

ASTM - A276/A276M SPECIFICATION FOR STAINLESS STEEL BARS AND SHAPES

This specification covers hot-finished or cold-finished bars except bars for reforging. It includes rounds, squares, and hexagons, and hot-rolled or extruded shapes, such as angles, tees, and channels in the more commonly used types of stainless steels.

UNS Designation ^B	Type	C, max	Mn, max	P, max	S, max	Si, max	Cr	Ni	Mo	Other Elements
Austenitic-Ferritic Grades										
S20100	201	0.15	5.50–7.50	0.06	0.03	1	16.00–18.00	3.50–5.50	...	N [0.25]
S20161	...	0.15	4.00–6.00	0.04	0.04	3.00–4.00	15.00–18.00	4.00–6.00	...	N [0.08–0.20]
S20200	202	0.15	7.50–10.00	0.06	0.03	1	17.00–19.00	4.00–6.00	...	N [0.25]
S20500	205	0.12– 25	14.00– 15.50	0.06	0.03	1	16.50–18.00	1.00–1.70	...	N [0.32–0.40]
S20910	XM– 19	0.06	4.00–6.00	0.04	0.03	1	20.50–23.50	11.50– 13.50	1.50–3.00	Cb [0.10–0.30], V [0.10–0.30], N [0.20–0.40]
S21800	...	0.1	7.00–9.00	0.06	0.03	3.50–4.50	16.00–18.00	8.00–9.00	...	N [0.08–0.18]

					0.03	1			...	
A. <u>Manufacture</u>										
S21900	XM-10	0.08	8.00–10.00	0.06	0.03	1	19.00–21.50	5.50–7.50	...	N [0.15–0.40]

Bars shall be furnished in one of the following conditions listed in the Mechanical Requirements table:

1. Condition A :- Annealed.
2. Condition H :- Hardened and tempered at a relatively low temperature.
3. Condition T :- Hardened and tempered at a relatively high temperature.
4. Condition S :- Strain Hardened–Relatively light cold work.
5. Condition B :- Relatively severe cold work.

B. Chemical Composition :-

1. The steel shall conform to the requirements for chemical composition specified in Table 1.

Table 1

S21904	XM-11	0.04	8.00–10.00	0.06			19.00–21.50	5.50–7.50		N [0.15–0.40]
S24000	XM-29	0.08	11.50–14.50	0.06	0.03	1	17.00–19.00	2.25–3.75	...	N [0.20–0.40]
S24100	XM-28	0.15	11.00–14.00	0.06	0.03	1	16.50–19.00	0.50–2.50	...	N [0.20–0.45]
S24565	...	0.03	5.0–7.0	0.03	0.01	1	23.00–25.00	16.0–18.0	4.0–5.0	Cb [0.10], N [0.4–0.6]
S28200	...	0.15	17.00–19.00	0.045	0.03	1	17.00–19.00	...	0.75–1.25	Cu [0.75–1.25], N [0.40–0.60]
S30200	302	0.15	2	0.045	0.03	1	17.00–19.00	8.00–10.00	...	N [0.1]

					0.03	1			...	
S30215	302B	0.15	2	0.045	0.03	2.00–3.00	17.00–19.00	8.00–10.00	...	...
S30400	304	0.08	2	0.045	0.03	1	18.00–20.00	8.00–10.50	...	N [0.1]
S30403	304L ^c	0.03	2	0.045	0.03	1	18.00–20.00	8.00–12.00	...	N [0.1]
S30451	304N	0.08	2	0.045	0.03	1	18.00–20.00	8.00–10.50	...	N [0.10–0.16]
S30452	XM-21	0.08	2	0.045	0.03	1	18.00–20.00	8.00–10.50	...	N [0.16–0.30]
S30453	304LN	0.03	2	0.045	0.03	1	18.00–20.00	8.00–12.00	...	N [0.10–0.16]
S30454	...	0.03	2	0.045	0.03	1	18.00–20.00	8.00–12.00	...	N [0.16–0.30]
S30500	305	0.12	2	0.045	0.03	1	17.00–19.00	10.50–13.00	...	...
S30800	308	0.08	2	0.045	0.03	1	19.00–21.00	10.00–12.00	...	...
S30815	...	0.1	0.8	0.04	0.03	1.40–2.00	20.00–22.00	10.00–12.00	...	Ce [0.03–0.08], N [0.14–0.20]
S30900	309	0.2	2	0.045	0.03	1	22.00–24.00	12.00–15.00	...	...

