Designation: B950 – 11

Standard Guide for Editorial Procedures and Form of Product Specifications for Copper and Copper Alloys[1]

This standard is issued under the fixed designation B950; 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 guide covers the editorial procedures and form and style for product specifications under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys.

NOTE 1—For standards other than product specifications, such as test methods, practices, and guides, see the appropriate sections of Form and Style for ASTM Standards (Blue Book).[2]

1.2 This guide has been prepared as a supplement to the current edition of the Form and Style Manual, and is appropriate for use by the subcommittees within ASTM Committee B05 on Copper and Copper Alloys. This guide is to be applied in conjunction with the Form and Style Manual. The Appendix contains a copy of the B05 electronic template which includes adopted language for various sections and provides a template for drafting B05 product specifications.

NOTE 2—The contents of this guide were previously maintained as a white paper under the title, "ASTM Committee B05 Outline of Form of Specifications."

1.3 Subcommittees preparing new product specifications or revising existing ones should follow the practices and procedures outlined herein, and be guided by the latest specifications covering similar commodities.

1.4 If a conflict exists between this guide and the mandatory sections of the current edition of the Form and Style Manual, the Form and Style Manual requirements have precedence. If a conflict exists between this guide and the nonmandatory sections of the current edition of the Form and Style Manual, the guide has precedence.

1.5 When patents are involved, the specifications writer should refer to the Form and Style Manual section on patents and trademarks. Also, refer to part F of the Form and Style Manual for trademark information and the safety hazards caveat.

2. Referenced Documents

2.1 *ASTM Standards:*[3]

B75 Specification for Seamless Copper Tube

B153 Test Method for Expansion (Pin Test) of Copper and Copper-Alloy Pipe and Tubing

B154 Test Method for Mercurous Nitrate Test for Copper Alloys

B170 Specification for Oxygen-Free Electrolytic Copper—Refinery Shapes

B193 Test Method for Resistivity of Electrical Conductor Materials

B194 Specification for Copper-Beryllium Alloy Plate, Sheet, Strip, and Rolled Bar

B216 Specification for Tough-Pitch Fire-Refined Copper—Refinery Shapes

B224 Classification of Coppers

B248 Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

B248M Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar (Metric)

B249/B249M Specification for General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

B250/B250M Specification for General Requirements for Wrought Copper Alloy Wire

B251 Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube

B251M Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube (Metric)

B577 Test Methods for Detection of Cuprous Oxide (Hydrogen Embrittlement Susceptibility) in Copper

B601 Classification for Temper Designations for Copper and Copper Alloys—Wrought and Cast

[1] This guide is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.91 on Editorial and Publications.

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[2] Available from ASTM International Headquarters, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959.

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

***A Summary of Changes section appears at the end of this standard.**

B824 Specification for General Requirements for Copper Alloy Castings
B846 Terminology for Copper and Copper Alloys
B858 Test Method for Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys
B900 Practice for Packaging of Copper and Copper Alloy Mill Products for U.S. Government Agencies
B968/B968M Test Method for Flattening of Copper and Copper-Alloy Pipe and Tube
E6 Terminology Relating to Methods of Mechanical Testing
E8/E8M Test Methods for Tension Testing of Metallic Materials
E18 Test Methods for Rockwell Hardness of Metallic Materials
E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
E44 Definitions of Terms Related to Heat Treatment[4]
E53 Test Method for Determination of Copper in Unalloyed Copper by Gravimetry
E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes[4]
E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods)[4]
E76 Test Methods for Chemical Analysis of Nickel-Copper Alloys[4]
E112 Test Methods for Determining Average Grain Size
E118 Test Methods for Chemical Analysis of Copper-Chromium Alloys[4]
E121 Test Methods for Chemical Analysis of Copper-Tellurium Alloys[4]
E243 Practice for Electromagnetic (Eddy-Current) Examination of Copper and Copper-Alloy Tubes
E478 Test Methods for Chemical Analysis of Copper Alloys
E581 Test Methods for Chemical Analysis of Manganese-Copper Alloys
E1227 Terminology Relating to Chemical Analysis of Metals[4]
E1371 Test Method for Gravimetric Determination of Phosphorus in Phosphorus-Copper Alloys or Phosphorus-Copper-Silver Alloys[4]

2.2 *Other ASTM Documents:*[5]

