Designation: B888/B888M – 19

Standard Specification for Copper Alloy Strip for Use in Manufacture of Electrical Connectors or Spring Contacts[1]

This standard is issued under the fixed designation B888/B888M; 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 specification establishes the requirements for copper alloy strip for use in the manufacture of electrical connectors or spring contacts produced from one of the following Copper Alloy UNS Nos.:[2] C14530, C15100, C15500, C17000, C17200, C17410, C17450, C17460, C17500, C17510, C19002, C19010, C19015, C19025, C19210, C19400, C19500, C19700, C23000, C26000, C40810, C40850, C40860, C42200, C42500, C42520, C42600, C50580, C50780, C51000, C51080, C51100, C51180, C51980, C52100, C52180, C52480, C63800, C64725, C65400, C68800, C70250, C70260, C70265, C70310, C70350, C75200, and C76200.

1.2 The requirements for the other copper alloys such as copper-nickel-tin spinodal, UNS C72650, C72700, and C72900, shall be as prescribed in the current edition of Specification B740.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *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:*[3]

B193 Test Method for Resistivity of Electrical Conductor Materials

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)

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

B740 Specification for Copper-Nickel-Tin Spinodal Alloy Strip

B820 Test Method for Bend Test for Determining the Formability of Copper and Copper Alloy Strip

B846 Terminology for Copper and Copper Alloys

E8/E8M Test Methods for Tension Testing of Metallic Materials

E54 Test Methods for Chemical Analysis of Special Brasses and Bronzes (Withdrawn 2002)[4]

E62 Test Methods for Chemical Analysis of Copper and Copper Alloys (Photometric Methods) (Withdrawn 2010)[4]

E75 Test Methods for Chemical Analysis of Copper-Nickel and Copper-Nickel-Zinc Alloys (Withdrawn 2010)[4]

E478 Test Methods for Chemical Analysis of Copper Alloys

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.2 *ISO Standards:*[5]

ISO 4744 Copper and Copper Alloys—Determination of Chromium Content—Flame Atomic Absorption Spectrometric Method

[1] This specification is under the jurisdiction of 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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[2] The UNS system for copper and copper alloys (see Practice E527) 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.

[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.

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

[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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

ISO 7602 Copper and Copper Alloys—Determination of Tellurium Content

3. Terminology

3.1 *Definitions*—For definition of terms used in this specification, refer to Terminology B846.

4. General Requirements

4.1 For product furnished under this specification in English units, the following sections of Specification B248 must constitute a part of this specification. For product furnished under this specification in the SI units, the following sections of Specification B248M must constitute a part of this specification.

4.1.1 Terminology;

4.1.2 Materials and Manufacture;

4.1.3 Dimensions, Weights, and Permissible Variations;

4.1.4 Workmanship, Finish, and Appearance;

4.1.5 Sampling;

4.1.6 Number of Tests and Retests;

4.1.7 Specimen Preparation;

4.1.8 Test Methods;

4.1.9 Significance of Numerical Limits;

4.1.10 Certification;

4.1.11 Test Reports; and

4.1.12 Packaging and Package Marking.

4.2 In the event of a conflict between this specification and Specification B248 or B248M, the requirements of this specification shall take precedence.

5. Classification

5.1 Product produced to this specification is classified as strip material to be used for spring contact or electrical and electronic connector applications only.

6. Ordering Information

6.1 Contract or purchase orders for product under this specification should include the following information:

6.1.1 ASTM designation and year of issue;

6.1.2 UNS alloy designation;

6.1.3 Dimensions, for example, thickness, width;

6.1.4 Quantity; and

6.1.5 Temper (Section 8).

6.2 The following options are available under this specification and shall be specified in the contract or purchase order when required:

6.2.1 Type of edge: slit, sheared, sawed, square corners, rounded corners, rounded edges, or full-rounded edges (Section 11);

6.2.2 Width and straightness tolerances, slit-metal tolerances, square-sheared metal tolerances, sawed metal tolerances, straightened or edge-rolled metal tolerances (Section 11);

