Designation: B 371/B 371M – 9602

Standard Specification for Copper-Zinc-Silicon Alloy Rod[1]

This standard is issued under the fixed designation B 371/B 371M; 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 Department of Defense.

1. Scope*

1.1 This specification establishes the requirements for copper-zinc-silicon alloy rod produced in Copper Alloy UNS Nos. C69400, C69430, C69700, and C69710.

1.1.1 If the purchaser does not specify the alloy to be supplied, product is permitted to be furnished in any of the alloys named in 1.1.

1.2 *Units*—The values stated in either inch-pound units or in SI units are ~~the~~ to be regarded as standard. ~~Values given in parentheses~~ Within the text, the SI units are shown in brackets. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 The following safety hazard caveat pertains only to 9.~~N~~1 of this spe~~1—M~~cification. *This standard does not purport to address all of the safety c~~u~~oncerns, 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 requirements prior to use.* (**Warning**—Mercury is a definite health hazard in use and disposal.)

2. Referenced Documents

2.1 *ASTM Standards:*

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[1] This specification is under the jurisdiction of ASTM Committee ~~B-5~~ B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.02 on Rod, Bar, Wire, Shapes~~,~~ and Forgings.

Current edition approved ~~April~~ Apr. 10, ~~1996.~~ 2002. Published June ~~1996.~~ 2002. Originally published as B 371 – 61. Last previous edition B 371 – 9~~3~~6.

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

B 154 Test Method for Mercurous Nitrate Test for Copper and Copper Alloys[2]
B 249/B 249M Specification for General Requirements for Wrought Copper and Copper Alloy Rod, Bar, Shapes, and Forgings
B 846 Terminology for Copper and Copper Alloys[2]
E 8 Test Methods for Tension Testing of Metallic Materials[3]
E 8M Test Methods for Tension Testing of Metallic Materials (Metric)[3]
E 54 Test Methods for Chemical Analysis of Special Brasses and Bronzes[4]
E 62 Test Methods for Chemical Analysis of Copper Alloys (Photometric Methods)[4]
E 478 Test Methods for Chemical Analysis of Copper Alloys[4]

3. Terminology

3.1 Refer to Terminology B 846 for definitionsGeneral Requirements
3.1 The following sections of Specification B 249/B 249M constitutes a part of this specification:
3.1.1 Terminology,
3.1.2 Workmanship, Finish, and Appearance,
3.1.3 Sampling,
3.1.4 Number of Tests and Retests,
3.1.5 Specimen Preparation,
3.1.6 Test Methods,
3.1.7 Significance of Numerical Limits,
3.1.8 Inspection,
3.1.9 Rejection and Rehearing,
3.1.10 Certification,
3.1.11 Test Report,
3.1.12 Packaging and Package Marking, and
3.1.13 Supplementary Requirements.
3.2 In addition, when a section with a title identical to that referenced in 3.1 appears in this specification, it contains additional requirements which supplement those appearing in Specification B 249/B 249M.

4. Ordering Information

4.1 Orders for product under this specification shall include the following information:
4.1.1 ASTM designation and year of issue (for example, B371 – 93), issue,
4.1.2 Copper alloy designation (for example, C69400), UNS No. designation,
4.1.3 *Form*—Cross section such as round, hexagon, etc., and so forth,
4.1.4 *Dimensions*—Diameter or distance between parallel surfaces,
4.1.5 Length, nominal,
4.1.6 *Quantity*—Total weight, footage, or number of pieces, and
4.1.7 When product is purchased for agencies of the U.S. Government (Section 9). Government.
4.2 The following requirements are optional and shall be included in the contract or purchase order when required:
4.2.1 Mercurous nitrate test (Section 8),
4.2.2 Certification, test,
4.2.2 Certification (Specification B 249/B 249M), and
4.2.3 Mill T test report (Specification B 249/B 249M).

5. Material and Manufacture

5.1 *Material*:
5.1.1 The material of manufacture shall be cast billets, logs, or rods of Copper Alloy UNS Nos. C69400, C69430, C69700, or C69710 of such soundness and structure as to make them suitable for processing into the desired product.
5.2 *Manufacture*:
5.2.1 The product shall be manufactured by hot extrusion and finished by such cold working, annealing, and straightening as may be necessary to achieve the required properties.

