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Designation: B174 - 10 (Reapproved 2015) B174 - 17

Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors¹

This standard is issued under the fixed designation B174; 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 U.S. Department of Defense.

1. Scope

1.1 This specification covers bare bunch-stranded conductors made from round copper wires, either uncoated or coated with tin, lead, or lead-alloy for use as electrical conductors (Explanatory Note 1 and Explanatory Note 2).

1.2 Coated wires shall include only those wires with finished diameters and densities substantially equal to the respective diameters and densities of uncoated wires.

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 may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.3.1 For conductor sizes designated by AWG or kcmil, the requirements in SI units have been numerically converted from corresponding values, stated or derived, in inch-pound units. For conductor sizes designated by SI units only, the requirements are stated or derived in SI units.

<u>1.4 This international standard was developed in accordance with internationally recognized principles on standardization</u> 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 The following documents of the issue in effect at the time of reference form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:²

ASTM B174-17

B3 Specification for Soft or Annealed Copper Wire B33 Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes

- B172 Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors
- B189 Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes

B193 Test Method for Resistivity of Electrical Conductor Materials

B263 Test Method for Determination of Cross-Sectional Area of Stranded Conductors

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

2.3 American National Standard:

ANSI C42.35 Definitions of Electrical Terms³

3. Classification

3.1 For the purpose of this specification bunch-stranded conductors are classified as shown in Tables 1 and 2.

¹ This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.04 on Conductors of Copper and Copper Alloys.