6.2.3 Identification marking (Section 22);

6.2.4 Certification (Section 20);

6.2.5 Mill test report (Section 21); and

6.2.6 How packaged: coil wound in traverse or pancake style (Section 22).

6.2.6.1 Number of strip lengths per coil,

6.2.6.2 Size and weight of each coil, and

6.2.7 The electrical resistivity or any other physical and electrical properties (See Table X1.1).

7. Materials and Manufacture

7.1 *Material*—The material of manufacture shall be a cast bar, slab, cake, billet, or other form of the composition given in Table 1 for the specified alloy, suitable for processing into the product prescribed in this specification.

7.2 *Manufacture*—The product shall be produced by either hot- or cold-working operation. It shall be finished, unless otherwise specified, by such hot working, cold working, annealing, or heat treatment as may be necessary to meet the properties specified in Table 2.

7.3 *Edges*—The edges shall be slit or rolled edges as specified by the buyer. Slit edges shall be furnished unless otherwise specified or agreed upon between the purchaser and supplier or manufacturer.

8. Chemical Composition

8.1 The materials shall conform to the chemical compositional requirements in Table 1 for the corresponding Copper Alloy UNS Number designation specified in the ordering information.

8.2 These composition limits do not preclude the presence of other elements. Limits for unnamed elements may be established and analysis required by agreement between manufacturer or supplier and purchaser when required.

8.3 Copper, when given as the remainder, is determined as the difference between the sum of results for all elements determined and 100 %.

8.4 Zinc, when given as the remainder, is determined as the difference between the sum of results for all elements determined and 100 %.

8.4.1 For those copper alloys in which zinc is given as the remainder, copper may be determined by difference; however, when so determined, the result shall conform to the limits prescribed in Table 1.

8.5 When a chemical analysis is performed as specified in the ordering information, for the Copper Alloy UNS No. in Table 1, copper plus the sum of the named elements shall be as specified in the appropriate table footnote.

