

MSS SP-94-2020

**Quality Standard for Steel
Castings and Forgings for Valves,
Flanges, Fittings, and Other
Piping Components**

Ultrasonic Examination Method

Standard Practice
Developed and Approved by the
Manufacturers Standardization Society of the
Valve and Fittings Industry, Inc.
127 Park Street, NE
Vienna, Virginia 22180-4602
Phone: (703) 281-6613
Fax: (703) 281-6671
E-mail: standards@msshq.org



www.msshq.org

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Non-toleranced dimensions in this Standard Practice are nominal unless otherwise specified.

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FOREWORD

This MSS Standard Practice, SP-94, *Quality Standard for Steel Castings and Forgings for Valves, Flanges, Fittings, and Other Piping Components – Ultrasonic Examination Method*, was originally adopted in 1983 for the purpose of providing the industry with a uniform method of applying the Ultrasonic Examination procedure and interpretation of the results.

The Standard Practice was reaffirmed in 1987 with essentially no changes.

The Third edition, issued in 1992, was revised to include a surface finish requirement for the calibration blocks. This was necessary as the previously referenced surface comparator of the Alloy Casting Institute was no longer available.

The 1999 edition included minor revisions and was re-formatted to conform to current MSS publication practices.

The 2008 edition included minor revisions and was re-formatted to conform to current MSS publication practices.

The 2015 edition included editorial and substantive revisions that included the addition of “forgings” as part of the Scope and Title, identification of critical sections (as per ASME B16.34), revision of Figure 1 and 2, and other “flagged” changes. Additionally, the 2015 edition was re-formatted to conform to updated MSS publication practices.

This 2020 edition includes the addition of austenitic casting and forgings and additional standard references from ASME and ASTM.

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Manufacturers Standardization Society of the Valve and Fittings Industry

QUALITY STANDARD FOR STEEL CASTINGS AND FORGINGS FOR VALVES, FLANGES, FITTINGS, AND OTHER PIPING COMPONENTS

ULTRASONIC EXAMINATION METHOD

1. SCOPE

1.1 This Standard Practice provides methods and acceptance standards for ultrasonic examination of austenitic, ferritic, and martensitic steel castings and forgings for valves, flanges, fittings, and other piping components. This Standard Practice is applicable to the initial examination of castings and forgings and towards the examination of repairs.

1.2 The methods contained in this Standard Practice describe uniform procedures that will provide satisfactory and consistent results upon which the acceptance standards of Section 11 may be used.

1.3 It is recognized that ultrasonic examination and radiographic examination are not directly comparable. This Standard Practice is intended to provide a casting or forging of functionally equivalent quality to those accepted by the method of MSS SP-54.

2. DEFINITIONS

For definitions of terms relating to ultrasonic testing, see ASTM E1316.

3. BASIS FOR USE

Critical sections of pressure containing castings and forgings, as identified by ASME B16.34, shall be examined ultrasonically.

4. EQUIPMENT

4.1 *Electronic Apparatus*

4.1.1 An ultrasonic, pulsed, reflection type of instrument which shall be capable of generating, receiving, and amplifying frequencies of at least 1 MHz to 5 MHz.

4.1.2 The ultrasonic equipment shall provide linear presentation within ± 5 percent ($\pm 5\%$) for at least 75 percent (75%) of the screen height (sweep line to top of screen). Linearity shall be determined in accordance with ASTM E317 or equivalent electronic means.

4.1.3 The electronic apparatus shall contain a single attenuator or calibrated gain control which shall be accurate over its useful range to ± 10 percent ($\pm 10\%$) of the nominal attenuation or gain ratio to allow measurement of signals beyond the linear range of the instrument.

4.2 *Search Units*

4.2.1 Longitudinal Wave internally grounded search units having 1/2 inch to 1¹/₈ inch (13 mm to 29 mm) diameter or 1 inch (25 mm) square piezoelectric elements shall be used. Based on the signal-to-noise ratio of the response pattern of the casting or forging, a frequency in the range of 1 MHz to 5 MHz shall be used. The background noise shall not exceed 25 percent (25%) of the Distance Amplitude Correction (DAC) curve. Transducers shall be utilized at their rated frequencies.

4.2.2 Dual element 5 MHz search units are recommended for sections 1 inch (25 mm) and under in thickness.