Form and Style for ASTM Standards
Committee B05 Bylaws Appendix III—Terminology Management Policy

2.3 *ISO Documents:*[6]

ISO 4744 Copper and copper alloys -- Determination of chromium content -- Flame atomic absorption spectrometric method
ISO 7602

2.4 *JIS Documents:*

JIS H1068 Methods for Determination of Bismuth in Copper and Copper Alloys

3. Terminology

3.1 For definitions of terms used in this guide, refer to the Form and Style Manual and Terminology B846.

4. Significance and Use

4.1 The Form and Style for ASTM Standards manual provides mandatory requirements and recommended practices for the preparation and content of ASTM specifications. In order to promote consistency in the style and content of product specifications under its jurisdiction, Committee B05 recognizes the need to provide a supplementary document pertaining to the types of products and materials covered by specifications under its jurisdiction.

4.2 This guide contains a list of sections to be considered for inclusion in a specification for copper and copper alloys, recommended wording, or both, for such sections. An electronic template including committee adopted language is included in the Appendix.[7]

4.3 Persons drafting new product specifications, or modifying existing ones, under the jurisdiction of Committee B05, should follow this guide and the requirements of the Form and Style Manual to ensure consistency.

5. Subject Headings of Text

5.1 The following is the heading sequence for the specifications text. The headings listed are those most generally used. Other headings may be included for specialized subjects when the information is pertinent to the document under development; in which case, all instructions and guidance for that particular section shall be applied, and these headings should appear in the most appropriate place and sequence depending on their relationship to other sections.

5.2 *Superscripts*—The headings identified as mandatory are required by the Society. The headings identified with an asterisk (*) are a guide for Committee B05 documents, where applicable, either by inclusion or by reference to a general requirements specification.

5.3 Not all of the headings may be required for a particular standard specification. For example, when the specification does not contain reference to any other standard within the text, it is not required to include a section on Referenced Documents. Or, in the case where no physical property requirements are given, the physical property section is not required.

Title[ASTM]	Sampling[B05]
Designation[ASTM]	Number of Tests and Retests[B05]
Scope[ASTM]	Specimen Preparation[B05]
Referenced Documents[B05]	Test Methods[B05*]
General Requirements[B05,A]	Significance of Numerical Limits[B05]
Terminology[B05]	Inspection[B05]
Classification	Rejection and Rehearing[B05]
Ordering information[B05]	Certification[B05]
Materials and Manufacture[B05]	Test Reports[B05]
Chemical Composition[B05]	Product Marking
Temper[B05]	Packaging and Package Marking[B05]
Grain Size of Annealed Tempers	Keywords[ASTM]

[4] Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

[5] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org.

[6] Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

[7] See B05 Main Page on the ASTM website, www.astm.org, for an electronic WORD version of the template.

Physical Property Requirements[B05]	Summary of Changes[B05]
Mechanical Property Requirements[*]	Supplementary Requirements
Performance Requirements	Quality Assurance
Other Requirements	Annexes
Dimensions, Mass, and Permissible Variations[B05]	Appendixes
Workmanship, Finish, and Appearance[B05]	

[ASTM] Mandatory ASTM Society requirement
[B05] Guide for B05 specifications
[A] When reference is made to a general requirements specification, the sequence position of the General Requirements section in the product specification should be prior to the first section referenced, which is usually Terminology.
[B] Test methods that are detailed in specifications shall contain all of the mandatory headings shown in Part A, Section A1, of the Blue Book.

5.4 Subject Headings shall precede each section to orient the reader. Section and text paragraphs shall be numbered in accordance with the Guide for the Use of the Modified Numbering System in Part D of the Form and Style for ASTM Standards manual. The following is an example of how it should appear in a standard:

1. Scope

1.1 This specification establishes the requirements for... etc.

6. Section Contents

NOTE 3—Explanations of section content requirements are detailed in this section. In the Annex and published separately on the B05 Main Page under Additional Information, is an electronic template containing recommended language for each section. In this guide, the examples were removed to avoid redundancy and inconsistencies.

6.1 *Title*[ASTM]

6.1.1 The title should be as concise as possible, yet complete enough to identify the material, product, system, or services for which the requirements are established by the document.

6.2 *Designation and Year of Issue*[ASTM]

6.2.1 *Designation*—The alphanumeric designation is assigned by ASTM Headquarters.