12.00⁻

					0.03	1	S30908		...	
	309S	0.08	2	0.045			22.00–24.00	15.00		...
S31040	310Cb	0.08	2	0.045	0.03	1.5	24.00–26.00	19.00–22.00	...	(Cb+Ta) [10C–1.10], N [0.1]
S31254	...	0.02	1	0.03	0.01	0.8	19.50–20.50	17.50–18.50	6.00–6.50	Cu [0.50–1.00], N [0.18–0.22]
S31400	314	0.25	2	0.045	0.03	1.50–3.00	23.00–26.00	19.00–22.00	...	...
S31600	316	0.08	2	0.045	0.03	1	16.00–18.00	10.00–14.00	2.00–3.00	N [0.1]
S31603	316L ^c	0.03	2	0.045	0.03	1	16.00–18.00	10.00–14.00	2.00–3.00	N [0.1]
S31635	316Ti	0.08	2	0.045	0.03	1	16.00–18.00	10.00–14.00	2.00–3.00	Ti [5(C+N)–0.70], N [0.1]
S31640	316Cb	0.08	2	0.045	0.03	1	16.00–18.00	10.00–14.00	2.00–3.00	(Cb+Ta) [10×C–1.10], N [0.1]
S31651	316N	0.08	2	0.045	0.03	1	16.00–18.00	10.00–14.00	2.00–3.00	N [0.10–0.16]
S30940	309Cb	0.08	2	0.045	0.03	1	22.00–24.00	12.00–16.00	...	(Cb+Ta) [10×C–1.10], N [0.1]
S31000	310	0.25	2	0.045	0.03	1.5	24.00–26.00	19.00–22.00	...	...
S31008	310S	0.08	2	0.045	0.03	1.5	24.00–26.00	19.00–22.00	...	...

					0.03	1			...	
S31653	316LN	0.03	2	0.045	0.03	1	16.00–18.00	10.00–14.00	2.00–3.00	Cu [0.16–0.30], N [0.10–0.16]
S31654	...	0.03	2	0.045	0.03	1	16.00–18.00	10.00–14.00	2.00–3.00	...
S31700	317	0.08	2	0.045	0.03	1	18.00–20.00	11.00–15.00	3.00–4.00	N [0.1]
S31725	...	0.03	2	0.045	0.03	1	18.00–20.00	13.50–17.50	4.0–5.0	Cu [0.75], N [0.1]
S31726	...	0.03	2	0.045	0.03	1	17.00–20.00	13.50–17.50	4.0–5.0	Cu [0.75], N [0.10–0.20]

					0.03	1			...	
								9.00-12.00	^D] S32100	321 0.08 2
	0.045	17.00-19.00	Ti [5(C+N)-0.70]							
S32550	...	0.04	1.5	0.04	0.03	1	24.0-27.0	4.50-6.50	2.9-3.9	Cu [1.50-2.50], N [0.10-0.25]
S34700	347	0.08	2	0.045	0.03	1	17.00-19.00	9.00-13.00	...	(Cb+Ta) [10×C min],
S34800	348	0.08	2	0.045	0.03	1	17.00-19.00	9.00-13.00	...	(Cb+Ta) [10×C min], Ta [0.10], Co [0.20],
S31100	XM-26	0.06	1	0.04	0.03	1	25.00-27.00	6.00-7.00	...	Ti [0.25],
S31803	...	0.03	2	0.03	0.02	1	21.00-23.00	4.50-6.50	2.50-3.50	N [0.08-0.20]
S32304	...	0.03	2.5	0.04	0.03	1	21.50-24.50	3.00-5.50	0.05-0.60	Cu [0.05-0.60], N [0.05-0.20]
S32760E	...	0.03	1	0.03	0.01	1	24.00-26.00	6.00-8.00	3.00-4.00	Cu [0.05-1.00], W [0.50-1.00], N [0.20-0.30]
Ferritic Grades										
S40500	405	0.08	1	0.04	0.03	1	11.50-14.50	...	...	Al [0.10-0.30],
S42900	429	0.12	1	0.04	0.03	1	14.00-16.00	...	...	...
S43000	430	0.12	1	0.04	0.03	1	16.00-18.00	...	...	...
S44400	...	0.025	1	0.04	0.03	1	17.5-19.5	1	1.75-2.50	(Ti+Cb) [0.20+4(C+N)-0.80], N [0.035]
S44600	446	0.2	1.5	0.04	0.03	1	23.00-27.00	...	...	N [0.25]
S44627	XM-27 ^F	0.010 ^G	0.4	0.02	0.02	0.4	25.00-27.50	0.5 max.	0.75-1.50	Cu [0.20], Cb [0.05-0.20], N [0.015 ^G]
S44700	...	0.01	0.3	0.025	0.02	0.2	28.00-30.00	0.15 max.	3.50-4.20	(C+N) [0.25], Cu [0.15], N [0.02]
S44800	...	0.01	0.3	0.025	0.02	0.2	28.00-30.00	2.00-2.50	3.50-4.20	(C+N) [0.25], Cu [0.15], N [0.02]

