



Designation: B 422 – 06

# Standard Specification for Copper-Aluminum-Silicon-Cobalt Alloy, Copper-Nickel- Silicon-Magnesium Alloy, Copper-Nickel-Silicon Alloy, Copper-Nickel-Aluminum-Magnesium Alloy, and Copper- Nickel-Tin Alloy Sheet and Strip<sup>1</sup>

This standard is issued under the fixed designation B 422; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope\*

1.1 This specification establishes the requirements for<sup>2</sup> Copper Alloy UNS Nos. C19010, C19020, C19025, C63800, C64725, C70250, C70260, and C70265 sheet and strip.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in SI units represent mathematical conversions, which are provided for information only and are not considered standard.

1.3 *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.*

## 2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards:*<sup>3</sup>

**B 248** Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar

**B 248M** Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar [Metric]

**B 846** Terminology for Copper and Copper Alloys

**E 527** Practice for Numbering Metals and Alloys (UNS)

## 3. General Requirements

3.1 Material furnished to this specification shall be in accordance with the applicable requirements of the current edition of Specification **B 248**.

## 4. Terminology

4.1 *Definitions*—For definitions of terms related to copper and copper alloys, refer to Terminology **B 846**.

## 5. Ordering Information

5.1 Orders for material under this specification should include the following information:

5.1.1 Quantity (of each size),

5.1.2 Alloy: Copper Alloy UNS No. (Section 1),

5.1.3 Form of material (sheet or strip),

5.1.4 Temper (see 7.1),

5.1.5 Dimensions (thickness, width, length (if applicable),

5.1.6 How furnished (rolls, specific lengths with or without ends, stock lengths with or without ends),

5.1.7 Type of edge, if required (slit, sheared, sawed, square corners, rounded corners, rounded edges, or full-rounded edges (see 10.6),

5.1.8 Type of width and straightness tolerances, if required (slit-metal tolerances, square sheared-metal tolerances, sawed-metal tolerances, straightened or edge-rolled-metal tolerances) (Section 10), and

5.1.9 ASTM specification number and year of issue.

5.2 In addition, when material is purchased for agencies of the U.S. government, it shall conform to the Supplementary Requirements as defined in Specification **B 248** when specified in the contract or purchase order.

## 6. Chemical Composition

6.1 The materials shall conform to the compositions prescribed in **Table 1**.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.01 on Plate, Sheet, and Strip.

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<sup>2</sup> The UNS system for copper and copper alloys (see Practice **E 527**) is a simple expansion of the former standard designation system accomplished by the addition of a prefix “C” and a suffix “00.” The suffix can be used to accommodate composition variations of the base alloy.

<sup>3</sup> 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.

**TABLE 1 Chemical Requirements Composition %**

Element	C19010	C19020	C19025	C63800	C64725	C70250	C70260	C70265
Nickel	0.8–1.8	0.50–3.0	0.80–1.2	0.20 max.	1.3–2.7 <sup>A</sup>	2.2–4.2 <sup>B</sup>	1.0–3.0 <sup>B</sup>	1.0–3.0 <sup>B</sup>
Silicon	0.15–0.35	...	...	1.5–2.1	0.20–0.8	0.25–1.2	0.20–0.7	0.20–0.7
Lead, max	...	...	...	0.05	0.01	0.05	...	0.05
Iron, max	...	...	0.10	0.20	0.25	0.20	...	...
Zinc, max	...	...	0.20	0.8	0.50–1.5	1.0	...	0.30
Aluminum	...	...	...	2.5–3.1	...	...	...	...
Copper <sup>A</sup>	remainder	remainder	remainder	remainder	95.0 min	remainder	remainder	remainder
Cobalt	...	...	...	0.25–0.55	...	...	...	...
Manganese, max	...	...	...	0.10	...	0.10	...	...
Magnesium	...	...	...	...	0.20 max	0.05–0.30	...	...
Tin	...	0.30–0.9	0.7–1.1	...	0.20–0.8	...	...	0.05–0.8
Phosphorus	0.01–0.05	0.01–0.20	0.03–0.07	...	...	...	0.010 max	0.01 max
Calcium	...	...	...	...	0.01	...	...	...
Chromium	...	...	...	...	0.20	...	...	...

