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Standard Specification for Compact Round Stranded Copper Conductors Using Single Input Wire Construction[1]

This standard is issued under the fixed designation B835; 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 covers bare compact round stranded conductors made from uncoated copper wires of a single input wire (SIW) diameter for general use in covered or insulated electrical wires or cables. These conductors shall be constructed with one or more layers of helically laid compacted wires (Explanatory Note 1, Note 2, and Note 3).

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

1.2.1 For density, resistivity and temperature, the values stated in SI units are to be regarded as 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:*[2]

B3 Specification for Soft or Annealed Copper Wire

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

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

2.3 *NIST Document:*[3]

NBS Handbook 100 ~~Handbook 100—Copper~~ Copper Wire Tables

3. Classification

3.1 The conductors described in this specification are intended for subsequent insulation or covering. The classification of these conductors is SIW compact.

4. Ordering Information

4.1 Orders for material in accordance with this specification shall include the following information:

4.1.1 Quantity of each size (Table 1);

4.1.2 Conductor size, circular-mil area, or AWG (Section 8);

4.1.3 Packaging (Section ~~15~~16), if required;

4.1.4 Special package marking; and

4.1.5 Place of inspection (Section ~~14~~15).

5. Requirements for Wires

5.1 Before stranding and compacting, the copper wire shall meet all of the requirements of Specification B3.

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[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~~standard's Document Summary page on the ASTM website.

[3] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

TABLE 1 Construction Requirements of Compact Round SIW-Stranded Copper Conductors

Conductor Size			Minimum Number of Wires	Compact Conductor Diameter		Mass/1000 ft, lb/1000 ft	Mass/km, kg/km	dc Resistance at 20°C	
Circular, mils	AWG	mm^2		in.	mm			Ω/1000 ft	Ω/km
1 000 000	...	507	53	1.060	26.9	3086	4590	0.0106	0.0347
900 000	...	456	53	0.999	25.4	2780	4140	0.0118	0.0386
800 000	...	405	53	0.938	23.8	2469	3680	0.0132	0.0433
750 000	...	380	53	0.908	23.0	2316	3450	0.0141	0.0462
700 000	...	355	34	0.877	22.3	2160	3220	0.0151	0.0495
650 000	...	329	34	0.845	21.4	2006	2990	0.0163	0.0535
600 000	...	304	34	0.813	20.6	1850	2760	0.0176	0.0577
550 000	...	279	34	0.775	19.7	1700	2530	0.0192	0.0630
500 000	...	253	30	0.736	18.7	1542	2300	0.0212	0.0695
450 000	...	228	30	0.700	17.8	1390	2070	0.0235	0.0770
400 000	...	203	24	0.659	16.7	1236	1840	0.0264	0.0865
350 000	...	177	24	0.616	15.7	1080	1610	0.0302	0.0990
300 000	...	152	18	0.570	14.5	925	1380	0.0353	0.116
250 000	...	127	18	0.520	13.2	772	1150	0.0423	0.139
211 600	4/0	107	17	0.475	12.1	653	972	0.0500	0.164
167 800	3/0	85.0	15	0.423	10.8	518	771	0.0630	0.206
133 100	2/0	67.4	12	0.376	9.57	411	611	0.0795	0.261
105 600	1/0	53.5	7	0.336	8.55	326	485	0.100	0.328
83 690	1	42.4	7	0.299	7.60	259	385	0.126	0.413
66 350	2	33.6	6	0.268	6.81	205	305	0.159	0.521
41 740	4	21.2	6	0.213	5.41	129	192	0.253	0.830
26 240	6	13.3	6	0.169	4.29	80.9	121	0.403	1.32
16 510	8	8.37	6	0.134	3.40	51.0	75.9	0.641	2.10

6. Joints

6.1 Welds and brazes may be made in rods or in wires prior to final drawing.

6.2 Welds and brazes may be made in the individual wires for compact conductors, but they shall not be closer together than 1 ft (0.3 m) for conductor of 19 wires or less or closer than 1 ft (0.3 m) in a layer for conductor of more than 19 wires.

6.3 No joint or splice shall be made in a compact-stranded conductor as a whole.

7. Lay

7.1 The length of lay shall not be less than 8 or more than 16 times the outside diameter of the completed conductor.

7.2 The direction of lay of the outer layer shall be left-hand, and it may be reversed or unidirectional in successive layers.

7.3 Other lay requirements may be furnished upon special agreement between the manufacturer and the purchaser.

8. Construction

8.1 The construction of the compact round SIW stranded conductors shall be as given in Table 1.

8.2 Wires used in the fabrication of the compact round conductor shall be of such dimensions as to produce a finished conductor as prescribed in Table 1.

9. Density

9.1 For the purpose of calculating mass per unit length, cross sections, and so forth, the density of the copper shall be taken as 8.89 g/cm^3 (0.32117 lb/$in.^3$) at 20°C.

10. ~~Density~~ Mass and Electrical Resistance

~~9.1 For the purpose of calculating mass per unit length, cross sections, and so forth, the density of the copper shall be taken as 8.89 g/cm^3 (0.32117 lb/$in.^3$) at 20°C.~~

10.1 The mass and electrical resistance of a unit length of stranded unsealed conductor are a function of the length of lay. The approximate mass and electrical resistance may be determined using ~~the standard increments shown in~~an increment of 2 %. ~~Table 2.~~ When greater accuracy is desired, the increment based on the specific lay of the conductor may be calculated (Explanatory Note 4).

10.2 The maximum electrical resistance of a unit length of stranded conductor shall not exceed 102 % of the nominal dc resistance shown in Table 1. When the dc resistance is measured at other than 20°C, it is to be corrected by using the multiplying factor given in Table 2.

10.3 For conductors to be used in covered or insulated wires or cables, dc resistance measurement may be used instead of the method outlined in Section ~~10~~11, to determine compliance with this specification.