S40300	403	0.15	1	0.04	0.03	0.5	11.50–13.00	...	...	...
S41000	410	0.15	1	0.04	0.03	1	11.50–13.50	...	...	...
S41040	XM-30	0.18	1	0.04	0.03	1	11.50–13.50	...	...	Cb [0.05–0.30]
S41400	414	0.15	1	0.04	0.03	1	11.50–13.50	1.25–2.50	...	...
S41500	H	0.05	0.50–1.00	0.03	0.03	0.6	11.50–14.00	3.50–5.50	0.50–1.00	...
S42000	420	over	1	0.04			12.00–14.00

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Type	Condition	Finish	Diameter or Thickness, in. (mm)	Tensile Strength, Min		Yield Strength, ^A Min.		Elongation in 2 in. (50 mm), ^B or 4D Min. ^B %	Reduction of Area, ^C Min., %	Brinell Hardness, ^D Max.
				ksi	MPa	ksi	MPa			

Austenitic Grades

		0.15								
S42010	...	0.15–0.30	1	0.04	0.03	1	13.50–15.00	0.35–0.85	0.40–0.85	...
S43100	431	0.2	1	0.04	0.03	1	15.00–17.00	1.25–2.50	...	...
S44002	440A	0.60–0.75	1	0.04	0.03	1	16.00–18.00	...	0.75	...
S44003	440B	0.75–0.95	1	0.04	0.03	1	16.00–18.00	...	0.75	...
S44004	440C	0.95–1.20	1	0.04	0.03	1	16.00–18.00	...	0.75	...
S50400	9	0.15	0.30–0.60	0.03	0.03	0.75–1.00	8.00–10.00	...	0.90–1.10	...

^A Maximum, unless range or minimum is indicated.

				0.03	1				...			
201, 202	A	hot-finished or cold-finished		all		75	515	40	275	40	45	...

^B Designations established in accordance with Practice E 527 and SAE J1086.

^C For some applications, the substitution of Type 304L for Type 304, or Type 316L for Type 316 may be undesirable because of design, fabrication, or service requirements. In such cases, the purchaser should so indicate on the order. ^D Nitrogen content is to be reported for this grade.

^E $\%Cr + 3.3 _ \%Mo + 16 _ \%N \geq 40$.

^F Nickel plus copper shall be 0.50 % max.

^G Product analysis tolerance over | the maximum limit for carbon and nitrogen shall | be 0.002 %. ^H Wrought version of CA 6NM.

C. Mechanical Properties Requirements :-

1. The material shall conform to the mechanical test requirements specified in Table 2.
2. The martensitic grades shall be capable of meeting the hardness requirements after heat treating as specified in Table 3.

