

ASTM - A789/A789M

Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service

This specification covers grades of nominal wall thickness, stainless steel tubing for services requiring general corrosion resistance, with particular emphasis on resistance to stress corrosion cracking.

❖ **Manufacture :-**

1. The tubes shall be made by the seamless or welded process with no filler metal added.

❖ **Heat Treatment :-**

All tubes shall be furnished in the heat-treated condition in accordance with the procedures shown in Table 1.

Table 1

UNS Designation	Temperature °F [°C]	Quench
S31200	1920–2010 [1050–1100]	rapid cooling in water
S31260	1870–2010 [1020–1100]	rapid cooling in air or water
S31500	1800–1900 [980–1040]	rapid cooling in air or water
S31803	1870–2010 [1020–1100]	rapid cooling in air or water
S32001	1800–1950 [982–1066]	rapid cooling in air or water
S32003	1850–2050 [1010–1120]	rapid cooling in air or water
S32101	1870 [1020] min	quenched in water or rapidly cooled by other means
S32202	1870–1975 [1020–1080]	rapid cooling in air or water
S32205	1870–2010 [1020–1100]	rapid cooling in air or water
S32304	1700–1920 [925–1050]	rapid cooling in air or water
S32506	1870–2050 [1020–1120]	rapid cooling in air or water
S32520	1975–2050 [1080–1120]	rapid cooling in air or water
S32550	1900 [1040] min	rapid cooling in air or water
S32707	1975–2050 [1080–1120]	rapid cooling in air or water
S32750	1880–2060 [1025–1125]	rapid cooling in air or water
S32760	1960–2085 [1070–1140]	rapid cooling in air or water
S32808	1920–2100 [1050–1150]	rapid cooling in air or water
S32900	1700–1750 [925–955]	rapid cooling in air or water
S32906	1870–2100 [1020–1150]	rapid cooling in air or water
S32950	1820–1880 [990–1025]	air cool
S33207	1905–2085 [1040–1140]	rapid cooling in water or by other means
S39274	1920–2060 [1025–1125]	rapid cooling in air or water
S39277	1975–2155 [1080–1180]	rapid cooling in air or water
S82011	1850–2050 [1010–1120]	rapid cooling in air or water

❖ **Chemical Composition :-**

The steel shall conform to the chemical requirements prescribed in Table 2.

Table 2^A

UNS Designation ^B	C	Mn	P	S	Si	Ni	Cr	Mo	N	Cu	Others
S31200	0.03	2	0.045	0.03	1	5.5–6.5	24.0–26.0	1.2–2.0	0.14–0.20	...	...
S31260	0.03	1	0.03	0.03	0.75	5.5–7.5	24.0–26.0	2.5–3.5	0.10–0.30	0.2–0.8	W 0.10–0.50
S31500	0.03	1.2–2.0	0.03	0.03	1.4–2.0	4.3–5.2	18.0–19.0	2.5–3.0	0.05–0.1	...	...
S31803	0.03	2	0.03	0.02	1	4.5–6.5	21.0–23.0	2.5–3.5	0.08–0.20	...	...
S32001	0.03	4.0–6.0	0.04	0.03	1	1.0–3.0	19.5–21.5	0.6	0.05–0.17	1	...
S32003	0.03	2	0.03	0.02	1	3.0–4.0	19.5–22.5	1.5–2.0	0.14–0.20	...	...
S32101	0.04	4.0–6.0	0.04	0.03	1	1.35–1.7	21.0–22.0	0.1–0.8	0.20–0.25	0.1–0.8	...
S32202	0.03	2	0.04	0.01	1	1.0–2.8	21.5–24.0	0.45	0.18–0.26	...	...
S32205	0.03	2	0.03	0.02	1	4.5–6.5	22.0–23.0	3.0–3.5	0.14–0.20	...	...
S32304	0.03	2.5	0.04	0.04	1	3.0–5.5	21.5–24.5	0.05–0.60	0.05–0.20	0.05–0.60	...
S32506	0.03	1	0.04	0.015	0.9	5.5–7.2	24.0–26.0	3.0–3.5	0.08–0.20	...	W 0.05–0.30
S32520	0.03	1.5	0.035	0.02	0.8	5.5–8.0	23.0–25.0	3–5	0.20–0.35	0.5–3.0	...
S32550	0.04	1.5	0.04	0.03	1	4.5–6.5	24.0–27.0	2.9–3.9	0.10–0.25	1.5–2.5	...
S32707	0.03	1.5	0.035	0.01	0.5	5.5–9.5	26.0–29.0	4.0–5.0	0.30–0.50	1 max	Co 0.5–2.0
S32750	0.03	1.2	0.035	0.02	0.8	6.0–8.0	24.0–26.0	3.0–5.0	0.24–0.32	0.5	...
S32760	0.05	1	0.03	0.01	1	6.0–8.0	24.0–26.0	3.0–4.0	0.20–0.30	0.5–1.0	W 0.50–1.00 40 min ^C
S32808	0.03	1.1	0.03	0.01	0.5	7.0–8.2	27.0–27.9	0.8–1.2	0.30–0.40	...	W 2.10–2.50
S32900	0.08	1	0.04	0.03	0.75	2.5–5.0	23.0–28.0	1.0–2.0	...	...	...
S32906	0.03	0.8–1.5	0.03	0.03	0.8	5.8–7.5	28.0–30.0	1.5–2.6	0.30–0.40	0.8	...
S32950	0.03	2	0.035	0.01	0.6	3.5–5.2	26.0–29.0	1.0–2.5	0.15–0.35	...	...
S33207	0.03	1.5	0.035	0.01	0.8	6.0–9.0	29.0–33.0	3.0–5.0	0.40–0.60	1	...
S39274	0.03	1	0.03	0.02	0.8	6.0–8.0	24.0–26.0	2.5–3.5	0.24–0.32	0.2–0.8	W 1.50–2.50
S39277	0.025	0.8	0.025	0.002	0.8	6.5–8.0	24.0–26.0	3.0–4.0	0.23–0.33	1.2–2.0	W 0.80–1.21
S82011	0.03	2.0–3.0	0.04	0.02	1	1.0–2.0	20.5–23.5	0.1–1.0	0.15–0.27	0.5	...