6.2.2 *Year Date*—After the designation, a hyphen is followed by the last two numbers of the year of acceptance or last revision. Reapprovals are the last date in parentheses. Footnote 1 is not changed with a reapproval.

NOTE 4—The Form and Style Manual includes definitions of date of issue and year date.

6.3 *Scope*[ASTM]

6.3.1 The Scope should be a brief summary of the product and product application.

6.3.2 A statement shall be included in this section as to whether inch-pound or SI units are the standard, if the specification has a companion specification or is a dual designation specification.

6.3.3 Include the prescribed caveat on safety hazards per mandatory blue book language, when one or more test methods are included other than by reference.

NOTE 5—The safety hazard caveat shall also appear in test methods, guides, and practices that involve the use of materials, operations, or equipment.

6.3.4 Related documents not referenced in the text may be included as a footnote, or listed as References at the end of the standard cited by number if more than five are cited.

6.4 *Referenced Documents*[B05]

6.4.1 List in alphanumeric sequence the designation and complete title of all standards and other documents referenced, including standards and codes of other organizations.

6.4.2 Provide footnotes to this section indicating the source of the documents. When referenced later in the text, us only the type of document (specification, test method, practice, guide, etc.) and the designation letter and number (for example, Test Methods B577).

6.4.3 Do not use the year of issue when listing the referenced documents unless there is a technical reason for requiring a specific issue.

6.5 *General Requirements*[B05,A]

6.5.1 This section should be used for requirements that are available in a General Requirements specification and are included in the specification by reference. General Requirements specifications are B248, B248M, B249/B249M, B250/B250M, B251, B251M, and B824. When a product specification refers to a general requirements specification for applicable requirements, the reference shall be made in this section so as to alert the user that the details of the requirement(s) shall be found in another document.

6.5.1.1 The utilization of a general requirements section in the drafting of a new specification or in the revision of a standard is not mandatory; however, it is recommended since considerable repetition within a group of similar documents would be avoided.

6.5.1.2 In the case where a section in the general requirements section has been referenced and the same titled section appears in the product specification with requirements that either supplement or supersede the referenced general requirements section, use the explanatory clause 3.2 in the electronic template.

6.6 *Terminology*[B05]

NOTE 6—For use of terminology in B05 standards, refer also to the Committee B05 Terminology Management Policy.

6.6.1 When applicable, refer to Terminology B846 for definitions of terms relating to copper and copper alloys, or to other existing ASTM terminology standards having general applications. Terms not appearing in other ASTM terminology standards and requiring other than dictionary definitions should be defined.

6.6.1.1 Examples of ASTM terminology standards having general application are: E44, Definitions of Terms Relating to Heat Treatment; E6, Definition of Terms Relating to Mechanical Testing; E1227 Terminology Relating to Chemical Analysis of Metals.

6.6.2 *Definitions*:

6.6.2.1 Definitions shall be in dictionary-definition form, following the guidelines of Part E of The Form and Style Manual and, when appropriate, include in this section definitions from any applicable terminology standard.

6.6.3 *Definitions of Terms Specific to this Standard*:

6.6.3.1 Terms that are specific to the standard under development or revision shall appear in the Terminology section under this heading.

6.7 *Classification*

6.7.1 When more than one material, product or system is specified, each may be separated by type, and designated by Roman numerals. The first subdivision shall be based upon some major property, composition, or application of the product. Designate further subdivisions by grades according to pertinent property or properties and identify by Arabic numbers. When necessary, make additional divisions into classes identified by capital letters.

6.7.1.1 An example of a classification standard is B224.

6.7.1.2 An example of material subdivided by grade is found in the Table of Chemical Composition of Specification B170.

6.8 *Ordering Information*[B05]

6.8.1 This section shall appear in all product specifications as a checklist of items which should be included in an inquiry, contract, or purchase order.

6.8.2 *Choices*—When the specification provides choices for purchase, such as various types, grades, classes, alloys, tempers, dimensions, forms, or quantities, the inquiry, contract, or purchase order should state which choices are required. Choices may have defaults, which should be stated in the specification, if the purchase order does not choose from the standard items offered.