TABLE 1 Chemical Requirements

Copper Alloy UNS No.	Elements Composition, %																
	Copper	Alum -inum	Beryll -ium	Cobalt	Iron	Lead	Magnes- ium	Man- ganese	Nickel	Phos- phorus	Tin	Zinc	Chro- mium	Zirco- nium	Silicon	Silver	Tellur -ium	Other
C14530	99.90[A] min	...	...	...	...	...	...	...	...	0.001–0.010	0.003–0.023	...	...	...	...	...	0.003–0.023[B]	...
C15100[C]	99.80[D] min	...	...	...	...	...	...	...	...	...	...	...	...	0.05–0.15	...	...	...	...
C15500	99.75[D] min	...	...	...	...	...	0.08–0.13	...	...	0.040–0.080	...	...	...	...	...	0.027–0.10	...	...
C17000[E]	remainder[D]	0.20 max	1.60–1.85	0.20[F] min	...	...	...	...	...	...	...	...	...	...	0.20 max	...	...	...
C17200[E]	remainder[D]	0.20 max	1.80–2.00	0.20[F] min	...	...	...	...	...	...	...	...	...	...	0.20 max	...	...	...
C17410[E]	remainder[D]	0.20 max	0.15–0.50	0.35–0.6	0.20 max	...	...	...	...	...	...	...	...	...	0.20 max	...	...	...
C17450[E]	remainder[D]	0.20 max	0.15–0.50	...	0.20 max	...	...	...	0.50–1.0	...	0.25 max	...	...	0.50 % max	0.20 max	...	...	...
C17460[E]	remainder[D]	0.20 max	0.15–0.50	...	0.20 max	...	...	...	1.0–1.4	...	0.25 max	...	...	0.50 % max	0.20 max	...	...	...
C17500[E]	remainder[D]	0.20 max	0.4–0.7	2.4–2.7	0.10 max	...	...	...	...	...	...	...	...	...	0.20 max	...	...	...
C17510[E]	remainder[D]	0.20 max	0.2–0.6	0.3 max	0.10 max	...	...	...	1.4–2.2	...	...	...	...	...	0.20 max	...	...	...
C19002[E]	remainder[D]	...	...	...	0.10	0.05	0.01	...	1.4–1.7[G]	0.05	0.02–0.30	0.04–0.35	...	0.005–0.05	0.20–0.35	0.02–0.50	...	...
C19010[E]	remainder[D]	...	...	...	...	...	...	...	0.8–1.8	0.01–0.05	...	...	...	...	0.15–0.35	...	...	...
C19015[H]	remainder[D]	...	...	...	...	...	0.02–0.15	...	0.50–2.4	0.02–0.20	...	...	...	...	0.10–0.40	...	...	...
C19025[I]	remainder[D]	...	...	...	0.10 max	...	...	...	0.8–1.2	0.03–0.07	0.7–1.1	0.20 max	...	...	...	...	...	...
C19210[H]	remainder	...	...	...	0.05–0.15	...	...	...	...	0.025–0.04	...	...	...	...	...	...	...	...
C19400[H]	97.0 min	...	...	...	2.1–2.6	0.03 max	...	...	...	0.015–0.15	...	0.05–0.20	...	...	...	...	...	...
C19500[H]	96.0 min	0.02 max	...	0.30–1.3	1.0–2.0	0.02 max	...	...	...	0.01–0.35	0.10–1.0	0.20 max	...	...	...	...	...	...
C19700[H]	remainder	...	...	0.05 max	0.30–1.2	0.05 max	0.01–0.20	0.05 max	0.05 max	0.10–0.40	0.20 max	0.20 max	...	...	...	...	...	...
C23000[H]	84.0-86.0	...	...	...	0.05 max	0.05 max	...	...	...	...	...	remainder	...	...	...	...	...	...
C26000[I]	68.5-71.5	...	...	...	0.05 max	0.07 max	...	...	...	...	...	remainder	...	...	...	...	...	...
C40810[I]	94.5-96.5	...	...	...	0.08–0.12	0.05 max	...	...	0.11–0.20	0.028–0.04	1.8–2.2	remainder	...	...	...	...	...	...
C40850[I]	94.5-96.5	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.20	2.6–4.0	remainder	...	...	...	...	...	...

