



STANDARD PRACTICE **SP-53**

1995
Edition

**QUALITY STANDARD for STEEL CASTINGS
and FORGINGS for
VALVES, FLANGES and FITTINGS
and OTHER PIPING COMPONENTS**

**MAGNETIC PARTICLE
EXAMINATION METHOD**

Developed and Approved
by the
Manufacturers Standardization Society
of the
Valve and Fittings Industry, Inc.
127 Park Street, N.E.
Vienna, Virginia 22180-4602
(703) 281-6613

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

MAGNETIC PARTICLE EXAMINATION METHOD

1. SCOPE

1.1 This standard practice provides methods and acceptance standards for magnetic particle examination of ferritic steel valves, flanges, fittings and other piping components by use of dry magnetic powder or wet magnetic particles. It is applicable to examination of repairs as well as to initial examination of castings and forgings.

1.2 The methods of Section 4.0 provide uniform procedures which will produce satisfactory and consistent results upon which the acceptance standards of Table 1 may be used.

1.3 This examination guide may be used on a voluntary basis or when specified in the inquiry, contract or order and when mutually agreed upon by the manufacturer and the purchaser.

1.4 This standard practice includes the examination of pressure containing castings and forgings.

2. REFERENCES

ASTM A275/A275M-90 Standard Method for Magnetic Particle Examination of Steel Forgings.

ASTM E709-91 Standard Recommended Practice for Magnetic Particle Examination.

ASTM E125-63 (85) Standard Reference Photographs for Magnetic Particle Indications on Ferrous Castings. (Photographs may be procured from the American Society for Testing and Material, 1916 Race Street, Philadelphia, PA 19103. Request PCN 12-501250-00).

ASTM E1316-92 Definitions of Terms Relating to Magnetic Particle Examination.

3. DEFINITIONS

3.1 Pressure Containing Piece — A piece whose failure would permit the contained fluid to escape to the atmosphere. For valves, the body and bonnet (cover) and end pieces (of multi-piece valve bodies, e.g., ball valves) shall be considered the pressure containing pieces.

3.2 Indication — A detectable magnetic particle accumulation resulting from a distortion of the magnetic field.

3.3 Linear Indication — An indication in which the length is more than three times the width.

3.4 Rounded Indication — An indication which is circular or elliptical with its length less than three times its width.

3.5 Standard Definitions — See ASTM E1316 Definitions of Terms Relating to Magnetic Particle Examination.

4. PROCEDURE

4.1 All exterior and accessible interior surfaces of the pressure containing pieces shall be examined by the magnetic particle method. Examination may occur prior to machining or after machining at the manufacturer's option. This standard practice may also be used for examination of other pieces when mutually agreed upon by the manufacturer and the purchaser.

TABLE 1
MAXIMUM PERMISSIBLE INDICATIONS
ACCEPTANCE STANDARDS

A Castings

Maximum acceptable indications are as follows:

Linear Indications

- 0.3" (8 mm) long for materials up to 0.5" (13 mm) thick
- 0.5" (13 mm) long for materials 0.5" to 1" (13 mm to 25 mm) thick
- 0.7" (18 mm) long for materials over 1" (25 mm) thick

For linear indications, the indications must be separated by a distance greater than the length of an acceptable indication. (Defined in Section 3.3)

Rounded Indications

- 0.3" (8 mm) dia. for materials up to 0.5" (13 mm) thick
- 0.5" (13 mm) dia. for materials over 0.5" (13 mm) thick

Four or more rounded indications in a line separated by 0.06" (2 mm) or less edge to edge are unacceptable. (Defined in Section 3.4)

B Forgings

Maximum acceptable indications are as follows:

Linear Indications

- 0.2" (5 mm) long for materials 0.5" (13 mm) or less thick
- 0.4" (10 mm) long for materials over 0.5" to 1" (13 mm to 25 mm) thick
- 0.6" (15 mm) long for materials over 1" (25 mm) thick