6.8.2.1 A listing of each such choice, together with a reference to the applicable section of the specification, will be of assistance in the wording of the inquiry, contract, or purchase order. This list should include the ASTM specification designation and year of issue to avoid possible misunderstandings between the contracting parties. The purchaser's attention should be directed to what product would be furnished by the manufacturer or supplier when the purchaser fails to specify one or more of the choices. This is typically noted by the phrase "unless otherwise specified".

6.8.3 *Options*—Under a subsection, list optional items to be specified at the time of the order.

6.8.3.1 Options are typically noted with the phrase, "when specified". The purchaser is advised that the option will not be provided if the purchaser fails to specify it in the order, with the explanatory clause of 6.2 in the electronic template.

6.9 *Material(s) and Manufacture*[B05]

6.9.1 *Materials*—This section should contain general statements regarding the material(s) and form(s) from which the product is produced. It is recommended that the alloys involved should be stated.

6.9.2 *Manufacture*—This section should contain general statements regarding the acceptable method(s) of manufacture. It is recommended that the kinds of processes used to achieve the properties should be stated.

6.9.3 The past practice of using the following sentence should be discontinued: "The material shall be of such quality and purity that the finished product shall have the properties and characteristics prescribed in this specification." See 7.1 and 7.2 of the electronic template for recommended wording.

6.10 *Chemical Composition*[B05]

6.10.1 *Limits for Specified Elements*:

6.10.1.1 Detailed chemical composition requirements and other chemical characteristics to which the material, product, or system must conform shall be provided. These requirements are usually presented in tabular form. It is most important that the following information be clearly indicated: *(a)* name of each constituent specified, *(b)* whether the requirement is a maximum or a minimum, *(c)* whether an allowance for measurement error is incorporated in these limits, *(d)* the measurement units applicable, and *(e)* references to notes or footnotes for further clarification.

6.10.1.2 When presenting chemical limits, it is recommended to use the "—" symbol in the tables (for example, 89.0–91.0), and to use "to" in the text (for example, 89.0 to 91.0).

6.10.1.3 When restricting limit for one of the specified elements, it is given as "remainder" in the chemical composition table. Select the appropriate wording in the electronic template depending on what alloys are specified in the standard.

6.10.2 *Product (Check) Sample*:

6.10.2.1 When it is desirable to state a permissible analytical variance for a specific product, an introductory statement should be used to indicate the requirements. See 8.1.1 in the electronic template for recommended wording.

6.10.2.2 The permitted variances may be incorporated in the chemical composition table or given a separate table.

6.10.3 *Limits for Nonspecified Elements*:

6.10.3.1 Include a disclaimer statement regarding limits for nonspecified elements for all specifications containing chemical composition sections. See 8.2 of the electronic template. See 8.3 for language required for stating the limit for one of the specified elements to be listed as remainder.

6.11 *Temper*[B05]

6.11.1 The standard temper(s) of the products specified shall be stated in this section. Refer to Classification B601 for temper designations for copper and copper alloys.

6.11.2 Use the temper designation codes and names of B601 in both text and tables. Avoid use of former designations. It is recommended to reference B601, as the current codes and names are cross referenced to former codes in the appendix.

6.11.3 If tempers not classified in B601 are used in the specification, details of the temper requirements must be explicitly stated.

6.12 *Grain Size for Annealed Tempers*

6.12.1 Use this section when grain size is the standard requirement for a copper or copper alloy in an annealed (OS) temper.

NOTE 7—In drafting a new document or revising a standard, it is essential to identify in the specification a test procedure for determining conformance to each requirement.

6.13 *Physical Property Requirements*[B05]

6.13.1 If specified, the requirements for electrical resistivity or conductivity, coefficient of thermal expansion, specific gravity and similar properties are presented in this section; usually in tabular form.

6.13.2 When a requirement is an option, or when the requirement of performance of the test is an option, it should be so stated. It should be noted that such options should be specified in the contract or purchase order. An example is included in 11.1.2 of the electronic template.

6.14 *Mechanical Property Requirements*[B05]

6.14.1 The requirements for tensile strength, yield strength, elongation, and hardness are included in this section. The property requirements are frequently placed in a table.

6.14.1.1 When a requirement is an option, or when the requirement of performance of the test is an option, it should be so stated. It should be noted that such options should be specified in the contract or purchase order. An example is included in 11.1.2 of the electronic template.

6.14.1.2 In the case where the approximate Rockwell hardness values are used as a quick test to indicate general conformance to a specification requirement, see 12.2 of the electronic template for an example of how it should appear.