Table 2

S20161	A	hot-finished or cold-finished	all	125	860	50	345	40	40	255
205	A	hot-finished or cold-finished	all	100	690	60	414	40	50	...
XM-19	A	hot-finished or cold-finished	all	100	690	55	380	35	55	...
	As hot rolled	hot-finished or cold-finished	up to 2 (50.8), incl.	135	930	105	725	20	50	...
			over 2 to 3 (50.8 to 76.2), incl.	115	795	75	515	25	50	...
			over 3 to 8 (76.2 to 203.2), incl.	100	690	60	415	30	50	...
S21800	A	hot-finished or	all	95	655	50	345	35	55	241

		cold-finished								
XM-10, XM-11	A	hot-finished or cold-finished	all	90	620	50	345	45	60	...
XM-29	A	hot-finished or cold-finished	all	100	690	55	380	30	50	...
XM-28	A	hot-finished or cold-finished	all	100	690	55	380	30	50	...
S24565	A	hot-finished or cold-finished	all	115	795	60	415	35	40	...
S28200	A	hot-finished or cold-finished	all	110	760	60	410	35	55	...
302, 302B, 304, 304LN, 305, 308, 309, 309S, 309Cb, 310, 310S, 310Cb, 314, 316, 316LN, 316Cb, 316Ti, 317, 321, 347, 348	A	hot-finished or cold-finished	all	75 ^E	515	30 ^E	205	40 ^G	50	...
			up to 1/2 (12.70) incl.	90	620	45	310	30	40	...
			over 1/2 (12.70)	75 ^E	515	30 ^E	205	30	40	...
304L, 316L	A		all	70	485	25	170	40 ^G	50	...

		hot-finished or cold-finished	up to 1/2 (12.70) incl.	90	620	45	310	30	40	...
			over 1/2 (12.70)	70	485	25	170	30	40	...
304N, 316N	A	hot-finished or cold-finished	all	80	550	35	240	30	...	...
202, 302, 304, 304N, 316, 316N	B	cold-finished	up to 3/4 (19.05) incl.	125	860	100	690	12	35	...
			over 3/4 (19.05) to 1 (25.40)	115	795	80	550	15	35	...
			over 1 (25.40) to 1 1/4 (31.75)	105	725	65	450	20	35	...
			over 1 1/4 (31.75) to 1 1/2 (38.10)	100	690	50	345	24	45	...
			over 1 1/2 (38.10) to 1 3/4 (44.45)	95	655	45	310	28	45	...
304, 304N, 316, 316N	S	cold-finished	up to 2 (50.8) incl.	95	650	75	515	25	40	...
			over 2 to 2 1/2 (50.8 to 63.5) incl.	90	620	65	450	30	40	...
			over 2 1/2 to 3 (63.5 to 76.2) incl.	80	550	55	380	30	40	...
XM-21, S30454, S31654	A	hot-finished or cold-finished	all	90	620	50	345	30	50	...
XM-21, S30454, S31654	B	cold-finished	up to 1 (25.40) incl.	145	1000	125	860	15	45	...
			over 1 (25.40) to 1 1/4 (31.75)	135	930	115	795	16	45	...
			over 1 1/4 (31.75) to 1 1/2 (38.10)	135	895	105	725	17	45	...

			over 1 1/2 (38.10) to 1 3/4 (44.45)	125	860	100	690	18	45	...
S30815	A	hot-finished or cold-finished	all	87	600	45	310	40	50	...
S31254	A	hot-finished or cold-finished	all	95	650	44	300	35	50	...
S31725	A	hot-finished or cold-finished	all	75	515	30	205	40	...	...
S31726	A	hot-finished or cold-finished	all	80	550	35	240	40	...	...
XM-26	A	hot-finished or cold-finished	all	90	620	65	450	20	55	...
S31803	A	hot-finished or cold-finished	all	90	620	65	448	25	...	290
S32304	A	hot-finished or cold-finished	all	87	600	58	400	25	...	290
S32550	A	hot-finished or cold-finished	all	110	760	80	550	15	...	302
S32760	A	hot-finished or cold-finished	all	109	750	80	550	25	...	290
S32760	S	cold-finished	all	125	860	105	720	16	...	335
Ferritic Grades										

405F	A	hot-finished	all	...	...	...	...	...	...	207
		cold-finished	all	...	...	...	...	...	...	217
429	A	hot-finished	all	70	480	40	275	20	45	...
		cold-finished	all	70	480	40	275	16	45	...

