

ASTM - A269/A269M

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

This specification covers grades of nominal-wall-thickness, stainless steel tubing for general corrosion-resisting and low- or high-temperature service.

The tubing sizes and thicknesses usually furnished to this specification are 1/4 in. [6.4 mm] in inside diameter and larger and 0.020 in. [0.51 mm] in nominal wall-thickness and heavier.

Mechanical property requirements do not apply to tubing smaller than 1/8 in. [3.2 mm] in inside diameter or 0.015 in. [0.38 mm] in thickness.

A. Heat Treatment :-

1. All material shall be furnished in the solution heat treated condition. Except as provided in point 2, the heat-treatment procedure shall consist of heating the material to a minimum temperature or temperature range as specified for the grade in Table 1, followed by quenching in water or rapidly cooling by other means. Alternatively, for seamless tubes, immediately following hot forming while the temperature of the tubes is not less than the specified minimum solution treatment temperature, tubes may be individually quenched in water or rapidly cooled by other means.
2. Controlled structural or special service characteristics shall be specified as a guide for the most suitable heat treatment. If the final heat treatment is at a temperature under 1900 °F [1040 °C] and is so specified on the order, each tube shall be stenciled with the final heat treatment temperature in degrees Fahrenheit [degrees Celsius] after the suffix "HT".
3. A solution annealing temperature above 1950 °F [1065 °C] may impair the resistance to intergranular corrosion after subsequent exposure to sensitizing conditions in TP321, TP347, and TP348.

B. Chemical Composition :-

The steel shall conform to the requirements as to chemical composition as prescribed in Table 1.

Table 1

Grade	UNS Designation ^A	C	Mn	P	S	Si	Ni	Cr	Mo	N ^F	Others
TP 201	S20100	0.15	5.5–7.5	0.06	0.03	1	3.5–5.5	16.0–18.0	...	0.25	...

TP 201LN	S20153	0.03	6.4–7.5	0.045	0.015	0.75	4.0–5.0	16.0–17.5	...	0.10–0.25	Cu 1
TP 304	S30400	0.08	2	0.045	0.03	1	8.0–11.0	18.0–20.0	...	...	...
TP 304L	S30403	0.035 ^B	2	0.045	0.03	1	8.0–12.0	18.0–20.0	...	...	...
TP 304LN	S30453	0.035 ^B	2	0.045	0.03	1	8.0–11.0	18.0–20.0	...	0.10–0.16	...
TP 316	S31600	0.08	2	0.045	0.03	1	10.0–14.0	16.0–18.0	2.00–3.00	...	...
TP 316L	S31603	0.035 ^B	2	0.045	0.03	1	10.0–15.0	16.0–18.0	2.00–3.00	...	...
TP 316LN	S31653	0.035 ^B	2	0.045	0.03	1	10.0–13.0	16.0–18.0	2.00–3.00	0.10–0.16	...
TP 317	S31700	0.08	2	0.045	0.03	1	11.0–15.0	18.0–20.0	3.0–4.0	...	...
...	S31730	0.03	2	0.04	0.01	1	15.0–16.5	17.0–19.0	3.0–4.0	0.45	Cu 4.0–5.0
TP 321	S32100	0.08	2	0.045	0.03	1	9.0–12.0	17.0–19.0	...	...	^D
TP 347	S34700	0.08	2	0.045	0.03	1	9.0–12.0	17.0–19.0	...	...	Cb [10×C min, 1.10 max]
TP 348	S34800	0.08	2	0.045	0.03	1	9.0–12.0	17.0–19.0	...	...	Co 0.20 max, E, Ta 0.1
TP XM-10	S21900	0.08	8.0–10.0	0.045	0.03	1	5.5–7.5	19.0–21.5	...	0.15–0.40	...
TP XM-11	S21904	0.04	8.0–10.0	0.045	0.03	1	5.5–7.5	19.0–21.5	...	0.15–0.40	...
TP XM-15	S38100	0.08	2	0.03	0.03	1.50–2.50	17.5–18.5	17.0–19.0	...	...	...
TP XM-19	S20910	0.06	4.0–6.0	0.045	0.03	1	11.5–13.5	20.5–23.5	1.50–3.00	0.20–0.40	Cb 0.10–0.30, V 0.10–0.30
TP XM-29	S24000	0.08	11.5–14.5	0.06	0.03	1	2.3–3.7	17.0–19.0	...	0.20–0.40	...
...	S31254	0.02	1	0.03	0.015	0.8	17.5–18.5	19.5–20.5	6.0–6.5	0.18–0.25	Cu 0.50–1.00
...	S31725	0.035	2	0.045	0.03	1	13.5–17.5	18.0–20.0	4.0–5.0	0.20 max	...
...	S31726	0.035	2	0.045	0.03	1	14.5–17.5	17.0–20.0	4.0–5.0	0.10–0.20	...
...	S31727	0.03	1	0.03	0.03	1	14.5–16.5	17.5–19.0	3.8–4.5	0.15–0.21	Cu 2.8–4.0
...	S32053	0.03	1	0.03	0.01	1	24.0–26.0	22.0–24.0	5.0–6.0	0.17–0.22	...
...	S30600 ^A	0.018	2	0.02	0.02	3.7–4.3	14.0–15.5	17.0–18.5	0.20 max		Cu 0.50 max
...	S32654	0.02	2.0–4.0	0.03	0.005	0.5	21.0–23.0	24.0–25.0	7.0–8.0	0.45–0.55	Cu 0.30–0.60
...	S34565	0.03	5.0–7.0	0.03	0.01	1	16.0–18.0	23.0–25.0	4.0–5.0	0.40–0.60	Cb 0.10 max
...	S35045	0.06–0.1	1.5	0.045	0.015	1	32.0–37.0	25.0–29.0		...	Al 0.15–0.60, Ti 0.15–0.60, Cu 0.75
...	N08367	0.03	2	0.04	0.03	1	23.5–25.5	20.0–22.0	6.0–7.0	0.18–0.25	Cu 0.75 max
...	N08925	0.02	1	0.045	0.03	0.5	24.0–26.0	19.0–21.0	6.0–7.0	0.10–0.20	Cu 0.80–1.50