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² 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.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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Area of Cross Section		Classification, Uncoated Copper Size, and Minimum Number						Coated Copper				
		Size, AWG	of Wires Class I Nominal Wire Diameter 0.0201 In.	Nominal dc resistance @20C	Maximum dc resistance @20C	Nominal dc resistance @20C	Maximum dc resistance @20C	Nominal dc resistance @20C	Maximum dc resistance @20C	Nominal dc resistance @20C	Maximum o resistance @20C	
			(0.511 mm)									
cmil 20820	 10.5	7	24 AWG 52	ohm/kft 0.508	ohm/kft 0.518	ohm/km 1.67	ohm/km 1.70	ohm/kft 0.528	ohm/kft 0.539	ohm/km 1.73	ohm/km 1.77	
16510	8.37	8	52 41	0.508	0.654	2.10	2.14	0.526	0.539	2.19	2.23	
13090	6.63	9	33	0.808	0.824	2.65	2.70	0.840	0.857	2.76	2.23	
10380 5.26		10	26	1.02	1.04	3.34	3.41	1.06	1.08	3.48	3.55	
TABLE	1 B Classifie	cation and	d Constructio	on Requiren	nents of Bur	ch-Strande	ed Conducto	ors—Class	J Bunch Str	anded Con	ductors ^A	
	a of		Classification,		Uncoated	I Copper		Coated Copper				
Cross	Section		Size, and Minimum Number of Wires									
		Size,	Class J	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	
		AWG	Nominal	dc	dc	dc	dc	dc	dc	dc	dc	
			Wire	resistance	resistance	resistance	resistance	resistance	resistance	resistance	resistanc	
			Diameter 0.0126 In. (0.320 mm)	@20C	@20C	@20C	@20C	@20C	@20C	@20C	@20C	
cmil	mm		28 AWG	ohm/kft	ohm/kft	ohm/km	ohm/km	ohm/kft	ohm/kft	ohm/km	ohm/km	
10380	5.26	10	65	1.02	1.04	3.34	3.41	1.08	1.10	3.54	3.61	
6530	3.31	12	41	1.62	1.65	5.31	5.42	1.72	1.75	5.64	5.76	
4110 2580	2.08 1.31	14 16	26 16	2.57	2.62	8.44 13.5	8.61	2.73 4.35	2.79 4.44	8.96 14.3	9.14	
1620	0.821	18	10	6.53	6.66	21.4	21.9	6.94	4.44 7.07	22.8	14.6 23.2	
1020	0.517	20	7	10.4	10.6	34.0	34.7	11.0	11.2	36.1	36.8	
TABLE [·]	1 C Classific	cation and	l Constructio	n Requirem	nents of Bun	ch-Strande	d Conducto	ors—Class	K Bunch Str	anded Con	ductors ^A	
	a of Section		Classification, Size,		Uncoated	l Copper			Coated	Copper		
			and Minimum									
			Number St of Wires									
Are	s://standar ea of Section		DC Number St of Wires Classification, Size, and inimum Number		ist/01120a					Copper		
Are	ea of	ds.iteh.a Size,	DC Number St of Wires Classification, Size, and inimum	andards/s			46cb-a71 Maximum	c-a84a3. Nominal		<u>Copper</u> Nominal	Maximun	
Are	ea of		DC Number St of Wires Classification, Size, and inimum Number of Wires		Uncoated	<u>l Copper</u>			Coated		Maximun dc	
Are	ea of	Size,	Number Size, of Wires Classification, Size, and inimum Number of Wires Class K	Nominal	<u>Uncoated</u> Maximum	<u>I Copper</u> Nominal	Maximum	Nominal	<u>Coated</u> Maximum	Nominal	Maximun dc resistanc @20C	
<u>Are</u> <u>Cross</u> cmil	<u>a of</u> Section mm	Size, AWG	Classification, <u>Size,</u> and inimum <u>Number</u> of Wires Class K Nominal Wire Diameter 0.0100 In. (0.254 mm) 30 AWG	Nominal dc resistance @20C ohm/kft	Uncoated Maximum dc resistance @20C ohm/kft	Nominal dc resistance @20C ohm/km	Maximum dc resistance @20C ohm/km	Nominal dc resistance @20C ohm/kft	Coated Maximum dc resistance @20C ohm/kft	Nominal dc resistance @20C ohm/km	dc resistanc @20C ohm/km	
