



Standard Test Method for Analysis of High Manganese Steel Using Atomic Emission Spectrometry¹

This standard is issued under the fixed designation E 2209; 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 method provides for the analysis of high manganese steel by atomic emission spectrometry using the point-to-plane technique for the following elements in the concentration ranges shown:

Elements	Concentration Range, %
Aluminum (Al)	0.02 to 0.15
Carbon (C)	0.3 to 1.4
Chromium (Cr)	0.25 to 2.00
Manganese (Mn)	8.0 to 16.2
Molybdenum (Mo)	0.03 to 2.0
Nickel (Ni)	0.05 to 4.0
Phosphorus (P)	0.025 to 0.06
Silicon (Si)	0.25 to 1.5

NOTE 1—The ranges represent the actual levels at which this method was tested.² These concentration ranges can be extended to higher concentrations by the use of suitable reference materials. Sulfur is not included because differences in results between laboratories exceeded acceptable limits at all analyte levels.

1.2 *This test method may involve hazardous materials, operations, and equipment. 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:

- A 128 Specification for Steel Castings; Austenitic Manganese³
- E 135 Terminology Relating to Emission Spectrometry⁴
- E 158 Practices for Fundamental Calculations to Convert Intensities into Concentrations of Optical Emission Spectrochemical Analysis⁴
- E 172 Practice for Describing and Specifying the Excitation Source in Emission Spectrochemical Analysis⁴

E 305 Practice for Establishing and Controlling Spectrochemical Analytical Curves⁴

E 353 Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and other Similar Chromium-Nickel-Iron Alloys⁴

E 406 Practice for Using Controlled Atmospheres Spectrometric Analysis⁴

E 876 Practice for Use of Statistics in the Evaluation of Spectrometric Data⁵

E 1019 Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys⁵

E 1059 Practice for Designation of Shapes and Sizes of Non-Graphite Electrodes⁵

E 1601 Practice for Conducting an Interlaboratory Study to Evaluate the Performance of an Analytical Method⁵

E 1806 Practice for Sampling Steel and Iron for the Determination of Chemical Composition⁵

2.2 Other Document:

ASTM Manual on Presentation of Data and Control Chart Analysis, ASTM STP 15D, fourth revision, 1976, Part 3, p. 71

3. Terminology

3.1 For definition of terms used in this method, refer to Terminology E 135.

4. Summary of Test Method

4.1 A controlled discharge is produced between the flat surface of the specimen and the counter electrode. The radiant energies of selected analytical lines are converted into electrical energies by photo-multiplier tubes and stored on capacitors. This discharge is terminated after a fixed exposure time. At the end of the exposure period, the charge on each capacitor is measured, and converted to concentration.

5. Significance and Use

5.1 The chemical composition of high manganese steel alloys must be determined accurately to ensure the desired metallurgical properties. This procedure is suitable for manufacturing control and inspection testing.

¹ This test method is under the jurisdiction of ASTM Committee E01 on Analytical Chemistry for Metals, Ores and Related Materials and is the direct responsibility of Subcommittee E01.01 on Iron, Steel, and Ferroalloys.

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² Supporting data for this test method as determined by cooperative testing have been filed at ASTM International Headquarters. Request RR: E01-1035.

³ Annual Book of ASTM Standards, Vol 01.02.

⁴ Annual Book of ASTM Standards, Vol 03.05.

⁵ Annual Book of ASTM Standards, Vol 03.06.