Max	439LL	S43903
51442	0.20	1.00	1.00	0.04	0.035	18.00-23.00	--	--	--	S44200
51446	0.20	1.50	1.00	0.04	0.030	23.00-27.00	--	N, 0.25 max	446	S44600

[a]Suffix F--denotes a free machining steel; Se--denotes a free machining steel with selenium
[b]Essentially nonhardenable by heat treatment.
[c]At producer's option; reported only when intentionally added.