^A Maximum, unless a range or minimum is indicated. Where ellipses (...) appear in this table, there is no minimum and analysis for the element need not be determined or reported.

^B Designation established in accordance with Practice E527 and SAE J1086. ^C % Cr + 3.3 × % Mo + 16 × % N.

- ❖ **Mechanical Tests :-** 1. Tension Tests.
2. Flaring Test (for Seamless Tubes).
3. Flange Test (for Welded Tubes).
4. Hardness Test.
5. Reverse Flattening Test.

❖ **Hydrostatic or Non-destructive Electric Test :-**

1. Each tube shall be subjected to the non-destructive electric test or the hydrostatic test. The type of test to be used shall be at the option of the manufacturer, unless otherwise specified in the purchase order.
2. The hydrostatic test shall be in accordance with Specification A1016/A1016M, except that in the calculation of the hydrostatic test pressure 64000(441.2) shall be substituted for 32000(220.6).

❖ **Tensile and Hardness Properties :-**

The material shall conform to the tensile and hardness properties prescribed in Table 3.

Table 3

UNS Designation	Tensile Strength, min, ksi [MPa]	Yield Strength, min, ksi [MPa]	Elongation in 2 in. or 50 mm, min, %	Hardness, max	
				HBW	HRC
S31200	100 [690]	65 [450]	25	280	...
S31260	100 [690]	65 [450]	25	290	30
S31500	92 [630]	64 [440]	30	290	30
S31803	90 [620]	65 [450]	25	290	30
S32001	90 [620]	65 [450]	25	290	30
S32003B	100 [690]	70 [485]	25	290	30
S32101					
Wall ≤ 0.187 in. [5.00 mm]	101 [700]	77 [530]	30	290	...
Wall > 0.187 in. [5.00 mm]	94 [650]	65 [450]	30	290	...
S32202	94 [650]	65 [450]	30	290	30
S32205	95 [655]	70 [485]	25	290	30
S32304					
OD 1 in. [25 mm] and Under	100 [690]	65 [450]	25	...	...
OD over 1 in. [25 mm]	87 [600]	58 [400]	25	290	30
S32506	90 [620]	65 [450]	18	302	32
S32520	112 [770]	80 [550]	25	310	...
S32550	110 [760]	80 [550]	15	297	31
S32707	133 [920]	101 [700]	25	318	34
S32750	116 [800]	80 [550]	15	300	32
S32760	109 [750]	80 [550]	25	300	...
S32808	116 [800]	80 [550]	15	310	32
S32900	90 [620]	70 [485]	20	271	28
S32906					
Wall below 0.40 in. [10 mm]	116 [800]	94 [650]	25	300	32
Wall 0.40 in. [10 mm] and above	109 [750]	80 [550]	25	300	32
S32950	100 [690]	70 [480]	20	290	30
S33207					
Wall below 0.157 in. [4 mm]	138 [950]	112 [770]	15	336	36
Wall 0.157 in. [4 mm] and above	123 [850]	101 [700]	15	336	36
S39274	116 [800]	80 [550]	15	310	32
S39277	120 [825]	90 [620]	25	290	30
S82011					
Wall 0.187 in	101 [700]	75 [515]	30	293	31
Wall above 0.187 in. [5.00 mm]	95 [655]	65 [450]	30	293	31

❖ **Supplementary Test :-**

1. Pneumatic Test :-

The tubing shall be examined by a pneumatic test,(either air underwater or pneumatic leak test) in accordance with Specification A1016/A1016M.

Keyword

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