<u>Are</u> <u>Cross</u> <u>cmil</u> 10380	mm 5.26	Size, AWG	Number Size, of Wires Classification, Size, and inimum Number of Wires Class K Nominal Wire Diameter 0.0100 In. (0.254 mm) 30 AWG	Nominal dc resistance @20C ohm/kft 1.02	Uncoated Maximum dc resistance @20C ohm/kft 1.04	Nominal dc resistance @20C ohm/km 3.35	Maximum dc resistance @20C ohm/km 3.41	Nominal dc resistance @20C ohm/kft 1.09	Coated Maximum dc resistance @20C ohm/kft 1.12	Nominal dc resistance @20C ohm/km 3.58	dc resistanc @20C <u>ohm/km</u> 3.65	
<u>Are</u> <u>Cross</u> <u>cmil</u> 10380 6530	mm 5.26 3.31	Size, AWG 10 12	Classification, <u>Size,</u> and inimum <u>Number</u> of Wires Class K Nominal Wire Diameter 0.0100 In. (0.254 mm) 30 AWG 104 65	Nominal dc resistance @20C ohm/kft 1.02 1.62	Uncoated Maximum dc resistance @20C ohm/kft 1.04 1.65	Nominal dc resistance @20C ohm/km 3.35 5.31	Maximum dc resistance @20C ohm/km 3.41 5.42	Nominal dc resistance @20C ohm/kft 1.09 1.74	Coated Maximum dc resistance @20C ohm/kft 1.12 1.77	Nominal dc resistance @20C ohm/km 3.58 5.71	dc resistanc @20C <u>ohm/km</u> 3.65 5.82	
<u>Area</u> <u>Cross</u> <u>cmil</u> 10380 6530 4110	mm 5.26 3.31 2.08	Size, AWG 10 12 14	Classification, <u>Size,</u> and inimum <u>Number</u> of Wires Class K Nominal Wire Diameter 0.0100 In. (0.254 mm) 30 AWG 104 65 41	Nominal dc resistance @ 20C ohm/kft 1.02 1.62 2.57	Uncoated Maximum dc resistance @20C ohm/kft 1.04 1.65 2.62	Nominal dc resistance @20C ohm/km 3.35 5.31 8.43	Maximum dc resistance @20C ohm/km 3.41 5.42 8.60	Nominal dc resistance @20C ohm/kft 1.09 1.74 2.76	Coated Maximum dc resistance @20C ohm/kft 1.12 1.77 2.82	Nominal dc resistance @20C ohm/km 3.58 5.71 9.06	dc resistanc @20C ohm/km 3.65 5.82 9.24	
<u>crnil</u> 10380 6530 4110 2580	mm 5.26 3.31 2.08 1.31	Size, AWG 10 12 14 16	H/C Number SI of Wires Classification, Size, and inimum Number of Wires Class K Nominal Wire Diameter 0.0100 In. (0.254 mm) 30 AWG 104 65 41 26	Nominal dc resistance @ 20C ohm/kft 1.02 1.62 2.57 4.10	Uncoated Maximum dc resistance @20C ohm/kft 1.04 1.65 2.62 4.18	Nominal dc resistance @20C ohm/km 3.35 5.31 8.43 13.5	Maximum dc resistance @20C <u>ohm/km</u> 3.41 5.42 8.60 13.7	Nominal dc resistance @20C ohm/kft 1.09 1.74 2.76 4.40	Coated Maximum dc resistance @20C ohm/kft 1.12 1.77 2.82 4.49	Nominal dc resistance @20C <u>ohm/km</u> 3.58 5.71 9.06 14.4	dc resistanc @ 20C <u>ohm/km</u> 3.65 5.82 9.24 14.7	
<u>Area</u> <u>Cross</u> <u>cmil</u> 10380 6530 4110	mm 5.26 3.31 2.08	Size, AWG 10 12 14	Classification, <u>Size,</u> and inimum <u>Number</u> of Wires Class K Nominal Wire Diameter 0.0100 In. (0.254 mm) 30 AWG 104 65 41	Nominal dc resistance @ 20C ohm/kft 1.02 1.62 2.57	Uncoated Maximum dc resistance @20C ohm/kft 1.04 1.65 2.62	Nominal dc resistance @20C ohm/km 3.35 5.31 8.43	Maximum dc resistance @20C ohm/km 3.41 5.42 8.60	Nominal dc resistance @20C ohm/kft 1.09 1.74 2.76	Coated Maximum dc resistance @20C ohm/kft 1.12 1.77 2.82	Nominal dc resistance @20C ohm/km 3.58 5.71 9.06	dc resistanc @20C ohm/km 3.65 5.82 9.24	

