



Designation: A513/A513M – 25

Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing¹

This standard is issued under the fixed designation A513/A513M; 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 covers electric-resistance-welded carbon and alloy steel tubing for use as mechanical tubing.

1.2 This specification covers mechanical tubing made from hot- or cold-rolled steel.

1.3 This specification covers round, square, rectangular, and special shape tubing.

Type	Size Range (Round Tubing)
Electric-Resistance-Welded Tubing from Hot-Rolled Steel	outside diameter from ½ to 15 in. [12.7 to 380 mm] wall from 0.065 to 0.650 in. [1.65 to 16.5 mm]
Electric-Resistance-Welded Tubing from Cold-Rolled Steel	outside diameter from ⅜ to 12 in. [9.5 to 300 mm] wall from 0.022 to 0.134 in. [0.56 to 3.40 mm]

1.3.1 Indeterminate wall thicknesses may be ordered. In those cases the more stringent tolerances of Tables 4, 6, 7, 8, 9, 10, 11, 12, 16, and 17 shall apply. When sizes within the allowable ranges are ordered all other requirements of the specification shall be met.

1.4 This specification covers mechanical tubing in various Grades (see Section 6), Types (see 13.1), and Thermal Conditions (13.1).

1.5 Optional supplementary requirements are provided and when desired, shall be so stated in the order.

1.6 The values stated in either SI units or inch-pound 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. In this specification

hard or rationalized conversions apply to diameters, lengths and tensile properties. Soft conversion applies to other SI measurements.

1.7 *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:²

- A370 Test Methods and Definitions for Mechanical Testing of Steel Products
- A700 Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment
- A751 Test Methods and Practices for Chemical Analysis of Steel Products
- A941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys
- A1008/A1008M Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
- A1011/A1011M Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- A1039/A1039M Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, and Ultra-High Strength, Produced by Twin-Roll Casting Process
- A1040 Guide for Specifying Harmonized Standard Grade Compositions for Wrought Carbon, Low-Alloy, and Alloy Steels
- A1058 Test Methods for Mechanical Testing of Steel Products—Metric

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 A01.09 on Carbon Steel Tubular Products.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. 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



E213 Practice for Ultrasonic Testing of Metal Pipe and Tubing

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

E309 Practice for Eddy Current Examination of Steel Tubular Products

E570 Practice for Flux Leakage Examination of Ferromagnetic Steel Tubular Products

2.2 *ASME Standard*.³

B46.1 Surface Texture

2.3 *Military Standards*.⁴

MIL-STD-129 Marking for Shipment and Storage

2.4 *Federal Standard*.⁴

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)

3. Terminology

3.1 *Definitions of Terms*—See Terminology **A941** for general steel terminology, Test Methods and Definitions **A370** or Test Methods **A1058** for mechanical testing of steel products terminology, and Test Methods and Practices **A751** for chemical analysis of steel products terminology.

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *flash*—with the ERW process, flash is the displaced parent material of the weld seam extruded onto the inside and outside of tubing/pipe during forging.

3.2.2 *seam normalized*—the seam is reheated to a temperature exceeding the upper limit of the critical range (that is, above A3 point) and cooled freely in air.

4. Ordering Information

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

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

4.1.2 Name of material (electric resistance-welded carbon or alloy steel mechanical tubing),

4.1.3 Types, conditions and code letters, (See Sections 1 and 13),

4.1.4 Thermal condition, (See 13.2),

4.1.5 Flash condition, (See 13.3),

4.1.6 Grade designation, if required, (See Section 6),

4.1.7 Report chemical analysis and product analysis, if required (See Sections 7 and 8),

4.1.8 Individual supplementary requirements, if required (S1 to S10, inclusive),

4.1.9 Cross section (round, square, rectangular and special shapes),

4.1.10 Dimensions, round, outside and inside and wall thickness (See 9.1 and 9.2) or square and rectangular, outside dimension and wall thickness and corner radii, if required (See 10.1 and 10.2),

4.1.11 Length, round, mill lengths or definite cut length (See 9.3), square and rectangular, specified length (See 10.4),

4.1.12 Squareness of cut, round tubing, if required, (See 9.4),

4.1.13 Burrs removed, if required (See 12.2),

4.1.14 Protective coating (See 15.1),

4.1.15 Special packaging (See 18.1),

4.1.16 Specification designation,

4.1.17 End use,

4.1.18 Special requirements,

4.1.19 Special marking (See Section 17), and

4.1.20 Straightness Test Method (See 9.5 and 10.6).

5. Materials and Manufacture

5.1 The steel may be made by any process.

5.2 If a specific type of melting is required by the purchaser, it shall be as stated on the purchase order.

5.3 The primary melting may incorporate separate degassing or refining, and may be followed by secondary melting, such as electroslag or vacuum-arc remelting. If secondary melting is employed, the heat shall be defined as all of the ingots remelted from a single primary heat.

5.4 Steel may be cast in ingots or may be strand cast. When steel of different grades is sequentially strand cast, identification of the resultant transition material is required. The producer shall remove the transition material by an established procedure that positively separates the grades.

5.5 Tubes shall be made by the electric-resistance-welded process and shall be made from hot- or cold-rolled steel as specified.

5.5.1 The weld shall not be located within the radius of the corners of any shaped tube unless specified by the purchaser.

6. Chemical Composition

6.1 The steel shall conform to the requirements as to chemical composition prescribed in Table 1 or Table 2 (See Specification **A1040**). If no grade is specified, Grades MT 1010 to MT 1020 may be furnished. Analyses of steels other than

TABLE 1 Chemical Requirements for Standard Low-Carbon Steels^A

NOTE 1— Chemistry represents heat analysis. Product analysis, except for rimmed or capped steel, is to be in accordance with usual practice as shown in Table 3.

Grade Designation	Chemical Composition Limits, %			
	Carbon	Manganese	Phosphorus, max	Sulfur, max
MT ^B 1010	0.02–0.15	0.30–0.60	0.035	0.035
MT 1015	0.10–0.20	0.30–0.60	0.035	0.035
MT X 1015	0.10–0.20	0.60–0.90	0.035	0.035
MT 1020	0.15–0.25	0.30–0.60	0.035	0.035
MT X 1020	0.15–0.25	0.70–1.00	0.035	0.035

^A Rimmed or capped steels which may be used for the above grades are characterized by a lack of uniformity in their chemical composition, and for this reason product analysis is not technologically appropriate unless misapplication is clearly indicated.

^B The letters MT under grade designation indicate Mechanical Tubing.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.