6.15 *Performance Requirements*

6.15.1 Include in this section functional, environmental, and similar requirements (for example, Microscopic Examination, Cuprous Oxide [Hydrogen Embrittlement Susceptibility], Expansion Test, Flattening Test, and Residual Stress Tests).

6.15.1.1 When a requirement is an option, or when the requirement of performance of the test is an option, it should be so stated. It should be noted that such options should be specified in the contract or purchase order. An example is included in 11.1.2 of the electronic template.

6.16 *Other Requirements*

6.16.1 Requirements not covered elsewhere, such as Nondestructive Testing (Electromagnetic eddy current Examination, Hydrostatic Test, Pneumatic Test), Cleanness Test, Weld Quality Test, Orders for U.S. Government Agencies, etc., should be located in this part of the specification. These additional requirements should follow the performance requirements and should not be intermixed with the other sections.

6.16.1.1 *Purchases for U.S. Government*—When product is purchased for agencies of the U.S. Government, the specification shall include this section. The section should appear immediately prior to the Dimensions, Mass, and Permissible Variations section of the specification. See the Supplementary Requirements section of the E Template for wording.

6.17 *Dimensions, Mass, and Permissible Variations*[B05]

6.17.1 Only that part of the title which is applicable to the product need be addressed. The section may be self contained or it may reference another document such as a general requirements specification.

6.17.2 This section shall be used for the details as to standard shape, mass, and size ranges which are usually presented in tabular form with a brief reference in the text. Separate sections may be necessary with the individual tables. The tables shall clearly indicate where divisions are made for the dimension ranges. For example ranges from 0 to 1 in., 1 to 2 in., 2 to 3 in. shall be more properly stated as 1 in. and under, over 1 to 2 in. inclusive, over 2 to 3 in., inclusive, etc.

6.17.3 The permissible variations in dimensions, mass, etc., may be included in the same tables with minimal sizes. It shall be made clear that the tolerances specified are plus and minus or apply only in one direction.

6.17.4 The specific tables in referenced General Requirements should be noted by table number to avoid confusion. As most dimensions are contained in more than one table, be sure to reference the one that is applicable to the product.

6.17.4.1 Should there be more than one section in a table due to grades or applications, the specific section should be noted. (for example the straightness table in B249/B249M.)

6.17.5 For new or revised documents, the Title headers of the appropriate tables in the referenced document should be checked to insure that the product specification, and alloys if applicable, are properly listed. Advise the ASTM Editor of any corrections or additions needed, when finalizing the product specification.

6.18 *Workmanship, Finish, and Appearance*[B05]

6.18.1 Workmanship, finish, and appearance may be addressed separately for better clarity or a general statement may be used. Requirements for workmanship, finish, and appearance include (but are not limited to) the type of finish, the general appearance or color, the temper, and whether the product is clean, sound, and free of scale or defects which would render it unsuitable for the intended application. To avoid misunderstanding, these requirements should be clearly stated. Provisions for removal or repair of minor surface imperfections that are not considered cause for rejection should also be addressed.

6.19 *Sampling*[B05]

6.19.1 This section shall include lot size, portion size, selection of portion pieces, and the manner by which the sample shall be taken from the portion pieces selected.

6.19.2 This subject is too complex to be addressed in this document. However, the Sampling section of Specification B249/B249M, General Requirements for Wrought Copper and Copper Alloy Rod, Bar, and Shapes, is an example of how this section should appear in the standard.

6.20 *Number of Tests and Retests*[B05]

6.20.1 *Tests*—This section shall state the number of test specimens required to determine conformance to specification product property requirements.

6.20.2 *Retests*—If the specification permits retesting, after the product fails to conform to specification requirements when tested by the purchaser, state the conditions and rules under which the retesting is permitted.

6.21 *Specimen Preparation*[B05]

6.21.1 Where special test specimen preparation is required, this section shall be included. Refer to a standard test method when possible and when an acceptable reference is not available, include sufficient information to allow acceptable reproduction of test results.

6.21.2 This subject is too complex to be further addressed in this document; however, the Specimen Preparation section of Specification B249/B249M, General Requirements for Wrought Copper and Copper Alloy Rod, Bar, and Shapes, is an example of how this section should appear in a standard.

