



Standard Test Methods for Chemical Analysis of Tool Steels and Other Similar Medium- and High-Alloy Steels¹

This standard is issued under the fixed designation E 352; 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.

^{ε1} NOTE—Editorial changes were made in November 2000.

1. Scope

1.1 These test methods² cover the chemical analysis of tool steels and other similar medium- and high-alloy steels having chemical compositions within the following limits:

Element	Concentration Range, %
Aluminum	0.005 to 1.5
Boron	0.001 to 0.10
Carbon	0.03 to 2.50
Chromium	0.10 to 14.0
Cobalt	0.10 to 14.0
Copper	0.01 to 2.0
Lead	0.001 to 0.01
Manganese	0.10 to 15.00
Molybdenum	0.01 to 10.00
Nickel	0.02 to 4.00
Nitrogen	0.001 to 0.20
Phosphorus	0.002 to 0.05
Silicon	0.10 to 2.50
Sulfur	0.002 to 0.40
Tungsten	0.01 to 21.00
Vanadium	0.02 to 5.50

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

	Sections
Carbon, Total, by the Combustion—Thermal Conductivity Method	2a
Carbon, Total, by the Combustion Gravimetric Method	(0.05 to 2.50 %) 78
Chromium by the Atomic Absorption Method	(0.006 to 1.00 %) 174
Chromium by the Peroxydisulfate Oxidation—Titration Method	(0.10 to 14.00 %) 184
Chromium by the Peroxydisulfate-Oxidation Titrimetric Method	2b
Cobalt by the Ion-Exchange—Potentiometric Titration Method	(2 to 14 %) 52

	Sections
Cobalt by the Nitroso-R-Salt Photometric Method	(0.10 to 5.0 %) 60
Copper by the Neocuproine Photometric Method	(0.01 to 2.00 %) 89
Copper by the Sulfide Precipitation-Electrodeposition Gravimetric Method	(0.01 to 2.0 %) 70
Lead by the Ion-Exchange—Atomic Absorption Method	(0.001 to 0.001 %) 99
Nickel by the Dimethylglyoxime Gravimetric Method	(0.1 to 4.0 %) 144
Manganese by the Periodate Photometric Method	(0.10 to 5.00 %) 8
Molybdenum by the Ion Exchange—8-Hydroxyquinoline Gravimetric Method	203
Molybdenum by the Photometric Method	(0.01 to 1.50 %) 162
Phosphorus by the Alkalimetric Method	(0.01 to 0.05 %) 136
Phosphorus by the Molybdenum Blue Photometric Method	(0.002 to 0.05 %) 18
Silicon by the Gravimetric Method	(0.10 to 2.50 %) 45
Sulfur by the Gravimetric Method	2c
Sulfur by the Combustion-Iodate Titration Method	(0.005 to 0.4 %) 36
Sulfur by the Chromatographic Gravimetric Method	2b
Tin by the Solvent Extraction—Atomic Absorption Method	(0.002 to 0.10 %) 152
Vanadium by the Atomic Absorption Method	(0.006 to 0.15 %) 193

1.3 Test methods for the determination of several elements not included in this standard can be found in Test Methods E 30 and Test Methods E 1019.

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

1.5 The values stated in SI units are to be regarded as standard. In some cases, exceptions allowed in Practice E 380 are also used.

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 5 and in special “Warning” paragraphs throughout these test methods.

¹ These test methods are under the jurisdiction of the 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 July 15, 1993. Published September 1993. Originally published as E 352 – 68 T. Last previous edition E 352 – 89^{ε1}.

² These test methods represent revisions of methods covered by ASTM E 30, which appear in this publication. Typical alloy specification numbers for this category are listed in the Appendix.

^{2a} Discontinued April 25, 1986. Its replacement appears as part of ASTM Methods E 1019, found in *Annual Book of ASTM Standards*, Vol 03.05.

^{2b} Discontinued May 30, 1980.

^{2c} Discontinued April 29, 1988.