TABLE 1 *Continued*

Copper Alloy UNS No.	Elements Composition, %																	
	Copper	Alum -inum	Beryll -ium	Cobalt	Iron	Lead	Magnes-ium	Man-ganese	Nickel	Phos-phorus	Tin	Zinc	Chro-mium	Zirco-nium	Silicon	Silver	Tellur -ium	Other
C40860[I]	94.0-96.0	...	...	...	0.01–0.05	0.05 max	...	...	0.05–0.20	0.02–0.04	1.7–2.3	remainder	...	...	...	...	...	...
C42200[I]	86.0-89.0	...	...	...	0.05 max	0.05 max	...	...	...	0.35 max	0.8–1.4	remainder	...	...	...	...	...	...
C42500[I]	87.0-90.0	...	...	...	0.05 max	0.05 max	...	...	...	0.35 max	1.5–3.0	remainder	...	...	...	...	...	...
C42520[I]	88.0-91.0	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.20	1.5–3.0	remainder	...	...	...	...	...	...
C42600[I]	87.0-90.0[D]	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20[G]	0.01–0.20	2.5–4.0	remainder	...	...	...	...	...	...
C50580[E]	remainder	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.35	1.0–1.7	0.30 max	...	...	...	...	...	...
C50780[E]	remainder	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.35	1.7–2.3	0.30 max	...	...	...	...	...	...
C51000[E]	remainder	...	...	...	0.10 max	0.05 max	...	...	...	0.03–0.35	4.2–5.8	0.30 max	...	...	...	...	...	...
C51080[E]	remainder	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.35	4.8–5.8	0.30 max	...	...	...	...	...	...
C51100[E]	remainder	...	...	...	0.10 max	0.05 max	...	...	...	0.03–0.35	3.5–4.9	0.30 max	...	...	...	...	...	...
C51180[E]	remainder	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.35	3.5–4.9	0.30 max	...	...	...	...	...	...
C51980[E]	remainder	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.35	5.5–7.0	0.30 max	...	...	...	...	...	...
C52100[E]	remainder	...	...	...	0.10 max	0.05 max	...	...	...	0.03–0.35	7.0–9.0	0.20 max	...	...	...	...	...	...
C52180[E]	remainder	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.35	7.0–9.0	0.30 max	...	...	...	...	...	...
C52480[E]	remainder	...	...	...	0.05–0.20	0.05 max	...	...	0.05–0.20	0.01–0.35	9.0–11.0	0.30 max	...	...	...	...	...	...
C63800[E]	remainder[D]	2.5-3.1	...	0.25–0.55	0.20 max	0.05 max	...	0.10 max	0.20 max	...	...	0.8 max	...	...	1.5–2.1	...	...	...
C64725[E]	95.0 min[D]	...	...	...	0.25	0.01	0.20	...	1.3–2.7[G]	...	0.20–0.8	0.50–1.5	0.09	...	0.20–0.8	...	...	0.01 Calcium
C65400[E]	remainder[D]	...	...	...	...	0.05 max	...	...	...	...	1.2–1.9	0.50 max	0.01–0.12	...	2.7–3.4	...	...	...
C68800[E]	remainder[D]	3.0-3.8[J]	...	0.25–0.55	0.20 max	0.05 max	...	...	...	...	...	21.3–24.1[J]	...	...	...	...	...	...
C70250[E]	remainder[D]	...	...	...	0.20 max	0.05 max	0.05–0.30	0.10 max	2.2–4.2[G]	...	...	1.0 max	...	...	0.25–1.2	...	...	...
C70260[E]	remainder[D]	...	...	...	...	...	...	...	1.0–3.0[G]	0.01 max	...	...	...	...	0.20–0.7	...	...	...
C70265[E]	remainder[D]	...	...	...	...	0.05 max	...	...	1.0–3.0[G]	0.01 max	0.05–0.8	0.30 max	...	...	0.20–0.7	...	...	...
C70310[E]	remainder[D]	...	...	...	0.10	0.05	0.01	...	1.0–4.0[G]	0.05	1.0	2.0	...	0.005–0.05	0.08–1.0	0.02–0.50	...	...
C70350[E]	remainder[D]	...	...	1.0–2.0	0.20 max	0.05 max	0.04 max	0.20 max	1.0–2.5	...	...	1.0 max	...	...	0.50–1.2	...	...	...
C75200[E]	63.0-66.5[D]	...	...	...	0.25 max	0.05 max	...	0.50 max	16.5–19.5[G]	...	...	remainder	...	...	...	...	...	...

TABLE 1 *Continued*

Copper Alloy UNS No.	Elements Composition, %																	
	Copper	Alum -inum	Beryll -ium	Cobalt	Iron	Lead	Magnes- ium	Man- ganese	Nickel	Phos- phorus	Tin	Zinc	Chro- mium	Zirco- nium	Silicon	Silver	Tellur -ium	Other
C76200[E]	57.0-61.0[D]	...	...	...	0.25 max	0.09 max	...	0.50 max	11.0–13.5[G]	...	...	remainder	...	...	...	...	...	...

[A] Includes silver + tin + tellurium + selenium.
[B] Tellurium or selenium, or both.
[C] Copper + the sum of the named elements shall be 99.9 % min.
[D] Copper value includes silver.
[E] Copper + the sum of the named elements shall be 99.5 % min.
[F] Nickel + cobalt, 0.20 % min; nickel + iron +cobalt, 0.6 % max.
[G] Includes cobalt.
[H] Copper + the sum of the named elements shall be 99.8 % min.
[I] Copper + the sum of the named elements shall be 99.7 % min.
[J] Aluminum + zinc = 25.1–27.1.