6.22 *Test Methods*[B05]

6.22.1 *General*—In this section identify specific test methods by which conformance with the specification requirements

may be determined. In addition to identifying the specific test method, include any additional information necessary for the proper application of the identified test method.

6.22.2 *Chemical Analysis*:

6.22.2.1 There are some copper alloys whose chemical compositions include element(s) with specified limiting values for which no recognized analytical test method is known to be published in the literature. When such a test method can not be obtained from the manufacturer of a product produced from such an alloy, who obviously has the in-house analytical capability, for inclusion in the specification, the following statement should appear immediately after the list of test methods:

X.X.1 Since no viable test method is known to be published, the determination of [specify the element or elements] shall be subject to agreement between the manufacturer or supplier and the purchaser.

6.22.2.2 When such a needed test method has been published by a recognized authority for a particular element, the above statement is no longer valid for that element, and the published test method shall be referenced.

6.22.2.3 Most, if not all, standard specifications permit an agreement between the manufacturer and the purchaser to establish limits and required analysis for unnamed element(s); however, since it cannot be predetermined which element(s) may be subject to this agreement, test method(s) for such element(s) do not have to be identified within the standard.

6.22.2.4 In case of dispute, it is recommended that resolution of dispute shall be subject to agreement between the manufacturer or supplier and purchaser.

1. *General*—Table 1 is a list of published test methods some of which are considered by ASTM as no longer viable. These and others not listed, may be used subject to agreement. Table 1 is a guide compilation of available chemical analysis methods for coppers and copper alloys listed by elemental alloy constituent or impurity and applicable range (by weight %). The Committee B05 Liaison to Committee E01 on Methods of Analysis may be consulted if there are any questions about the listed methods.

NOTE 8—Commonly accepted methods not included here are frequently used for routine chemical analysis.

TABLE 1 Compilation of Chemical Analysis Methods for Coppers and Copper Alloys

Element	Range or % max	Test Method(s)	Applicability[A]
Aluminum (Al)	2–12	E478; Titrimetric	General
	>0.10	E54; Gravimetric	General
Antimony (Sb)	0.05–0.70	E62	General
Arsenic (As)	0.0–0.50	E62	General
Bismuth (Bi)	0.1–6	JIS H1068	Bismuth alloys
Cadmium (Cd)	2–25 ppm	E53	Coppers
Carbon (C)	0.0–0.50	E76	Nickel-Copper alloys
Chromium (Cr)	0.003–2.0	ISO 4744	General
	0.30–0.70	E118	General
Cobalt (Co)	0.01–0.5	B75; Photometric	7xxx series alloys
Copper (Cu)	>50	E478; Electrolytic & Photometric	General
	99.75–99.99	E53; Electrolytic	Coppers
Iron (Fe)	0.003-1.25	E478; Photometric	General
	1.0 max	B75; Atomic Absorption	7xxx series alloys
	0.0–5.0	E54	General
Lead (Pb)	0.002–15.0	E478; Atomic Absorption	General
	2.0–30.0	E478; Titrimetric	General
Manganese (Mn)	0.10–12.0	E62	General
	0.10–12.0	B75; Photometric	7xxx series alloys
	28–32	E581 Titrimetric	General
Nickel (Ni) (incl Colbalt (Co))	0.03–5.0	E478; Photometric	General
	4.0–50.0	E478; Gravimetric	General
Phosphorus (P)	0.01–1.2	E62	General
	1–15	E1371; Gravimetric	Phosphor coppers
Silicon (Si)	0.005–5.50	E54; Perchloric Acid Dehydration	General
	0.1–5.0	E62	6xxx series alloys
Silver (Ag)	0.01–5.0	E54	General
	0.01–0.12	E478; Atomic Absorption	Silver Bearing Copper
Sulfur (S)	0.05–0.08	E76; Direct Combustion	Nickel-Copper alloys
	0.001–0.5	E76; Gravimetric	
Tellurium (Te)	0.003–0.05	ISO 7602 Part 1 E/F	General
	0.4–1.0	E121	Copper-Tellurium Alloys
Tin (Sn)	0.01–1.0	E478; Photometric	General
	0.50–20.0	E478; Titrimetric	General
Zinc (Zn)	0.02–2.0	E478; Atomic Absorption	General
	2.0–40.0	E478; Titrimetric	General

[A] Always, refer to the test method involved for the scope, specific details and limitations.