<sup>A</sup> Including silver.

<sup>B</sup> Including cobalt.

6.2 These specification limits do not preclude the presence of other elements. Limits for unnamed elements may be established by agreement between manufacturer or supplier and purchaser.

6.3 When copper is listed as remainder, copper may be taken as the difference between the sum of all the elements analyzed and 100 %. When all the elements in **Table 1** for Alloys C 19010, C63800, C64725, C70250, C70260 and C70265 are analyzed, their sum shall be 99.5 % min. When all the elements in **Table 1** for Alloy C19025 are analyzed, their sum shall be 99.7 % min. When all the elements in **Table 1** for Alloy C19020 are analyzed, their sum shall be 99.8 % min.

## 7. Temper

7.1 Tempers available under this specification are as designated in **Tables 2-7**.

## 8. Mechanical Properties

8.1 Copper Alloy UNS No. C63800 is a dispersion-strengthened alloy which does not require heat treatment. The annealed and rolled tempers shall conform to the tensile property requirements prescribed in **Table 2**.

8.2 Copper Alloy UNS No. C70250 is supplied in a mill-hardened, or cold-worked and precipitation heat-treated, or precipitation heat-treated or spinodal heat-treated, 1/2 Hd and stress-relieved tempers. The 0.2 % offset yield strength shall be the standard tests for these tempers and shall conform to the requirements specified in **Table 3**.

**TABLE 3 Yield Requirements for Copper Alloy UNS No. C70250**

Temper Designation	Yield Strength at 0.2 % Offset	
	ksi <sup>A</sup>	MPa <sup>B</sup>
TM00	65–90	450–620
TM02	83–110	585–760
TM03	95–120	655–825
TR02	80 min	550 min
TH03	65–85	450–585

<sup>A</sup> ksi = 1000 psi.

<sup>B</sup> See **Appendix X1**.

**TABLE 4 Tensile and Yield Requirements for Copper Alloy UNS No. C70260 and C70265**

Temper Designation	Yield Strength at 0.2 % Offset	
	ksi <sup>A</sup>	MPa <sup>B</sup>
TM00	65–85	450–585
TM02	90–100	620–690
TM03	95–115	653–790
TM04	100–120	687–825

<sup>A</sup> ksi = 1000 psi.

<sup>B</sup> See **Appendix X1**.

8.2.1 If ductility or formability requirements are desired, they shall be negotiated and agreed upon between manufacturer and purchaser.

8.3 Copper Alloys UNS No. C70260 and C70265 are supplied in a mill-hardened temper. The 0.2 % offset yield

**TABLE 2 Tensile Property Requirements and Approximate Hardness Values for Copper Alloy UNS No. C63800**

Temper		Tensile Strength		Elongation in 2 in. (50.8 mm), %	Approximate Rockwell Hardness <sup>A</sup>	
Designation	Name	ksi <sup>B</sup>	MPa <sup>C</sup>		Rockwell B	Superficial 30T
O60	soft anneal	78 max	540 max	37 min	...	...
O61	annealed	77–87	530–600	27–40	...	70–78
H01	¼ hard	90–102	620–705	...	92–96	76–80
H02	½ hard	100–112	690–775	...	95–98	79–81
H03	¾ hard	105–117	720–810	...	97–99	80–82
H04	hard	114–126	785–870	...	98–100	81–83
H06	extra hard	118–130	815–900	...	99–101	81–83
H08	spring	123–134	845–925	...	99–101	82–84
H10	extra spring	130 min	900 min	...	100 min	83 min

<sup>A</sup> Hardness values shown apply only to direct determination, not converted values. They are for information only.

<sup>B</sup> ksi = 1000 psi.

<sup>C</sup> See **Appendix X1**.