6. Chemical Composition

6.1 The material shall conform to the chemical compositional requirements specified in Table 1 for the Copper Alloy UNS No. designated in the ordering information.

[2] *Annual Book of ASTM Standards*, Vol 02.01.
[3] *Annual Book of ASTM Standards*, Vol 03.01.
[4] *Annual Book of ASTM Standards*, Vol 03.05.

TABLE 1 Chemical Requirements

Element	Composition, %							
	Copper Alloy UNS No.							
	C69400		C69430		C69700		C69710	
	min	max	min	max	min	max	min	max
~~Copper~~	~~80.0~~	~~83.0~~	~~80.0~~	~~83.0~~	~~75.0~~	~~80.0~~	~~75.0~~	~~80.0~~
Copper[A]	80.0	83.0	80.0	83.0	75.0	80.0	75.0	80.0
Silicon	3.5	4.5	3.5	4.5	2.5	3.5	2.5	3.5
Lead	...	0.30	...	0.30	0.50	1.5	0.50	1.5
Iron	...	0.20	...	0.20	...	0.20	...	0.20
Manganese	...	...	...	...	...	0.40	...	0.40
Arsenic	...	...	0.03	0.06	...	...	0.03	0.06
Antimony	...	...	...	...	...	...	...	...
Phosphorus	...	...	...	...	...	...	...	...
Zinc	remainder		remainder		remainder		remainder	

[A] Includes Silver.

6.1.1 These composition limits do not preclude the presence of other elements. ~~When required, limits~~ Limits shall be established and analysis required for unnamed elements by agreement between the manufacturer and the purchaser.

6.2 For copper alloys in which zinc is specified as the remainder, either copper or zinc is permitted to be taken as the difference between the sum of results for all elements analyzed and 100 %. When copper is so determined, that difference value shall conform to the requirements given in Table 1.

6.3 When all elements specified in Table 1 for the copper alloy designated in the ordering information are determined, the sum of results shall be 99.5 % minimum.

7. Temper

7.1 The standard temper for products under this specification is H04 (Hard).

8. Mechanical Property Requirements

~~7~~8.1 *Tensile Requirements*:

~~7~~8.1.1 The product shall conform to the tensile requirements prescribed in Table 2 for the size and alloy designated in the ordering information when tested in accordance with Test Methods ~~E 8.~~

~~8. Mercurous Nitrate Test~~

~~8.1 The product shall conform to the requirements of the test when tested in accordance with Test Method B 154.~~ E 8 or E 8M.

9. Performance Requirements

9.1 *Merc~~h~~urous Nitrate Test*:

9.1.1 When specifor~~e~~d in the ~~U.S. Government~~

~~9.1 Product purchased for agencies of~~ contract or purchase order, the ~~U.S. Government~~ product shall ~~conform to the additional requirements prescribed~~ be tested in ~~the Supplemental Requirements section~~ accordance with Test Method B 154, and show no signs of ~~Specification B 249 (4.1.7).~~ cracking.

10. ~~D~~ Other Requirements

10.1 *Purchases for the U.S. Government* :

TABLE 2 Tensile Requirements

Diameter or Distance Between Parallel Surfaces, in.~~ ([mm)]~~	Tensile Strength, min		Yield Strength at 0.5 % Extension Under Load, min		Elongation in 4× Diameter or Thickness of Specimen, min,%[A]
Temper H04 Hard	ksi[B]	MPa[C]	ksi[B]	MPa[C]	
Copper Alloy UNS Nos. C69400, C69430:					
~~Up to 1 (25.4), incl~~	~~80~~	~~550~~	~~40~~	~~250~~	~~15~~
~~Over 1 (25.4) to 2 (50.8), incl~~	~~75~~	~~515~~	~~35~~	~~240~~	~~15~~
Up to 1 (25.4), incl	80	550	40	250	15
Over 1 [25] to 2 [50], incl	75	515	35	240	15
Over 2 (50.8)	65	450	35	240	15
Copper Alloy UNS Nos. C69700, C69710:					
~~Up to 1 (25.4), incl~~	~~65~~	~~450~~	~~32~~	~~220~~	~~20~~
~~Over 1 (25.4)~~	~~55~~	~~380~~	~~28~~	~~195~~	~~25~~
Up to 1 (25.4), incl	65	450	32	220	20
Over 1 [25]	55	380	28	195	25

[A] In any case, a minimum gage length of 1 in.~~ ([25.4 mm)]~~ shall be used~~.~~

[B] ~~ksi = 1000 psi.~~

[C] ~~See Appendix X1~~.

