



Designation: A939/A939M – 15

Standard Practice for Ultrasonic Examination from Bored Surfaces of Cylindrical Forgings¹

This standard is issued under the fixed designation A939/A939M; 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 practice covers a basic procedure of ultrasonically inspecting cylindrical forgings with bores from the bore surface.

1.2 This practice applies to the manual testing mode. It does not restrict the use of other testing modes, such as mechanized or automated.

1.3 This practice applies to cylindrical forgings having bore sizes equal to or greater than 2.5 in. [64 mm].

1.4 This practice is expressed in inch-pound and SI units; however, the inch-pound units shall apply unless the purchase order or contract specifies the applicable “M” specification designation (SI units). 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 other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *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 appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[A788/A788M Specification for Steel Forgings, General Requirements](#)

2.2 *ASNT Standard:*³

[SNT-TC-1A Recommended Practice for Non-destructive Personnel Qualifications and Certification](#)

¹ This practice is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.06 on Steel Forgings and Billets.

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² 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.

³ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

3. Significance and Use

3.1 This practice shall be used when ultrasonic inspection from the bore surface is required by the order or specification for inspection purposes in which the acceptance of the forging is based on limitations of the number, amplitude, or location of discontinuities or a combination thereof, which leads to ultrasonic indications.

3.2 The acceptance criteria shall be stated clearly as order requirements.

3.3 This practice requires pitch-catch search unit with twin transducers, which depending on the angle, are sensitive only to 2 to 3 in. [50 to 75 mm] into the metal from the bore surface.

4. General Requirements

4.1 As far as possible, the entire bore surface shall be subjected to ultrasonic inspection. It may be impossible to inspect some small portions of the bore surface because of chamfers at step-downs and other local configurations.

4.2 The bore ultrasonic inspection shall be performed after the final austenitizing and tempering heat treatment for mechanical properties of the forging, and may be performed either prior to or after any subsequent stress relieving heat treatment.

4.3 The ultrasonic beam shall be introduced radially for overall scanning.

4.4 Forgings may be tested either when stationary or while rotated by means of a lathe or rollers.

4.5 To ensure complete coverage of the bore surface, the search unit shall be indexed approximately 75 % of the transducer width with each pass of the search unit.

4.6 A frequency of 2.0 or 2¼ MHz shall be used unless additional transducer frequencies are specified by the purchaser.

4.7 The bore hole diameter and calibration hole(s) shall be as specified on the purchaser's drawing or order.

5. Personnel

5.1 Personnel performing ultrasonic examination to this practice shall be qualified and certified in accordance with a

*A Summary of Changes section appears at the end of this standard