



# Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service<sup>1</sup>

This standard is issued under the fixed designation A 269; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

## 1. Scope

1.1 This specification covers grades of nominal-wall-thickness, stainless steel tubing for general corrosion-resisting and low- or high-temperature service, as designated in **Table 1**.

1.2 The tubing sizes and thicknesses usually furnished to this specification are  $\frac{1}{4}$  in. (6.4 mm) in inside diameter and larger and 0.020 in. (0.51 mm) in nominal wall-thickness and heavier.

1.3 Mechanical property requirements do not apply to tubing smaller than  $\frac{1}{8}$  in. (3.2 mm) in inside diameter or 0.015 in. (0.38 mm) in thickness.

NOTE 1—When the impact test criterion for a low-temperature service would be 15 ft-lbf (20 J) energy absorption or 15 mils lateral expansion, some of the austenitic stainless steel grades covered by this specification are accepted by certain pressure vessel or piping codes without the necessity of making the actual test. For example, Grades 304, 304L, and 347 are accepted by the ASME Pressure Vessel Code, Section VIII Division 1, and by ANSI **B31.3**, for service at temperatures as low as  $-425^{\circ}\text{F}$  ( $-254^{\circ}\text{C}$ ) without qualification by impact tests. Other AISI stainless steel grades are usually accepted for service temperatures as low as  $-325^{\circ}\text{F}$  ( $-198^{\circ}\text{C}$ ) without impact testing. Impact testing may, under certain circumstances, be required. For example, materials with chromium or nickel content outside the AISI ranges, and for material with carbon content exceeding 0.10 %, are required to be impact tested under the rules of ASME Section VIII Division 1 when services temperatures are lower than  $-50^{\circ}\text{F}$  ( $-46^{\circ}\text{C}$ ).

1.4 Optional supplementary requirements are provided and, when one or more of these are desired, each shall be so stated in the order.

1.5 The values stated in inch-pound units are to be regarded as the standard.

## 2. Referenced Documents

### 2.1 ASTM Standards:

**A 262** Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels<sup>2</sup>

<sup>1</sup> 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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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 01.03.

**A 370** Test Methods and Definitions for Mechanical Testing of Steel Products<sup>2</sup>

**A 450/A 450M** Specification for General Requirements for Carbon, Ferritic Alloy, and Austenitic Alloy Steel Tubes<sup>3</sup>

**A 480/A 480M** Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip<sup>2</sup>

**A 632** Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service<sup>3</sup>

**E 527** Practice for Numbering Metals and Alloys (UNS)<sup>3</sup>

2.2 *ANSI Standard:*

**B31.3** Chemical Plant and Petroleum Refinery Piping<sup>4</sup>

2.3 *ASME Pressure Vessel Code:*

**Section VIII Division 1**, Pressure Vessels<sup>5</sup>

2.4 *Other Standard:*

**SAE J1086** Practice for Numbering Metals and Alloys (UNS)<sup>6</sup>

## 3. Ordering Information

3.1 Orders for material 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 material (seamless or welded tubes),

3.1.3 Grade (**Table 1**),

3.1.4 Size (outside diameter and nominal wall thickness),

3.1.5 Length (specific or random),

3.1.6 Optional requirements (heat treatment, see **Section 6**; hydrostatic or nondestructive electric test, see **Section 10**),

3.1.7 Test report required (see **Section on Inspection of Specification A 450/A 450M**),

3.1.8 Specification designation, and

3.1.9 Special requirements and any supplementary requirements selected.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 01.01.

<sup>4</sup> Available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

<sup>5</sup> Available from ASME International, Three Park Avenue, New York, NY 10016-5900.

