Designation: A268/A268M – 24

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

This standard is issued under the fixed designation A268/A268M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification[2] covers a number of grades of nominal-wall-thickness, stainless steel tubing for general corrosion-resisting and high-temperature service. Most of these grades are commonly known as the "straight-chromium" types and are characterized by being ferromagnetic. Two of these grades, TP410 and UNS S 41500 (Table 1), are amenable to hardening by heat treatment, and the high-chromium, ferritic alloys are sensitive to notch-brittleness on slow cooling to ordinary temperatures. These features should be recognized in the use of these materials.

1.2 An optional supplementary requirement is provided, and when desired, shall be so stated in the order.

1.3 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 may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard. The inch-pound units shall apply unless the "M" designation of this specification is specified in the order.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

A480/A480M Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip

A763 Practices for Detecting Susceptibility to Intergranular Attack in Ferritic Stainless Steels

A1016/A1016M Specification for General Requirements for Ferritic Alloy Steel, Austenitic Alloy Steel, and Stainless Steel Tubes

E213 Practice for Ultrasonic Testing of Metal Pipe and Tubing

E273 Practice for Ultrasonic Testing of the Weld Zone of Welded Pipe and Tubing

3. Terminology

3.1 *Lot Definitions:*

3.1.1 For flange and flaring requirements, the term lot applies to all tubes, prior to cutting, of the same nominal size and wall thickness that are produced from the same heat of steel. If final heat treatment is in a batch-type furnace, a lot shall include only those tubes of the same size and from the same heat that are heat treated in the same furnace charge. If the final heat treatment is in a continuous furnace, the number of tubes of the same size and from the same heat in a lot shall be determined from the size of the tubes as given in Table 2.

3.1.2 For tensile and hardness test requirements, the term lot applies to all tubes, prior to cutting, of the same nominal diameter and wall thickness that are produced from the same heat of steel. If final heat treatment is in a batch-type furnace, a lot shall include only those tubes of the same size and the same heat that are heat treated in the same furnace charge. If the final heat treatment is in a continuous furnace, a lot shall

[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-268 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.

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

TABLE 1 Chemical Requirements

Grade	TP405	TP410	TP429	TP430	TP443	TP446–1	TP446–2[A]	. . .	TP409
UNS Designation	S40500	S41000	S42900	S43000	S44300	S44600	S44600	S40800	S40900
Element	Composition, %								
C, max	0.08	0.15	0.12	0.12	0.20	0.20	0.12	0.08	0.08
Mn, max	1.00	1.00	1.00	1.00	1.00	1.50	1.50	1.00	1.00
P, max	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.045	0.045
S, max	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.045	0.030
Si, max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ni	0.50 max	. . .	. . .	. . .	0.75 max	0.75 max	0.50 max	0.80 max	0.50 max
Cr	11.5–14.5	11.5–13.5	14.0–16.0	16.0–18.0	18.0–23.0	23.0–27.0	23.0–27.0	11.5–13.0	10.5–11.7
Mo	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Al	0.10–0.30	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .
Cu	. . .	. . .	. . .	. . .	0.90–1.25	. . .	. . .	. . .	. . .
N	. . .	. . .	. . .	. . .	. . .	0.25	0.25	. . .	. . .
Ti	. . .	. . .	. . .	. . .	. . .	. . .	. . .	12 × C min; 1.10 max	6 × C min; 0.75 max

