



Standard Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys¹

This standard is issued under the fixed designation E354; 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.

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 high-temperature, electrical, magnetic, and other similar iron, nickel, and cobalt alloys having chemical compositions within the following limits:

Element	Composition Range, %
Aluminum	0.005 to 18.00
Beryllium	0.001 to 0.05
Boron	0.001 to 1.00
Calcium	0.002 to 0.05
Carbon	0.001 to 1.10
Chromium	0.10 to 33.00
Cobalt	0.10 to 75.00
Columbium (Niobium)	0.01 to 6.0
Copper	0.01 to 10.00
Iron	0.01 to 85.00
Magnesium	0.001 to 0.05
Manganese	0.01 to 3.0
Molybdenum	0.01 to 30.0
Nickel	0.10 to 84.0
Nitrogen	0.001 to 0.20
Phosphorus	0.002 to 0.08
Silicon	0.01 to 5.00
Sulfur	0.002 to 0.10
Tantalum	0.005 to 10.0
Titanium	0.01 to 5.00
Tungsten	0.01 to 18.00
Vanadium	0.01 to 3.25
Zirconium	0.01 to 2.50

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

	Sections
Aluminum, Total, by the 8-Quinolinol Gravimetric Method (0.20 % to 7.00 %)	100
Carbon, Total, by the Combustion-Thermal Conductivity Method	Discontinued
Carbon, Total, by the Combustion Gravimetric Method (0.05 % to 1.10 %)	Discontinued
Chromium by the Atomic Absorption Method (0.006 % to 1.00 %)	165

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 Sept. 15, 2014. Published November 2014. Originally approved in 1968. Last previous edition approved in 2006 as E354 – 93 (2006). DOI: 10.1520/E0354-14.

Chromium by the Peroxydisulfate Oxidation—Titration Method (0.10 % to 33.00 %)	175
Chromium by the Peroxydisulfate-Oxidation Titrimetric Method	Discontinued
Cobalt by the Ion-Exchange-Potentiometric Titration Method (2 % to 75 %)	53
Cobalt by the Nitroso-R-Salt Spectrophotometric Method (0.10 % to 5.0 %)	61
Copper by Neocuproine Spectrophotometric Method (0.01 % to 10.00 %)	90
Copper by the Sulfide Precipitation-Electrodeposition Gravimetric Method (0.01 % to 10.00 %)	71
Iron by the Silver Reduction Titrimetric Method (1.0 % to 50.0 %)	192
Manganese by the Periodate Spectrophotometric Method (0.05 % to 2.00 %)	9
Molybdenum by the Ion Exchange—8-Hydroxyquinoline Gravimetric Method (1.5 % to 30 %)	184
Molybdenum by the Spectrophotometric Method (0.01 % to 1.50 %)	153
Nickel by the Dimethylglyoxime Gravimetric Method (0.1 % to 84.0 %)	135
Phosphorus by the Molybdenum Blue Spectrophotometric Method (0.002 % to 0.08 %)	19
Silicon by the Gravimetric Method (0.05 % to 5.00 %)	46
Sulfur by the Gravimetric Method	Discontinued
Sulfur by the Combustion-Iodate Titration Method (0.005 % to 0.1 %)	Discontinued
Sulfur by the Chromatographic Gravimetric Method	
Tin by the Solvent Extraction-Atomic Absorption Method (0.002 % to 0.10 %)	143

1.3 Methods for the determination of carbon and sulfur not included in this standard can be found in Test Methods E1019.

1.4 Some of the composition ranges given in 1.1 are too broad to be covered by a single method and therefore this standard contains multiple methods for some elements. The user must select the proper method by matching the information given in the Scope and Interference sections of each method with the composition of the alloy to be analyzed.

1.5 The values stated in SI units are to be regarded as standard.

1.6 *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.* Specific hazards statements are given in Section 6 and in special “Warning” paragraphs throughout these test methods.