



~~Designation: B 682-81a (Reapproved 1996)^{ε1}~~ **Designation: B 682-01 (Reapproved 2009)**

Standard Specification for Standard Metric Sizes of Electrical Conductors¹

This standard is issued under the fixed designation B 682; 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.

~~^{ε1}Note—Section 11 was added editorially in March 1996.~~

1. Scope

~~1.1 This specification prescribes the recommended standard metric sizes of solid round electrical conductors.~~

~~1.2 This specification prescribes the recommended standard metric size designations of stranded electrical conductors.~~

~~NOTE 1—The purpose of this specification is to provide logical geometrically progressive series of sizes for guidance to individuals and organizations preparing hard metric specifications for all types of round wire and stranded electrical conductors (see 3.1). The preferred sizes have been established to avoid proliferation of non-preferred sizes. They provide a series of sizes intended to be acceptable for most applications. The use of metric sizes will depend upon commercial factors, and their existence does not render obsolete existing specifications with inch-pound units as standard. This specification and hard metric conductor specifications prepared in accordance with it are not intended to replace any of the existing specifications having inch-pound units as the standard, with or without the inclusion of soft metric conversion (see 3.1.2).~~

~~1.1 This specification covers and prescribes the recommended standard metric sizes of solid round electrical conductors.~~

~~1.2 This specification prescribes the recommended standard metric size designations of stranded electrical conductors (see Explanatory Note 1).~~

~~NOTE 2—Physical properties, construction requirements, and manufacturing tolerances for specific products should be included in individual product specifications developed in accordance with appropriate sizes in this specification.~~

~~NOTE 3—Inch-pound units shown in the tables were calculated from the metric values and rounded, and are shown for information only. 1—Physical properties, construction requirements, and manufacturing tolerances for specific products should be included in individual product specifications developed in accordance with appropriate sizes in this specification.~~

~~1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.~~

~~1.3.1 Exceptions — 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. Rounded values appear in Table 1.~~

2. Referenced Documents

2.1 *ASTM Standards*:²

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

F 205 Test Method for Measuring Diameter of Fine Wire by Weighing

2.2 *IEC Standards*:

IEC 182 Basic Dimensions of Winding Wires³

IEC 228 Nominal Cross-Sectional Areas and Composition of Conductors of Insulated Cables³

2.3 *ISO Standards*:

ISO R388 Metric Series for Basic Thickness of Sheet and Diameters of Wire³

3. Terminology

~~3.1 Definitions of Terms Specific to This Standard:~~

¹ This specification is under the jurisdiction of ASTM Committee B+ B01 on Wires for Electrical Conductors and is the direct responsibility of Subcommittee B01.02 on Methods of Test and Sampling Procedure.

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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*, Vol 14.02, volume information, refer to the standard's Document Summary page on the ASTM website.

³ Annual Book of ASTM Standards, Vol 10.04.

³ International Electrotechnical Commission and International Organization for Standardization documents are available from the American National Standards Institute (ANSI), 11 West 42nd St., 13th Floor, New York, NY 10036.

TABLE 1 Standard Metric Diameters and Cross-Sectional Areas of Solid Round Wires at 20°C