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430	A	hot-finished or cold-finished	all	60	415	30	207	20	45	...
S44400	A	hot-finished	all	60	415	45	310	20	45	217
		cold-finished	all	60	415	45	310	16	45	217
446, XM-27	A	hot-finished	all	65	450	40	275	20	45	219
		cold-finished	all	65	450	40	275	16	45	219
S44700	A	hot-finished	all	70	480	55	380	20	40	...
		cold-finished	all	75	520	60	415	15	30	...
S44800	A	hot-finished	all	70	480	55	380	20	40	...
		cold-finished	all	75	520	60	415	15	30	...
403, 410	A	hot-finished	all	70	480	40	275	20	45	...
		cold-finished	all	70	480	40	275	16	45	...
	T	hot-finished	all	100	690	80	550	15	45	...
		cold-finished	all	100	690	80	550	12	40	...
XM-30	T	hot-finished	all	125	860	100	690	13	45	302
		cold-finished	all	125	860	100	690	12	35	...
403, 410	H	hot-finished	all	120	830	90	620	12	40	...
		cold-finished	all (rounds only)	120	830	90	620	12	40	...
XM-30	A	hot-finished	all	70	480	40	275	13	45	235

		cold-finished	all	70	480	40	275	12	35	...
414	A	hot-finished or cold-finished	all	...	...	...	...	...	...	298
	T	hot-finished or cold-finished	all	115	790	90	620	15	45	..

		hot-finished or cold-finished	all	115	795	90	620	15	45	295	S41500	T	cold-finished	all
420	A	hot-finished	all	...	...	...	...	...	...	...	...	...	...	241
		cold-finished	all	...	...	...	...	...	...	...	...	...	...	255
S42010	A	hot-finished or cold-finished	all	...	...	...	...	...	...	...	...	...	...	235
	...	cold-finished	all	...	...	...	...	...	...	...	...	...	...	255
431	A	hot-finished or cold-finished	all	...	...	...	...	...	...	...	...	...	...	285
440A, 440B, and 440C	A	hot-finished	all	...	...	...	...	...	...	...	...	...	...	269
		cold-finished	all	...	...	...	...	...	...	...	...	...	...	285
9 (S50400)	A	hot-finished or cold-finished	all	60	415	30	207	30	45	179				
	T	hot-finished or cold-finished	all	100	690	80	550	14	35	241				

^A Yield strength shall be determined by the 0.2% offset in accordance with Test Methods and Definitions A 370. An alternative method of determining yield strength may be used based on total extension under load of 0.5%.

^B For some specific products, it may not be practicable to use a 2 in. or 50 mm gage length. The use of sub-size test specimens, when necessary, is permissible in accordance with Test Methods and Definitions A 370.

^C Reduction of area does not apply on flat bars 3/16 in. (4.76 mm) and under in thickness as this determination is not generally made in this product size. ^D Or equivalent Rockwell hardness.

^E For extruded shapes of all Cr-Ni grades of Condition A, the yield strength shall be 25 ksi (170 MPa) min., and tensile strength shall be 70 ksi (480 MPa) min. ^F Material shall be capable of being heat treated to a maximum Brinell hardness of 250 when oil quenched from 1750°F (953°C).

^G For shapes having section thickness of 1/2 in. (12.5 mm) or less, 30% min., elongation is acceptable.

Table 3

Type ^A	Heat Treatment Temperature ^B °F (°C), Min.	Quenchant	Hardness HRC, Min.
403	1750 [955]	Air	35
410	1750 [955]	Air	S
414	1750 [955]	Oil	42
420	1825 [995]	Air	50
S42010	1850 [1010]	Oil	48
431	1875 [1020]	Oil	40
440A	1875 [1020]	Air	55
440B	1875 [1020]	Oil	56
440C	1875 [1020]	Air	58

^A Samples for testing shall be in the form of a section not exceeding 3/8 in. (9.50 mm) in thickness.

^B Temperature tolerance is $\pm 25^{\circ}\text{F}$ (14°C).

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D. Magnetic Permeability :-

1. When required by the purchase order, the magnetic permeability of Types 201 and 205 in the annealed condition shall not exceed 1.2 as tested by a Severn-type indicator.

Keyword

- astm a276 pdf free download
- astm a276 standard pdf free download
- astm a276 type 304 • astm a276 type 316
- astm a276 type 410
- astm a276 grades
- astm a276 specification

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