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Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Tubing for General Service[1]

This standard is issued under the fixed designation A 789/A 789M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification[2] covers grades of nominal wall thickness, stainless steel tubing for services requiring general corrosion resistance, with particular emphasis on resistance to stress corrosion cracking. These steels are susceptible to embrittlement if used for prolonged periods at elevated temperatures.

1.2 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the specification. The inch-pound units shall apply unless the *M* designation of this specification is specified in the order.

2. Referenced Documents

2.1 *ASTM Standards:* [3]

A 480/A 480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

A 1016/A 1016M Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes

E 527 Practice for Numbering Metals and Alloys (UNS)

2.2 *SAE Standard:*[4]

SAE J 1086 Practice for Numbering Metals and Alloys (UNS)

3. Ordering Information

3.1 Orders for product under this specification should include the following, as required, to describe the desired material adequately:

3.1.1 Quantity (feet, metres, or number of lengths),

3.1.2 Name of product (seamless or welded tubes),

3.1.3 Grade (see Table 1),

3.1.4 Size (outside diameter and nominal wall thickness),

3.1.5 Length (specific or random),

3.1.6 Optional requirements (for product analysis, see Section 8; for hydrostatic or nondestructive electric test, see Section 10),

3.1.7 Test report required (see the Inspection section of Specification A 1016/A 1016M),

3.1.8 Specification designation, and

3.1.9 Special requirements.

4. General Requirements

4.1 ~~p~~Product furnished under this specification shall conform to the applicable requirements of Specification A 1016/A 1016M, unless otherwise provided herein.

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[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.10 on Stainless and Alloy Steel Tubular Products.

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[2] For ASME Boiler and Pressure Vessel Code applications, see related Specification SA–789 in Section II of that Code.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

***A Summary of Changes section appears at the end of this standard.**

TABLE 1 Chemical Requirements

UNS Designation[A]	C	Mn	P	S	Si	Ni	Cr	Mo	N	Cu	Others
S31803	0.030 max	2.00 max	0.030 max	0.020 max	1.00 max	4.5–6.5	21.0–23.0	2.5–3.5	0.08–0.20	. . .	. . .
S32205	0.030 max	2.00 max	0.030 max	0.020 max	1.00 max	4.5–6.5	22.0–23.0	3.0–3.5	0.14–0.20	. . .	. . .
S31500	0.030 max	1.20–2.00	0.030 max	0.030 max	1.40–2.00	4.3–5.2	18.0–19.0	2.50–3.00	0.05–0.1	. . .	. . .
S32550	0.04 max	1.50 max	0.040 max	0.030 max	1.00 max	4.5–6.5	24.0–27.0	2.9–3.9	0.10–0.25	1.50–2.50	. . .
S31200	0.030 max	2.00 max	0.045 max	0.030 max	1.00 max	5.5–6.5	24.0–26.0	1.20–2.00	0.14–0.20	. . .	. . .
S31260	0.030 max	1.00 max	0.030 max	0.030 max	0.75 max	5.5–7.5	24.0–26.0	2.5–3.5	0.10–0.30	0.20–0.80	W 0.10–0.50
S32001	0.030 max	4.00–6.00	0.040 max	0.030 max	1.00 max	1.0–3.0	19.5–21.5	0.60 max	0.05–0.17	1.00 max	. . .
S32304	0.030 max	2.50 max	0.040 max	0.040 max	1.00 max	3.0–5.5	21.5–24.5	0.05–0.60	0.05–0.20	0.05–0.60	. . .
S39274	0.030 max	1.00 max	0.030 max	0.020 max	0.80 max	6.0–8.0	24.0–26.0	2.5–3.5	0.24–0.32	0.20–0.80	W 1.50–2.50
S32750	0.030 max	1.20 max	0.035 max	0.020 max	0.80 max	6.0–8.0	24.0–26.0	3.0–5.0	0.24–0.32	0.50 max	. . .
S32760	0.05 max	1.00 max	0.030 max	0.010 max	1.00 max	6.0–8.0	24.0–26.0	3.0–4.0	0.20–0.30	0.50–1.00	W 0.50–1.00 40 min[B]
S32900	0.08 max	1.00 max	0.040 max	0.030 max	0.75 max	2.5–5.0	23.0–28.0	1.00–2.00	. . .	. . .	. . .
S32950	0.030 max	2.00 max	0.035 max	0.010 max	0.60 max	3.5–5.2	26.0–29.0	1.00–2.50	0.15–0.35	. . .	. . .
S39277	0.025 max	0.80 max	0.025 max	0.002 max	0.80 max	6.5–8.0	24.0–26.0	3.00–4.00	0.23–0.33	1.20–2.00	W 0.80–1.21
S32520	0.030 max	1.50 max	0.035 max	0.020 max	0.80 max	5.5–8.0	23.0–25.0	3.–5.	0.20–0.35	0.50–3.00	. . .
S32906	0.030 max	1.50 max	0.030 max	0.030 max	0.50 max	7.5 max	30.0 max	2.60 max	0.40	0.80	. . .
		0.80 min				5.8 min	28.0 min	1.50 min	.30	. . .	. . .
S32003	0.030 max	2.00 max	0.030 max	0.020 max	1.00 max	3.0-4.0	19.5-22.5	1.50-2.00	0.14-0.20	. . .	. . .
S32101	0.040 max	4.0-6.0	0.040 max	0.030 max	1.00 max	1.35-1.70	21.0-22.0	0.10-0.80	0.20-0.25	0.10-0.80	. . .

[A] New designation established in accordance with Practice E 527 and SAE J1086.
[B] % Cr + 3.3 × % Mo + 16× % N.

5. Manufacture

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

6. Heat Treatment

6.1 All tubes shall be furnished in the heat-treated condition in accordance with the procedures shown in Table 2. For seamless tubes, as an alternate to final heat treatment in a continuous furnace or batch-type furnace, immediately following hot forming

TABLE 2 Heat Treatment

UNS Designation	Temperature	Quench
S32003	1850–2050 °F [1010–1120°C]	rapid cooling in air or water
S31803	1870–2010 °F [1020–1100°C]	rapid cooling in air or water
S32205	1870–2010 °F [1020–1100°C]	rapid cooling in air or water
S31500	1800–1900 °F [980–1040°C]	rapid cooling in air or water
S32550	1900 °F [1040°C] min	rapid cooling in air or water
S31200	1920–2010 °F [1050–1100°C]	rapid cooling in water
S31260	1870–2010 °F [1020–1100°C]	rapid cooling in air or water
S32001	1800–1950 °F [982–1066°C]	rapid cooling in air or water
S32304	1700–1920 °F [925–1050°C]	rapid cooling in air or water
S39274	1920–2060 °F [1025–1125°C]	rapid cooling in air or water
S32750	1880–2060 °F [1025–1125°C]	rapid cooling in air or water
S32760	2010–2085 °F [1100–1140°C]	rapid cooling in air or water
S32900	1700–1750 °F [925–955°C]	rapid cooling in air or water
S32950	1820–1880 °F [990–1025°C]	air cool
S39277	1975–2155 °F [1080–1180°C]	rapid cooling in air or water
S32520	1975–2050 °F [1080–1120°C]	rapid cooling in air or water
S32906	1900–1980 °F [1040–1080°C]	rapid cooling in air or water
S32101	1870 °F [1020 °C] min	quenched in water or rapidly cooled by other means