10.1.1 Product purchased for agencies of the U.S. Government s, Mhall conform to the additional requirements pres,cribed in the Supplementary Requirements section of Specification B 249/B 249M.

11. Dimensions and Permissible Variations

101.1 The dimensions and tolerances for product furnished to this specification shall be as specified in the following tables and related paragraphs in Specification B 249/B 249M:

101.1.1 *Diameter or Distance Between Parallel Surfaces* —Refer to Table 2, Tolerance for Diameter of Cold-Drawn Rod.

101.1.2 *Length*—Refer to Table, Length Tolerances 13 for Rod, Bar, and Shapes and Table, Schedule of Lengths 15 with Ends for Rod and Bar.

101.1.3 *Straightness*—Refer to Table 16, Straightness Tolerances for Rod, Bar, and Shapes.

112. Test Methods

112.1 Chemical composition, in case of disagreement, shall be determined as follows:

Element	ASTM Test Methods
Antimony	E 62
Arsenic	E 62
Copper	E 478
Iron	E 478
Lead	E 478, atomic absorption
Manganese	E 62
Phosphorous	E 62
Silicon	E 54
~~Zinc~~	~~E 478, titrimetric~~
Zinc	E 478, Titrametric

112.2 The test method(s) to be followed for the determination of element(s) resulting from contractual or purchase order agreement shall be as agreed upon between the supplier and the purchaser.

~~12. General Requirements~~

~~12.1 The following sections of Specification B 249 constitutes a part of this specification:~~

~~12.1.1 Terminology,~~

~~12.1.2 Workmanship, Finish, and Appearance,~~

~~12.1.3 Sampling,~~

~~12.1.4 Number of Tests and Retests,~~

~~12.1.5 Specimen Preparation,~~

~~12.1.6 Test Methods,~~

~~12.1.7 Significance of Numerical Limits,~~

~~12.1.8 Inspection,~~

~~12.1.9 Rejection and Rehearing,~~

~~12.1.10 Certification,~~

~~12.1.11 Test Report,~~

~~12.1.12 Packaging and Package Marking, and~~

~~12.1.13 Supplementary Requirements.~~

~~12.2 In addition, when a section with a title identical to that referenced in 12.1 appears in this specification, it contains additional requirements which supplement those appearing in Specification B 249.~~

13. Keywords

13.1 copper-zinc-silicon ~~rod~~

~~APPENDIX~~

~~(Nonmandatory Information)~~

~~X1. METRIC EQUIVALENTS~~

~~X1.1 The SI unit for strength properties now shown is in accordance with the International System of Units (SI). The derived SI unit for force is the newton (N), which is defined as that force which when applied to a body having a mass of one kilogram gives it an acceleration of one metre per second squared ($N = kg \cdot m/s^2$). The derived SI unit for pressure or stress is the newton per square metre (N/m^2), which has been named the pascal (Pa) by the General Conference on Weights and Measures. Since 1 ksi = 6 894 757 Pa, the metric equivalents are expressed as megapascal (MPa), which is the same as MN/m^2 and N/mm^2.~~ rod; C69400; C69430; C69700; C69710

SUMMARY OF CHANGES

~~This section identifies~~

Committee B05 has identified the location of selected changes to this ~~specification that have been incorporated~~ standard since the ~~1993 issue.~~

~~(1) General Requirements section revised to identify~~ last issue (B 371-96) that may impact the ~~sections in Specification B 249 which constitutes a part~~ use of this ~~specification.~~

~~(2) Deleted from this text~~ standard.

(*1*) Revised as a ~~number of sections which previously, individually referenced Specification B 249.~~

~~(3) The Ordering Information~~ combined specification with inch-pound and SI units.

(*2*) Added a Temper section ~~was revised to eliminate reference to Specification B 249.~~

~~(4) Expanded upon,~~ and ~~gave meaning to,~~ established the ~~Material and Manufacture section.~~ standard temper as H04, Hard.

(*3*) Made editorial clarifications.