^A The constructions shown in these tables are typical of those used in the industry. It is intended that these tables preclude other constructions which may be desirable for specific applications. The constructions shown provide for a finished stranded conductor approximately of the area indicated. When specified by the purchaser, the number or sizes of wire may be increased to provide additional area to compensate for draw-down during subsequent processing. ^BAs an alternate to the construction shown for 20 AWG, Class K; for hook-up wire construction may consist of 8 wires 0.0100 in. (0.254 mm) diameter around wire of 0.0142 is (0.024 mm) diameter.

in. (0.361 mm) diameter.



TABLE 2 Classification and Construction Requirements of Bunch-Stranded Conductors—Class L, M, O, P and Q Bunch Stranded

							Cond	uctors								
Area of Cross Section			Classification, Size, and					Uncoated Copper Coated Copper								
			Minimum Number													
			of Wires													
		Size, AWG	Class L	Class M	Class O	Class P	Class Q	Nominal dc	Maximum dc	Nominal dc	Maximum dc	Nominal dc	Maximum dc	Nominal dc	Maximum dc	
								resistance @20C	resistance @20C	resistance @20C	eresistance @20C	resistance @20C	e resistance @20C	eresistance @20C	e resistance @20C	
			Nominal	Nominal	Nominal	Nominal	Nominal	-								
			Wire	Wire	Wire	Wire	Wire									
			Diameter	Diameter	Diameter	Diameter	Diameter									
			0.0080 In	0.0063 In	.0.0050 In	. 0.0040 In	.0.0031 In									
			(0.511	(0.320	(0.254	(0.320	(0.254									
			mm)	mm)	mm)	mm)	mm)									
cmil	mm	-	32 AWG	34 AWG	36 AWG	38 AWG	40 AWG	ohm/kft	ohm/kft	ohm/km	ohm/km	ohm/kft	ohm/kft	ohm/km	ohm/km	
10380	5.26	10	165					1.02	1.04	3.34	3.41	1.09	1.12	3.58	3.65	
6530	3.31	12	104					1.62	1.65	5.31	5.42	1.74	1.77	5.71	5.82	
4110	2.08	14	65	104				2.57	2.62	8.43	8.60	2.76	2.82	9.06	9.24	
2580	1.31	16	41	65	104	165		4.10	4.18	13.5	13.7	4.40	4.49	14.4	14.7	
1620	0.821	18	26	41	65	104	165	6.53	6.66	21.4	21.9	7.00	7.15	23.0	23.4	
1020	0.517	20	16	26	41	65	104	10.4	10.6	34.1	34.8	11.1	11.4	36.4	37.1	
640	0.324	22		19				16.5	16.9	54.1	55.2	17.7	18.1	58.1	59.2	
404	0.205	24	7		19			26.2	26.7	86.0	87.7	28.1	28.7	92.2	94.0	
253	0.128	26		7				41.8	42.6	137	140	44.9	45.8	147	150	

^A The constructions shown in this table are typical of those used in the industry. It is intended that this table preclude other constructions which may be desirable for specific applications. The constructions shown provide for a finished stranded conductor approximately of the area indicated. When specified by the purchaser, the number or sizes of wire may be increased to provide additional area to compensate for draw-down during subsequent processing.

4. Ordering Information

iTeh Standards

- 4.1 Orders for material under this specification shall include the following information:
- 4.1.1 Quantity of each size and class, OS://SUADOATOS.IUCD.21
- 4.1.2 Conductor size: circular-mil area or AWG (see 7.1),
- 4.1.3 Class (Section 3 and Table 3), Deciment Prev
- 4.1.4 Whether coated or uncoated; if coated, designate type of coating (see 11.1),
- 4.1.5 Maximum length of lay (see 6.3),
- 4.1.6 Whether separator is required (see 7.2), ASTM B174-1
- 4.1.7 Package size (see section 14.1), 4.1.8 Special package marking, if required (Section 14), and 1-dcc1-46cb-a71c-a84a3205c618/astm-b174-17
- 4.1.9 Place of inspection (Section 13).

5. Joints

5.1 Necessary joints in wires shall be made in accordance with accepted commercial practice.

TABLE 3 Maximum Length of Lay for Bunch-Stranded
Conductors

Area of Cross Section			Maximum Length of Lay							
		Size, AWG	Norr Diarr		С	olumn A	Co	Column B		
cmil	mm	_	in.	mm	in.	mm	in.	mm		
20 820	10.5	7	0.167	4.24	3.00	76.20	3.00	76.20		
16 510	8.37	8	0.149	3.78	2.75	69.85	2.75	69.85		
13 090	6.63	9	0.133	3.38	2.50	63.50	2.50	63.50		
10 380	5.26	10	0.118	3.00	2.50	63.50	2.50	63.50		
6 530	3.31	12	0.093	2.36	2.00	50.80	2.00	50.80		
4 110	2.08	14	0.074	1.88	2.00	50.80	1.75	44.45		
2 580	1.31	16	0.059	1.50	2.00	50.80	1.50	38.10		
1 620	0.821	18	0.047	1.19	2.00	50.80	1.25	31.75		
1 020	0.517	20	0.037	0.94	2.00	50.80	1.00	25.40		
640	0.324	22	0.030	0.76	1.30	33.02	0.80	20.32		
404	0.205	24	0.024	0.61	1.20	30.48	0.70	17.78		
253	0.128	26	0.019	0.48	1.00	25.40	0.60	15.24		
159	0.0806	28	0.015	0.38	1.00	25.40	0.50	12.70		