TABLE 1 *Continued*

Grade	TP439	. . .	. . .	TP430 Ti	TP XM-27	TP XM-33[A]	18Cr-2Mo	29-4	29-4-2	26-3-3	25-4-4	...	. . .	. . .	. . .	. . .	TP468
UNS Designation	S43035	S43932	S41500[B]	S43036	S44627	S44626	S44400	S44700	S44800	S44660	S44635	S44735	S32803	S40977	S43940	S42035	S46800
Element	Composition, %																
C, max	0.07	0.030	0.05	0.10	0.01[A]	0.06	0.025	0.010	0.010	0.030	0.025	0.030	0.015[C]	0.03	0.03	0.08	0.030
Mn, max	1.00	1.00	0.5–1.0	1.00	0.40	0.75	1.00	0.30	0.30	1.00	1.00	1.00	0.5	1.50	1.00	1.00	1.00
P, max	0.040	0.040	0.03	0.040	0.02	0.040	0.040	0.025	0.025	0.040	0.040	0.040	0.020	0.040	0.040	0.045	0.040
S, max	0.030	0.030	0.03	0.030	0.02	0.020	0.030	0.020	0.020	0.030	0.030	0.030	0.005	0.015	0.015	0.030	0.030
Si, max	1.00	1.00	0.60	1.00	0.40	0.75	1.00	0.20	0.20	1.00	0.75	1.00	0.50	1.00	1.00	1.00	1.00
Ni	0.50 max	0.50	3.5–5.5	0.75 max	0.5[D] max	0.50 max	1.00 max	0.15 max	2.0–2.5	1.0–3.50	3.5–4.5	1.00 max	3.0–4.0	0.30–1.00	. . .	1.0–2.5	0.50
Cr	17.00–19.00	17.0–19.0	11.5–14.0	16.00–19.50	25.0–27.5	25.0–27.0	17.5–19.5	28.0–30.0	28.0–30.0	25.0–28.0	24.5–26.0	28.00–30.00	28.0–29.0	10.50–12.50	17.50–18.50	13.5–15.5	18.00–20.00
Mo	...	...	0.5–1.0	...	0.75–1.50	0.75–1.50	1.75–2.50	3.5–4.2	3.5–4.2	3.0–4.0	3.5–4.5	3.60–4.20	1.8–2.5	. . .	. . .	0.2–1.2	. . .
Al, max	0.15	0.15	. . .	...	...	...	...	...	...	...	...	...	. . .	. . .	. . .	. . .	. . .
Cu, max	...	...	. . .	...	0.2	0.20	...	0.15	0.15	...	...	...	. . .	. . .	. . .	. . .	. . .
N, max	0.04	0.030	. . .	...	0.015	0.040	0.035	0.020[E]	0.020[E]	0.040	0.035	0.045	0.020	0.030	. . .	. . .	0.030
Ti	0.20 + 4 (C + N) min; 1.10 max		. . .	5 × C min; 0.75 max	...	7 × (C + N) but no less than 0.20 min; 1.00 max	...	...	...	...	...	...	. . .	. . .	0.10–0.60	0.30–0.50	0.07–0.30
Nb[G]	...		. . .	...	0.05–0.20	...	...	...	...	...	...	...	0.15–0.50[F]	. . .	(3 × %C + 0.30) min	. . .	0.10–0.60
Other		(Ti + Nb) = {0.20 + 4 × (C + N)} min.; 0.75 max					(Ti + Nb) = 0.020 + 4 × (C + N) min; 0.80 max			(Ti + Nb) = 0.20–1.00 and 6 × (C + N) min	(Ti + Nb) = 0.020 + 4 × (C + N) min; 0.80 max	(Ti + Nb) = 0.020–1.00 and 6 × (C + N) min					(Ti + Nb) = 0.020 + 4 × (C + N) min; 0.80 max

[A] For small diameter or thin walls, or both, tubing, where many drawing passes are required, a carbon maximum of 0.015 % is necessary. Small outside diameter tubes are defined as those less than 0.500 in. [12.7 mm] in outside diameter and light wall tubes as those less than 0.049 in. [1.2 mm] in average wall thickness (0.040 in. [1 mm] in minimum wall thickness).
[B] Plate version of CA6NM.
[C] Carbon plus nitrogen = 0.30 max.
[D] Nickel plus copper.
[E] Carbon plus nitrogen = 0.025 % max.
[F] Nb/(C + N) = 12 min.
[G] The terms Niobium (Nb) and Columbium (Cb) are alternate names for the same element number 41.