For linear indications, the indications must be separated by a distance greater than the length of an acceptable indication. (Defined in Section 3.3)

Rounded Indications

- 0.2" (5 mm) dia. for materials up to 0.5" (13 mm) thick
- 0.3" (8 mm) dia. for materials over 0.5" (13 mm) thick

Four or more rounded indications in a line separated by 0.06" (2 mm) or less edge to edge are unacceptable. (Defined in Section 3.4)

4.2 Magnetic particle procedures and personnel qualification requirements for casting examination shall be in accordance with ASTM E709. For forgings, the examination procedures and personnel qualification requirements shall be in accordance with ASTM A275/A275M.

5. ACCEPTANCE STANDARDS

Acceptance standards for magnetic particle indications shall be as shown in Table 1.

6. REFERENCE PHOTOGRAPHS

6.1 Typical Magnetic Particle Indications are shown in ASTM Standard E125, Reference Photographs for Magnetic Particle Indications on Ferrous Castings.

6.2 Indications of weld discontinuities illustrated in ASTM E125 are merely examples of discontinuities in weld repairs and not degrees of severity.

6.3 The ten examples of false indications and magnetic anomalies illustrated in ASTM E125 are necessary as a guide to the type of indications and not necessarily indicative of any conditions concerning integrity or usefulness under the scope of quality herein defined. It is recognized that in some instances surveys by methods other than magnetic particle examination may be

necessary to establish what indications belong to these categories.

7. REMOVAL AND REPAIR OF DISCONTINUITIES

7.1 Pieces rejected through the application of these standards may be repaired. If welding is required, it shall be in accordance with the requirement specified in the applicable steel casting or forging specifications.

7.2 Discontinuities in excess of those represented by acceptable indications shall be removed by suitable means. If removal of surface discontinuities to acceptable level does not result in reducing wall thickness below acceptable minimum, the area shall be blended smoothly into surrounding surface. Where removal of discontinuities results in a wall thickness below acceptable minimum, the resultant cavity may be repaired by welding. Welded areas shall be blended smoothly into surrounding surface.

7.3 Areas which have been weld repaired or from which discontinuities have been removed without requirement for weld repair as a result of magnetic particle examination shall be re-examined by the magnetic particle method.

7.4 The acceptance standards for magnetic particle re-examination required under Section 7.3 shall be as shown in Table 1.