...	N08926	0.02	2	0.03	0.01	0.5	24.0–26.0	19.0–21.0	6.0–7.0	0.15–0.25	Cu 0.50–1.50
...	N08904	0.02	2	0.04	0.03	1	23.0–28.0	19.0–23.0	4.0–5.0	0.10max	Cu 1.00–2.00

^A New designation established in accordance with Practice E527 and SAE J1086.

^B 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.

^C Maximum, unless otherwise indicated. Where ellipses (. . .) appear in this table, there are no requirements and analysis for the element need not be determined or reported.

^D 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 %.

^E 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 %. ^F The method of analysis for nitrogen shall be a matter of agreement between the purchaser and manufacturer.

C. Mechanical Tests Required :- 1.

Flaring Test (Seamless Tubes).

2. Flange Test (Welded Tubes).

3. Hardness Test.

4. Reverse Flattening Test.

5. Hydrostatic or Non-destructive Electric Test :- 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.

D. Hardness Requirements :-

1. Tubes shall have a hardness number not exceeding the values shown for the grade in Table 2.

2. The hardness test shall not be required on tubes smaller than 1/4 in. [6.4 mm] in inside diameter or tubes having a wall thickness thinner than 0.020 in. [0.51 mm]. Smaller or thinner tubes should be tension tested only, in accordance with Specification A632.

Table 2

Grade	UNS Number	Austenitizing Temperature, min or range °F [°C]	Hardness, max
TP201	S20100	1900 [1040]	220 HBW/230 HV or 96 HRB
TP201LN	S20153	1900 [1040]	250 HBW/263 HV or 100 HRB
TP304	S30400	1900 [1040]	192 HBW/200 HV or 90 HRB
TP304L	S30403	1900 [1040]	192 HBW/200 HV or 90 HRB
TP304LN	S30453	1900 [1040]	192 HBW/200 HV or 90 HRB

TP316	S31600	1900 [1040]	192 HBW/200 HV or 90 HRB
TP316L	S31603	1900 [1040]	192 HBW/200 HV or 90 HRB
TP316N	S31653	1900 [1040]	192 HBW/200 HV or 90 HRB
TP317	S31700	1900 [1040]	192 HBW/200 HV or 90 HRB
...	S31730	1900 [1040]	192 HBW/200 HV or 90 HRB
TP321	S32100	1900 [1040]	192 HBW/200 HV or 90 HRB
TP347	S34700	1900 [1040]	192 HBW/200 HV or 90 HRB
TP348	S34800	1900 [1040]	192 HBW/200 HV or 90 HRB
TPXM-10	S21900	1900 [1040]	269 HBW/285 HV or 25 HRC
TPXM-11	S21904	1900 [1040]	269 HBW/285 HV or 25 HRC
TPXM-15	S38100	1900 [1040]	192 HBW/200 HV or 90 HRB
TPXM-19	S20910	1900 [1040]	269 HBW/25 HV or 25 HRC
TPXM-29	S24000	1900 [1040]	265 HB/270 HV or 100 HRB
...	SS31254	2100 [1150]	220 HBW/230 HV or 96 HRB
...	S31725	1900 [1040]	192 HBW/200 HV or 90 HRB
...	S31726	1900 [1040]	192 HBW/200 HV or 90 HRB
...	S31727	1975–2155 [1080–1180]	192 HBW/200 HV or 90 HRB
...	S32053	1900 [1040]	192 HBW/200 HV or 90 HRB
...	S30600	1900 [1040]	192 HBW/200 HV or 90 HRB
...	S32654	2100 [1150]	192 HBW/200 HV or 90 HRB
...	S34565	2050–2140 [1120–1070]	265 HBW/270 HV or 100 HRB
...	S35045	2000 [1095]	192 HBW/200 HV or 90 HRB
...	N08367	2025 [1110]	265 HBW/270 HV or 100 HRB
...	N08925	2010–2100 [1100–1150]	217 HBW or 95 HRB
...	N08926	2010 [1100]	265 HBW/270 HV or 100 HRB
...	N08904	2000 [1100]	192 HBW/200 HV or 90 HRB

E. Supplementary Requirements :-

1. Stress-Relieved Annealed Tubes :- When stress-relieved tubes are specified, tubes shall be given a heat treatment at 1550 to 1650 °F [845 to 900 °C] after roll straightening. Cooling from this temperature range may be either in air or by slow cooling.
2. Pneumatic Test :- The tubing shall be examined by a pneumatic test (either air under water or pneumatic leak test) in accordance with Specification A1016/A1016M.
3. Stabilizing Heat Treatment :- Subsequent to the solution anneal required Grades TP321, TP347, and TP348 shall be given a stabilization heat treatment at a temperature lower than that used for the initial solution annealing heat treatment.
4. Intergranular Corrosion Test :- Material shall pass intergranular corrosion tests conducted by the manufacturer in accordance with Practices A262, Practice E.

Keyword :

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