



Designation: B891/B891M – 19

Standard Specification for Seamless and Welded Titanium and Titanium Alloy Condenser and Heat Exchanger Tubes with Enhanced Surface for Improved Heat Transfer¹

This standard is issued under the fixed designation B891/B891M; 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 seamless and welded titanium and titanium alloy tubing on which at least part of the external or internal surface has been enhanced by cold forming for improved heat transfer. The tubes are used in surface condensers, evaporators, heat exchangers, coils, and similar heat transfer apparatus in diameters up to and including 1 in. [25.4 mm]. The base tube wall thickness is typically at least 0.049 in. [1.245 mm] average, but lighter gauge may be negotiated with the manufacturer.

1.2 Tubing purchased to this specification will typically be inserted through close-fitting holes in tubesheets, baffles, or support plates spaced along the tube length such as defined in the Tubular Exchanger Manufacturer's Association (TEMA) Standard.² The tube ends will also be expanded, and may then be welded. Tube may also be bent to form U-tubes or be coiled or otherwise formed, although tight radii may require unenhanced length for the bends.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the order. Combining values from the two systems may result in non-conformance. Within the text, the SI units are shown in brackets. The inch-pound units shall apply unless the "M" designation of this specification is specified in the order.

1.4 The following precautionary statement pertains to the test method portion only: Section 8, 9, 10 and S1 of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-*

priate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.

1.5 *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

A1047/A1047M Test Method for Pneumatic Leak Testing of Tubing

B338 Specification for Seamless and Welded Titanium and Titanium Alloy Tubes for Condensers and Heat Exchangers

E426 Practice for Electromagnetic (Eddy Current) Examination of Seamless and Welded Tubular Products, Titanium, Austenitic Stainless Steel and Similar Alloys

E1316 Terminology for Nondestructive Examinations

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *base tube, n*—the seamless or welded tube conforming to Specification B338 prior to enhancing.

3.1.2 *finished tube, n*—the tube following enhancement and any heat treatment, forming, or other processing specified.

3.1.3 *enhanced tube or section, n*—all or sections of tube length that have been mechanically worked inside, outside, or both, to produce increased surface area for improved heat transfer.

3.1.4 *finned section, n*—sections of tube exterior length that have been mechanically worked to produce increased surface area for improved heat transfer; see Table 1 for nomenclature of finning details.

¹ This specification is under the jurisdiction of ASTM Committee B10 on Reactive and Refractory Metals and Alloys and is the direct responsibility of Subcommittee B10.01 on Titanium.

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² Available from Tubular Exchanger Manufacturers Association, Inc. 25 North Broadway Tarrytown, NY 10591, www.tema.org.

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