

MSS SP-94-2015

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

**Ultrasonic
Examination Method**

Standard Practice
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U.S. customary units in this Standard Practice are the standard; the SI (metric) units are for reference only.

Substantive changes in this 2015 edition are “flagged” by parallel bars as shown on the margins of this paragraph. The specific detail of the change may be determined by comparing the material flagged with that in the previous edition.

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 Ferritic and Martensitic 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 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.

This 2015 edition includes editorial and substantive revisions that include 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, this edition was re-formatted to conform to updated MSS publication practices.

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QUALITY STANDARD FOR FERRITIC AND MARTENSITIC STEEL CASTINGS AND FORGINGS FOR VALES, 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 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) for at least 75 percent 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 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 to 1 1/8 inch (13 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 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.