



Designation: E478 – 08 (Reapproved 2017)

# Standard Test Methods for Chemical Analysis of Copper Alloys<sup>1</sup>

This standard is issued under the fixed designation E478; 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 These test methods cover the chemical analysis of copper alloys having chemical ranges within the following limits:<sup>2</sup>

| Element    | Composition, % |
|------------|----------------|
| Aluminum   | 12.0 max       |
| Antimony   | 1.0 max        |
| Arsenic    | 1.0 max        |
| Cadmium    | 1.5 max        |
| Cobalt     | 1.0 max        |
| Copper     | 40.0 min       |
| Iron       | 6.0 max        |
| Lead       | 27.0 max       |
| Manganese  | 6.0 max        |
| Nickel     | 50.0 max       |
| Phosphorus | 1.0 max        |
| Silicon    | 5.0 max        |
| Sulfur     | 0.1 max        |
| Tin        | 20.0 max       |
| Zinc       | 50.0 max       |

1.2 The test methods appear in the following order:

|                                                                                                                           | Sections  |
|---------------------------------------------------------------------------------------------------------------------------|-----------|
| Aluminum by the Carbamate Extraction-Ethyl-enedinitrilotetraacetate Titrimetric Test Method [2 % to 12 %]                 | 71 – 78   |
| Copper by the Combined Electrodeposition Gravimetric and Oxalyldihydrazide Spectrophotometric Test Method [50 %, minimum] | 10 – 18   |
| Iron by the 1,10-Phenanthroline Spectrophotometric Test Method [0.003 % to 1.25 %]                                        | 19 – 28   |
| Lead by Atomic Absorption Spectrometry [0.002 % to 15 %]                                                                  | 90 – 100  |
| Lead by the Ethylenedinitrilotetraacetic Acid (EDTA) Titrimetric Test Method [2.0 % to 30.0 %]                            | 29 – 36   |
| Nickel by the Dimethylglyoxime Extraction Spectrophotometric Test Method [0.03 % to 5.0 %]                                | 37 – 46   |
| Nickel by the Dimethylglyoxime Gravimetric Test Method [4 % to 50 %]                                                      | 55 – 62   |
| Silver in Silver-Bearing Copper by Atomic Absorption Spectrometry [0.01 % to 0.12 %]                                      | 101 – 112 |
| Tin by the Iodotimetric Titration Test Method [0.5 % to 20 %]                                                             | 63 – 70   |

<sup>1</sup> 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 E01.05 on Cu, Pb, Zn, Cd, Sn, Be, Precious Metals, their Alloys, and Related Metals.

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<sup>2</sup> The actual limits of application of each test method are presented in 1.2.

|                                                                                            |           |
|--------------------------------------------------------------------------------------------|-----------|
| Tin by the Phenylfluorone Spectrophotometric Test Method [0.01 % to 1.0 %]                 | 113 – 123 |
| Zinc by Atomic Absorption Spectrometry [0.2 % to 2 %]                                      | 79 – 89   |
| Zinc by the Ethylenedinitrilotetraacetic Acid (EDTA) Titrimetric Test Method [2 % to 40 %] | 47 – 54   |

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.4 *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.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>3</sup>

- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E50 Practices for Apparatus, Reagents, and Safety Considerations for Chemical Analysis of Metals, Ores, and Related Materials
- E60 Practice for Analysis of Metals, Ores, and Related Materials by Spectrophotometry
- E135 Terminology Relating to Analytical Chemistry for Metals, Ores, and Related Materials
- E173 Practice for Conducting Interlaboratory Studies of Methods for Chemical Analysis of Metals (Withdrawn 1998)<sup>4</sup>
- E255 Practice for Sampling Copper and Copper Alloys for the Determination of Chemical Composition
- E1601 Practice for Conducting an Interlaboratory Study to

<sup>3</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>4</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).