Designation: B 902 – 04

Standard Specification for Compressed Round Stranded Copper Conductors, Hard, Medium-Hard, or Soft Using Single Input Wire Construction[1]

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1. Scope

1.1 This specification covers stranded conductors made from round copper wires, either uncoated or coated with tin, lead, or lead alloy for general use in insulated conductor assemblies for electrical purposes. These conductors shall be composed of one or more roller shaped or die closed layers of helically laid wires using the single input wire (SIW) methodology. (see Note 1 and Explanatory Note 1)

NOTE 1—Sealed conductors which are intended to prevent longitudinal water propagation and are further covered/insulated, are also permitted within the guidelines of this specification.

1.2 The values stated in inch-pound or SI units are to be regarded separately as standard. The values in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.2.1 For density, resistivity, and temperature, the values stated in SI units are to be regarded as standard.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

B 1 Specification of Hard-Drawn Copper Wire
B 2 Specification for Medium-Hard-Drawn Copper Wire
B 3 Specification for Soft or Annealed Copper Wire
B 33 Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
B 189 Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes[3]
B 193 Test Method for Resistivity of Electrical Conductor Materials
B 246 Specification for Tinned Hard-Drawn and Medium-Hard-Drawn Copper Wire for Electrical Purposes
B 263 Test Method for Determination of Cross-Sectional Area of Stranded Conductors
B 354 Terminology Relating to Uninsulated Metallic Electrical Conductors

2.2 *Other Standard:*[4]

NBS Handbook 100: 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 compressed.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Quantity of each size,
4.1.2 Conductor size: circular-mil area or AWG (see Section 7),
4.1.3 Class: SIW compressed (see 1.2 and Table 1),
4.1.4 Temper (see 5.3),
4.1.5 Whether coated or uncoated; if coated (see 5.1 and 5.2).
4.1.6 Details of special-purpose lays, if required (see 7.3).
4.1.7 When physical tests shall be made (see 10.2 and 10.3).
4.1.8 Package size (see 16.1).
4.1.9 Lagging, if required (see 16.2).
4.1.10 Special package marking, if required (see Section 16.3), and
4.1.11 Place of inspection (see Section 15).

5. Requirements for Wires

5.1 The purchaser shall designate the type of wire and the kind of coating, if any, to be used in the conductor.

5.2 Before stranding, the copper wire used shall meet all of the requirements of the following specifications of ASTM that are applicable to its type:

5.2.1 Specification B 3,
5.2.2 Specification B 33,
5.2.3 Specification B 2,
5.2.4 Specification B 1,
5.2.5 Specification B 189, and

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

[4] Available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

TABLE 1 Construction Requirements of Compressed Round SIW Standard Copper Conductors

