ASTM - A209/A209M
Standard Specification for Seamless Carbon-Molybdenum Alloy-Steel Boiler and Superheater Tubes

This specification covers several grades of minimum wall- thickness, seamless, carbonmolybdenum alloy-steel, boiler and superheater tubes.

This specification covers tubes 1⁄2 to 5 in. [12.7 to 127 mm] inclusive, in outside diameter and 0.035 to 0.500 in. [0.9 to 12.7 mm], inclusive, in minimum wall thickness.

A. Manufacture

1. Steelmaking Practice—The steel shall be killed.
2. The tubes shall be made by the seamless process and shall be either hot-finished or cold-finished, as specified.

B. Heat Treatment

1. Hot-finished tubes shall be heat treated at a temperature of 1200 °F [650 °C] or higher.
2. Cold-finished tubes shall, after the final cold finishing, be heat treated at a temperature of 1200 °F [650 °C] or higher, or tubing may be furnished in the full-annealed, isothermal annealed, or normalized and tempered condition. If furnished in the normalized and tempered condition, the minimum tempering temperature shall be 1200 °F [650 °C].

C. Chemical Composition

The steel shall conform to the requirements given in Table 1.

Table 2

Element	Composition, %		
	Grade T1	Grade T1a	Grade T1b
Carbon	0.10–0.20	0.15–0.25	0.14 max
Manganese	0.30–0.80	0.30–0.80	0.30–0.80
Phosphorus, max	0.025	0.025	0.025
Sulfur, max	0.025	0.025	0.025
Silicon	0.10–0.50	0.10–0.50	0.10–0.50
Molybdenum	0.44–0.65	0.44–0.65	0.44–0.65

D. Mechanical Properties

1. Tensile Requirements:-
   i. The material shall conform to the requirements given in Table 2.

ii. Table 3 gives the computed minimum elongation values for each 1⁄32-in. [0.8mm] decrease in wall thickness.

iii. Where the wall thickness lies between two values shown above, the minimum elongation value shall be determined by the following equation:

E = 48t + 15.00 [E = 1.87t + 15.00] where:

E = elongation in 2 in. [50 mm], %, and, t = actual thickness of specimen, in. [mm].

Table 2

	Grade T1	Grade T1b	Grade T1a
Tensile strength, min, ksi (MPa)	55 [380]	53 [365]	60 [415]
Yield strength, min, ksi (MPa)	30 [205]	28 [195]	32 [220]
Elongation in 2 in. [50 mm], min, %:	30	30	30
For longitudinal strip tests a deduction shall be made for each 1⁄32-in. [0.8mm] decrease in wall thickness below 5⁄16 in. [8 mm] from the basic minimum elongation of the following percentage	1.5[A]	1.5[A]	1.5[A]
When standard round 2-in. or 50-mm gage length or smaller proportionally sized specimen with the gage length equal to 4D (four times the diameter) is used	22	22	22

[A] *Table 3 gives the computed minimum values.*

Table 3

Wall Thickness		***Elongation in 2 in. or 50 mm, min, %[B]***
in.	**mm**	
5⁄16 (0.312)	8	30
9⁄32 (0.281)	7.2	29
1⁄4 (0.250)	6.4	27
7⁄32 (0.219)	5.6	26
3⁄16 (0.188)	4.8	24
5⁄32 (0.156)	4	22
1⁄8 (0.125)	3.2	21
3⁄32 (0.094)	2.4	20
1⁄16 (0.062)	1.6	18

[B] *Calculated elongation requirements shall be rounded to the nearest whole number*

2. Hardness Requirements:-

The tubes shall have a hardness not exceeding the values given in Table 4.

Table 4

Grade	Brinell Hardness Number (Tubes 0.200 in. [5.1 mm] and over in Wall Thickness), HBW	Rockwell Hardness Number (Tubes less than 0.200 in. [5.1 mm] in Wall Thickness), HRB
T 1	146	80
T 1a	153	81
T 1b	137	77

E. <u>Mechanical Tests Required</u>

1. Tension Test.
2. Flattening Test.
3. Flaring Test.
4. Hardness Test.

❖ **Keyword**

- astm b209m pdf download
- astm b209 pdf free download
- astm b209 alloy 1060
- astm b209 equivalent
- astm b209 6061
- astm b209 specification