TABLE 2 Mechanical Requirements

Temper Designation		Tensile Strength, ksi		Tensile Strength, MPa		Yield Strength (0.2 % Offset), ksi	Yield Strength (0.2 % Offset), MPa	Elongation, %
Standard	Former	min	max	min	max	min	min	min
				Copper Alloy UNS NO. C14530				
H01	¼ hard	35	45	240	310	26	180	7
H02	½ hard	40	50	275	345	33	230	5
H03	¾ hard	44	54	305	370	39	270	3
H04	hard	47	57	325	395	43	295	2
H06	extra hard	50	60	345	415	47	325	1
H08	spring	54	64	370	440	51	350	1
H10	extra spring	58	. . .	400	. . .	56	385	. . .
				Copper Alloy UNS NO. C15100				
O61	annealed	37	42	255	290	9	60	35
H01	¼ hard	40	45	275	310	26	180	11
H02	½ hard	43	51	295	350	35	240	4
H03	¾ hard	47	56	325	385	45	310	2
H04	hard	53	62	365	425	51	350	2
H06	extra hard	59	65	405	450	57	395	1
H08	spring	64	71	440	490	62	425	1
				Copper Alloy UNS NO. C15500				
O61	annealed	34	43	235	295	15	105	30
H02	½ hard	45	55	310	380	38	260	13
H04	hard	56	64	385	440	50	345	6
H06	extra hard	63	72	435	495	56	385	5
H08	spring	65	73	450	505	60	415	4
H10	extra spring	68	75	470	515	63	435	3
				Copper Alloy UNS NO. C17000				
TB00	A	60	78	410	540	30	210	35
TD01	¼ H	75	88	520	610	60	415	15
TD02	½ H	85	100	590	690	75	520	9
TD04	H	100	130	690	900	90	620	2
TF00	AT	150	180	1030	1240	130	900	3
TH01	¼ HT	160	190	1100	1310	135	930	2.5
TH02	½ HT	170	200	1170	1380	145	1000	1
TH04	HT	180	210	1240	1450	155	1070	1
AM	TM00	100	110	690	760	70	480	18
¼ HM	TM01	110	120	760	830	80	550	15
½ HM	TM02	120	135	830	930	95	660	12
HM	TM04	135	150	930	1030	110	760	9
SHM	TM05	150	160	1030	1100	125	860	9
XHM	TM06	155	175	1070	1210	135	930	3
				Copper Alloy UNS NO. C17200				
TB00	A	60	78	410	540	30	210	35
TD01	¼ H	75	88	520	610	60	415	20
TD02	½ H	85	100	590	690	75	520	12
TD04	H	100	130	690	900	90	620	2
TF00	AT	165	195	1140	1340	140	970	4
TH01	¼ HT	175	205	1210	1410	150	1030	3
TH02	½ HT	185	215	1280	1480	160	1100	2
TH04	HT	190	220	1310	1520	165	1140	1
AM	TM00	100	110	690	760	70	480	16
¼ HM	TM01	110	120	760	830	80	550	15
½ HM	TM02	120	135	830	930	95	660	12
HM	TM04	135	150	930	1030	110	760	9
SHM	TM05	150	160	1030	1100	125	860	9
XHM	TM06	155	175	1070	1210	135	930	4
XHMS	TM08	175	190	1210	1310	150	1030	3
				Copper Alloy UNS NO. C17410				
TH02	½ HT	95	115	665	790	80	550	10
TH04	HT	110	130	760	895	100	690	7
				Copper Alloy UNS NO. C17450				
TH02	½ HT	95	115	655	790	80	550	12
				Copper Alloy UNS NO. C17460				
TH03	¾ HT	115	135	790	930	95	655	11
TH04	HT	120	140	825	965	105	720	10
				Copper Alloy UNS NO. C17500				
TB00	A	35	55	240	380	25	170	20
TD04	H	70	85	480	585	55	380	3
TF00	AT	100	120	690	830	80	550	10
TH04	HT	110	130	760	900	95	655	8
HTR		120	150	830	1030	110	760	1
HTC		75	85	512	590	50	340	8
				Copper Alloy UNS NO. C17510				
TB00	A	35	55	240	380	25	170	20
TD04	H	70	85	480	585	55	380	2