Compressed Strand Dimensions									
Conductor Size			Minimum Number of Wires	Nominal Diameter of SIW Compressed Conductor, in.	Nominal Diameter of SIW Compressed Conductor, mm.	Mass		DC Resistance at 20°C	
cmils	AWG	mm^2				lb/1000ft	kg/km	Ω/1000ft	Ω/km
5 000 000		2534	217	2.424	61.57	15890	23649	0.00218	0.00715
4 500 000		2280	217	2.300	58.41	14300	21283	0.00242	0.00794
4 000 000		2027	217	2.168	55.07	12590	18738	0.00270	0.00886
3 500 000		1773	169	2.028	51.51	11020	16401	0.00308	0.01010
3 000 000		1520	169	1.878	47.69	9353	13920	0.00365	0.01197
2 500 000		1267	127	1.714	43.54	7794	11600	0.00428	0.01404
2 000 000		1013	127	1.533	38.94	6175	9190	0.00529	0.01735
1 900 000		962.7	127	1.494	37.95	5866	8730	0.00557	0.01827
1 800 000		912.1	127	1.454	36.93	5558	8272	0.00588	0.01929
1 750 000		886.7	127	1.434	36.42	5403	8041	0.00604	0.01981
1 700 000		861.4	127	1.413	35.89	5249	7812	0.00622	0.02040
1 600 000		810.7	127	1.371	34.82	4940	7352	0.00661	0.02168
1 500 000		760.1	90	1.327	33.71	4631	6892	0.00705	0.02312
1 400 000		709.4	90	1.282	32.56	4323	6434	0.00756	0.02480
1 300 000		658.7	90	1.236	31.39	4014	5974	0.00814	0.02670
1 250 000		633.4	90	1.212	30.78	3859	5743	0.00847	0.02778
1 200 000		608.0	90	1.187	30.15	3705	5514	0.00882	0.02893
1 100 000		557.4	90	1.137	28.88	3396	5054	0.00962	0.03155
1 000 000		506.7	53	1.084	27.53	3088	4596	0.0106	0.0348
900 000		456.0	53	1.028	26.11	2779	4136	0.0118	0.3087
800 000		405.4	53	0.969	24.61	2470	3676	0.0132	0.0433
750 000		380.0	53	0.939	23.85	2316	3447	0.0141	0.0462
700 000		354.7	34	0.907	23.04	2161	3216	0.0151	0.0495
650 000		329.4	34	0.874	22.20	2007	2987	0.0163	0.0535
600 000		304.0	34	0.840	21.34	1883	2802	0.0177	0.0581
550 000		278.7	34	0.804	20.42	1698	2527	0.0192	0.0630
500 000		253.4	30	0.766	19.46	1544	2298	0.0212	0.0695
450 000		228.0	30	0.727	18.47	1389	2067	0.0235	0.0771
400 000		202.7	24	0.685	17.40	1235	1838	0.0264	0.0866
350 000		177.3	24	0.641	16.28	1081	16.09	0.3002	0.0991
300 000		152.0	18	0.594	15.09	926.3	1379	0.0353	0.1158
250 000		126.7	18	0.542	13.77	771.9	1149	0.0423	0.1387
211 600	0000	107.2	17	0.498	12.65	653.1	972.0	0.0500	0.1640
167 800	000	85.03	15	0.443	11.25	518.1	771.1	0.0630	0.2066
133 100	00	67.44	12	0.395	10.03	410.9	611.5	0.0795	0.2607
105 600	0	53.51	7	0.352	8.94	325.8	484.9	0.100	0.328
83 690	1	42.41	7	0.313	7.95	258.4	384.6	0.127	0.417
66 360	2	33.63	6	0.283	7.19	204.9	305.0	0.159	0.521
52 620	3	26.66	6	0.252	6.40	162.5	241.8	0.201	0.659
41 740	4	21.15	6	0.225	5.72	128.9	191.8	0.253	0.830
33 090	5	16.77	6	0.200	5.08	102.2	152.1	0.319	1.046
26 240	6	13.30	6	0.178	4.52	81.05	120.6	0.403	1.322
20 820	7	10.55	6	0.159	4.04	64.28	95.67	0.509	1.669
16 510	8	8.366	6	0.142	3.61	50.97	75.86	0.640	2.099
13 090	9	6.633	6	0.126	3.20	40.42	60.16	0.809	2.653
10 380	10	5.260	6	0.113	2.87	32.06	47.71	1.02	3.35
6 530	12	3.309	6	0.089	2.26	20.16	30.00	1.63	5.35
4 110	14	2.083	6	0.071	1.80	12.68	18.87	2.58	8.46
2 580	16	1.307	6	0.054	1.37	7.974	11.87	4.10	13.45
1 620	18	0.8209	6	0.043	1.09	5.015	7.464	6.54	21.45
1 020	20	0.5168	6	0.034	0.86	3.154	4.694	10.3	33.8
640	22	0.3243	6	0.027	0.69	1.992	2.965	16.4	53.8
404	24	0.2047	6	0.022	0.56	1.249	1.859	26.1	85.6

5.2.6 Specification B 246.

5.3 In SIW compressed conductors, the central core shall be made of wire of the same type and temper as the concentric layers, unless otherwise specified.

6. Joints

6.1 Welds and brazes may be made in rods or in wires prior to final drawing. Welds and brazes may be made in the finished individual wires composing the conductor, but shall not be closer together than prescribed in Table 2.

TABLE 2 Minimum Distance Between Joints in Completed Conductor

Number of Wires in Conductor	Hard or Medium-Hard Temper	Soft Temper
3 to 19	50 ft	1 ft
20 to 36	50 ft	1 ft in a layer[A]
37 to 60	25 ft	1 ft in a layer[A]
61 and over	5 ft	1 ft in a layer[A]

[A] Except as indicated, the limitations apply to closeness of joints throughout the completed conductor.