LIST OF MSS STANDARD PRACTICES

NUMBER

SP- 6-1990	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
SP- 9-1992	Spot Facing for Bronze, Iron and Steel Flanges
SP-25-1993	Standard Marking System for Valves, Fittings, Flanges and Unions
SP-42-1990 (R 1995)	Class 150 Corrosion Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt Weld Ends
SP-43-1991	Wrought Stainless Steel Butt-Welding Fittings
SP-44-1991	Steel Pipe Line Flanges
SP-45-1992	Bypass and Drain Connections
SP-51-1991 (R 1995)	Class 150 LW Corrosion Resistant Cast Flanges and Flanged Fittings
SP-53-1995	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components — Magnetic Particle Examination Method
SP-54-1995	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components — Radiographic Examination Method
SP-55-1985 (R 1990)	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components — Visual Method
SP-58-1993	Pipe Hangers and Supports — Materials, Design and Manufacture
SP-60-1991	Connecting Flange Joint Between Tapping Sleeves and Tapping Valves
SP-61-1992	Pressure Testing of Steel Valves
SP-65-1994	High Pressure Chemical Industry Flanges and Threaded Stubs for Use with Lens Gaskets
SP-67-1990	Butterfly Valves
SP-68-1988	High Pressure-Offset Seat Butterfly Valves
SP-69-1991	Pipe Hangers and Supports — Selection and Application
SP-70-1990	Cast Iron Gate Valves, Flanged and Threaded Ends
SP-71-1990	Cast Iron Swing Check Valves, Flanged and Threaded Ends
SP-72-1992	Ball Valves with Flanged or Butt-Welding Ends for General Service
SP-73-1991	Brazing Joints for Wrought and Cast Copper Alloy Solder Joint Pressure Fittings
SP-75-1993	Specifications for High Test Wrought Butt Welding Fittings
SP-77-1984 (R 1990)	Guidelines for Pipe Support Contractual Relationships
SP-78-1987 (R 1992)	Cast Iron Plug Valves, Flanged and Threaded Ends
SP-79-1992	Socket-Welding Reducer Inserts
SP-80-1987	Bronze Gate, Globe, Angle and Check Valves
SP-81-1981 (R 1986, 91)	Stainless Steel, Bonnetless, Flanged Knife Gate Valves
SP-82-1992	Valve Pressure Testing Methods
SP-83-1987	Steel Pipe Unions, Socket-Welding and Threaded
SP-84-1990	Valves — Socket-Welding and Threaded Ends
SP-85-1994	Cast Iron Globe & Angle Valves, Flanged and Threaded Ends
SP-86-1987 (R 1992)	Guidelines for Metric Data in Standards for Valves, Flanges, Fittings and Actuators
SP-87-1991	Factory-Made Butt-Welding Fittings for Class I Nuclear Piping Applications
SP-88-1993	Diaphragm Type Valves
SP-89-1991	Pipe Hangers and Supports — Fabrication and Installation Practices
SP-90-1986 (R 1991)	Guidelines on Terminology for Pipe Hangers and Supports
SP-91-1992	Guidelines for Manual Operation of Valves
SP-92-1987 (R 1992)	MSS Valve User Guide
SP-93-1987 (R 1992)	Quality Standard for Steel Castings and Forgings for Valves, Flanges, and Fittings and Other Piping Components — Liquid Penetrant Examination Method
SP-94-1992	Quality Standard for Ferritic and Martensitic Steel Castings for Valves, Flanges, and Fittings and Other Piping Components — Ultrasonic Examination Method
SP-95-1986 (R 1991)	Swage(d) Nipples and Bull Plugs
SP-96-1991	Guidelines on Terminology for Valves and Fittings
SP-97-1995	Forged Carbon Steel Branch Outlet Fittings — Socket Welding, Threaded and Buttwelding Ends
SP-98-1992	Protective Coatings for the Interior of Valves and Hydrants
SP-99-1994	Instrument Valves
SP-100-1988	Qualification Requirements for Elastomer Diaphragms for Nuclear Service Diaphragm Type Valves
SP-101-1989	Part-Turn Valve Actuator Attachment — Flange and Driving Component Dimensions and Performance Characteristics
SP-102-1989	Multi-Turn Valve Actuator Attachment — Flange and Driving Component Dimensions and Performance Characteristics
SP-103-1995	Wrought Copper and Copper Alloy Insert Fittings for Polybutylene Systems
SP-104-1995	Wrought Copper Solder Joint Pressure Fittings
SP-105-1990	Instrument Valves for Code Applications
SP-106-1990	Cast Copper Alloy Flanges and Flanged Fittings, Class 125, 150 and 300
SP-107-1991	Transition Union Fittings for Joining Metal and Plastic Products
SP-108-1991	Resilient Seated-Eccentric Cast Iron Plug Valves
SP-109-1991	Welded Fabricated Copper Solder Joint Pressure Fittings
SP-110-1992	Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
SP-111-1992	Gray-Iron and Ductile-Iron Tapping Sleeves
SP-112-1993	Quality Standard for Evaluation of Cast Surface Finishes — Visual and Tactile Method. This SP must be sold with a 10-surface, three-dimensional Cast Surface Comparator, which is a necessary part of the Standard. Additional comparators may be sold separately.
SP-113-1994	Connecting Joint between Tapping Machines and Tapping Valves

R-Year — Indicates year standard reaffirmed without substantive change.

Prices available upon request.

A large number of former MSS Practices have been approved by the ANSI as ANSI Standards, published by others. In order to maintain a single source of authoritative information, the MSS withdraws its Standard Practices in such cases.