<sup>6</sup> Available from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

**TABLE 1 Chemical Requirements %**

Grade	Composition, %																								
	TP 304	TP 304L	TP 304LN	TP 316	TP 316L	TP 316LN	TP 317	TP 321	TP 347	TP 348	TP XM-10	TP XM-11	TP XM-15	TP XM-19	TP XM-29										
UNS Designation <sup>A</sup>	S30400	S30403	S30453	S31600	31603	S31653	S31700	S32100	S34700	S34800	S21900	S21904	S38100	S20910	S24000	S31254	S31725	S31726	S30600 <sup>A</sup>	S24565	S32654	N08367	N08926	N08904	
Carbon	0.08 max	0.035 max <sup>B</sup>	0.035 max <sup>B</sup>	0.08 max	0.035 max <sup>B</sup>	0.035 max <sup>B</sup>	0.08 max	0.08 max	0.08 max	0.08 max	0.08 max	0.04 max	0.08 max	0.06 max	0.08 max	0.020 max	0.035 max	0.035 max	0.018 max	0.030 max	0.020 max	0.030 max	0.020 max	0.020 max	
Manganese, max <sup>C</sup>	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	8.00–10.00	8.00–10.00	2.00	4.0–6.0	11.5–14.5	1.00	2.00	2.00	2.0	5.0–7.0	2.0–4.0	2.00	2.00	2.00	
Phosphorus, max.	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.030	0.045	0.060	0.030	0.045	0.045	0.020	0.030	0.030	0.040	0.030	0.040	
Sulfur, max.	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.015	0.030	0.030	0.020	0.010	0.005	0.030	0.010	0.030	
Silicon <sup>C</sup>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50–2.50	1.00	1.00	0.80	1.00	1.00	3.7–4.3	1.00	0.50	1.00	0.50	1.00	
Nickel	8.0–11.0	8.0–12.0	8.0–11.0	10.0–14.0	10.0–14.0	10.0–13.0	11.0–15.0	9.0–12.0	9.0–12.0	9.0–12.0	5.5–7.5	5.5–7.5	17.5–18.5	11.5–13.5	2.3–3.7	17.5–18.5	13.5–17.5	14.5–17.5	14.0–15.5	16.0–18.0	21.0–23.0	23.5–25.5	24.0–26.0	19.0–23.0	
Chromium	18.0–20.0	18.0–20.0	18.0–20.0	16.0–18.0	16.0–18.0	16.0–18.0	17.0–20.0	17.0–19.0	17.0–19.0	17.0–19.0	19.0–21.5	19.0–21.5	17.0–19.0	20.5–23.5	17.0–19.0	19.5–20.5	18.0–20.0	17.0–20.0	17.0–18.5	23.0–25.0	24.0–25.0	20.0–22.0	19.0–21.0	23.0–28.0	
Molybdenum	...	...	...	2.00–3.00	2.00–3.00	2.00–3.00	3.0–4.0	...	...	...	...	...	...	1.50–3.00	...	6.0–6.5	4.0–5.0	4.0–5.0	0.20 max	4.0–5.0	7.0–8.0	6.0–7.0	4.0–5.0	4.0–5.0	
Titanium	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Columbium	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tantalum, max	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nitrogen <sup>F</sup>	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Vanadium	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Others	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

<sup>A</sup> New designation established in accordance with Practice E 527E 527 and SAE J1086.  
<sup>B</sup> For small diameter or thin walls, or both, where many drawing passes are required, a carbon maximum of 0.040 % is necessary in grades TP 304L, TP 304LN, 316L and 316LN. Small outside diameter tubes are defined as those with less than 0.500 in. [12.7 mm] in outside diameter and light walls are those less than 0.049 in. [1.2 mm] in minimum wall thickness.  
<sup>C</sup> Maximum, unless otherwise indicated.  
<sup>D</sup> Grade TP 321 shall have a titanium content of not less than five times the sum of the carbon and nitrogen content and not more than 0.70 %.  
<sup>E</sup> Grade TP 348 shall have a columbium plus tantalum content of not less than ten times the carbon content and not more than 1.10 %.  
<sup>F</sup> The method of analysis for nitrogen shall be a matter of agreement between the purchaser and manufacturer.