



Standard Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron¹

This standard is issued under the fixed designation E350; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 These test methods cover the chemical analysis of carbon steels, low-alloy steels, silicon electrical steels, ingot iron, and wrought iron having chemical compositions within the following limits:

Element	Composition Range, %
Aluminum	0.001 to 1.50
Antimony	0.002 to 0.03
Arsenic	0.0005 to 0.10
Bismuth	0.005 to 0.50
Boron	0.0005 to 0.02
Calcium	0.0005 to 0.01
Cerium	0.005 to 0.50
Chromium	0.005 to 3.99
Cobalt	0.01 to 0.30
Columbium (Niobium)	0.002 to 0.20
Copper	0.005 to 1.50
Lanthanum	0.001 to 0.30
Lead	0.001 to 0.50
Manganese	0.01 to 2.50
Molybdenum	0.002 to 1.50
Nickel	0.005 to 5.00
Nitrogen	0.0005 to 0.04
Oxygen	0.0001 to 0.03
Phosphorus	0.001 to 0.25
Selenium	0.001 to 0.50
Silicon	0.001 to 5.00
Sulfur	0.001 to 0.60
Tin	0.002 to 0.10
Titanium	0.002 to 0.60
Tungsten	0.005 to 0.10
Vanadium	0.005 to 0.50
Zirconium	0.005 to 0.15

1.2 The test methods in this standard are contained in the sections indicated as follows:

	Sections
Aluminum, Total, by the 8-Quinolinol Gravimetric Method (0.20 % to 1.5 %)	124 – 131
Aluminum, Total, by the 8-Quinolinol Spectrophotometric Method (0.003 % to 0.20 %)	76 – 86
Aluminum, Total or Acid-Soluble, by the Atomic Absorption Spectrometry Method (0.005 % to 0.20 %)	308 – 317

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

Current edition approved Aug. 15, 2012. Published September 2012. Originally approved in 1968. Last previous edition approved in 2005 as E350 – 95 (2005)^{ε1}. DOI: 10.1520/E0350-12.

	Sections
Antimony by the Brilliant Green Spectrophotometric Method (0.0002 % to 0.030 %)	142 – 151
Bismuth by the Atomic Absorption Spectrometry Method (0.02 % to 0.25 %)	298 – 307
Boron by the Distillation-Curcumin Spectrophotometric Method (0.0003 % to 0.006 %)	208 – 219
Calcium by the Direct-Current Argon Plasma Atomic Emission Spectroscopy Method (0.0005 % to 0.010 %)	289 – 297
Carbon, Total, by the Combustion Gravimetric Method (0.05 % to 1.80 %)—Discontinued 1995	
Cerium and Lanthanum by the Direct Current Plasma Atomic Emission Spectrometry Method (0.003 % to 0.50 % Cerium, 0.001 % to 0.30 % Lanthanum)	249 – 257
Chromium by the Atomic Absorption Spectrometry Method (0.006 % to 1.00 %)	220 – 229
Chromium by the Peroxydisulfate Oxidation-Titration Method (0.05 % to 3.99 %)	230 – 238
Cobalt by the Nitroso-R Salt Spectrophotometric Method (0.01 % to 0.30 %)	53 – 62
Copper by the Atomic Absorption Spectrometry Method (0.004 % to 0.5 %)	279 – 288
Copper by the Neocuproine Spectrophotometric Method (0.005 % to 1.50 %)	114 – 123
Lead by the Ion-Exchange—Atomic Absorption Spectrometry Method (0.001 % to 0.50 %)	132 – 141
Manganese by the Atomic Absorption Spectrometry Method (0.005 % to 2.0 %)	269 – 278
Manganese by the Metaperiodate Spectrophotometric Method (0.01 % to 2.5 %)	9 – 18
Manganese by the Peroxydisulfate-Arsenite Titrimetric Method (0.10 % to 2.50 %)	164 – 171
Molybdenum by the Thiocyanate Spectrophotometric Method (0.01 % to 1.50 %)	152 – 163
Nickel by the Atomic Absorption Spectrometry Method (0.003 % to 0.5 %)	318 – 327
Nickel by the Dimethylglyoxime Gravimetric Method (0.1 % to 5.00 %)	180 – 187
Nickel by the Ion-Exchange-Atomic-Absorption Spectrometry Method (0.005 % to 1.00 %)	188 – 197
Phosphorus by the Alkalimetric Method (0.02 % to 0.25 %)	172 – 179
Phosphorus by the Molybdenum Blue Spectrophotometric Method (0.003 % to 0.09 %)	19 – 30
Silicon by the Molybdenum Blue Spectrophotometric Method (0.01 % to 0.06 %)	103 – 113
Silicon by the Gravimetric Titration Method (0.05 % to 3.5 %)	46 – 52
Sulfur by the Combustion-Iodate Titration Method (0.005 % to 0.3 %)	37 – 45
Tin by the Sulfide-Iodometric Titration Method (0.01 % to 0.1 %)	95 – 102
Tin by the Solvent Extraction-Atomic Absorption Spectrometry Method (0.002 % to 0.10 %)	198 – 207