| Diameter | | Cross-Sectional Area | | |
|------------------|------------------|----------------------|-------------------|--------------------|
| mm (R 20 Series) | in. ^A | mm ² | in. ^{2A} | kcMil ^A |
| 18.0 | 0.708 7 | 254.5 | 0.394 4 | 502.2 |
| 16.0 | 0.629 9 | 201.1 | 0.311 6 | 396.8 |
| 14.0 | 0.551 8 | 153.9 | 0.238 6 | 303.8 |
| 12.5 | 0.492 1 | 122.7 | 0.190 2 | 242.2 |
| 11.2 | 0.440 9 | 98.52 | 0.152 7 | 194.4 |
| 10.0 | 0.393 7 | 78.54 | 0.121 7 | 155.0 |
| 9.00 | 0.354 3 | 63.62 | 0.098 61 | 125.6 |
| 8.00 | 0.315 0 | 50.27 | 0.077 91 | 99.2 |
| 7.10 | 0.279 5 | 39.59 | 0.061 37 | 78.14 |
| 6.30 | 0.248 0 | 31.17 | 0.048 32 | 61.52 |
| 5.60 | 0.220 5 | 24.63 | 0.038 18 | 48.61 |
| 5.00 | 0.196 9 | 19.63 | 0.030 43 | 38.75 |
| 4.50 | 0.177 2 | 15.90 | 0.024 65 | 31.39 |
| 4.00 | 0.157 5 | 12.57 | 0.019 48 | 24.80 |
| 3.55 | 0.139 8 | 9.898 | 0.015 34 | 19.53 |
| 3.15 | 0.124 0 | 7.793 | 0.012 08 | 15.38 |
| 2.80 | 0.110 2 | 6.158 | 0.009 54 | 12.15 |
| 2.50 | 0.098 4 | 4.909 | 0.007 61 | 9.69 |
| 2.24 | 0.088 2 | 3.941 | 0.006 11 | 7.78 |
| 2.00 | 0.078 7 | 3.142 | 0.004 87 | 6.20 |
| 1.80 | 0.070 9 | 2.545 | 0.003 94 | 5.02 |
| 1.60 | 0.063 0 | 2.011 | 0.003 12 | 3.97 |
| 1.40 | 0.055 1 | 1.539 | 0.002 39 | 3.04 |
| 1.25 | 0.049 2 | 1.227 | 0.001 90 | 2.42 |
| 1.12 | 0.044 1 | 0.985 | 0.001 53 | 1.94 |
| 1.00 | 0.039 4 | 0.785 | 0.001 22 | 1.55 |
| 0.900 | 0.035 4 | 0.636 | 0.000 986 | 1.26 |
| 0.800 | 0.031 5 | 0.503 | 0.000 779 | 0.992 |
| 0.710 | 0.028 0 | 0.396 | 0.000 614 | 0.781 |
| 0.630 | 0.024 8 | 0.312 | 0.000 483 | 0.615 |
| 0.560 | 0.022 0 | 0.246 | 0.000 382 | 0.486 |
| 0.500 | 0.019 7 | 0.196 | 0.000 304 | 0.388 |
| 0.450 | 0.017 7 | 0.159 | 0.000 247 | 0.314 |
| 0.400 | 0.015 7 | 0.126 | 0.000 195 | 0.248 |
| 0.355 | 0.014 0 | 0.099 0 | 0.000 153 | 0.195 |
| 0.315 | 0.012 4 | 0.077 9 | 0.000 121 | 154 |
| 0.280 | 0.011 0 | 0.061 6 | 0.000 095 4 | 122 |
| 0.250 | 0.009 8 | 0.049 1 | 0.000 076 1 | 96.9 |
| 0.224 | 0.008 8 | 0.039 4 | 0.000 061 1 | 77.8 |
| 0.200 | 0.007 9 | 0.031 4 | 0.000 048 7 | 62.0 |
| 0.180 | 0.007 1 | 0.025 4 | 0.000 039 4 | 50.2 |
| 0.160 | 0.006 3 | 0.020 1 | 0.000 031 2 | 39.7 |
| 0.140 | 0.005 5 | 0.015 4 | 0.000 023 9 | 30.4 |
| 0.125 | 0.004 9 | 0.012 3 | 0.000 019 0 | 24.2 |
| 0.112 | 0.004 4 | 0.009 85 | 0.000 015 3 | 19.4 |
| 0.100 | 0.003 9 | 0.007 85 | 0.000 012 2 | 15.5 |
| 0.090 | 0.003 5 | 0.006 36 | 0.000 009 86 | 12.6 |
| 0.080 | 0.003 1 | 0.005 03 | 0.000 007 79 | 9.92 |
| 0.071 | 0.002 8 | 0.003 96 | 0.000 006 14 | 7.81 |
| 0.063 | 0.002 5 | 0.003 12 | 0.000 004 83 | 6.15 |
| 0.056 | 0.002 2 | 0.002 46 | 0.000 003 82 | 4.86 |
| 0.050 | 0.002 0 | 0.001 96 | 0.000 003 04 | 3.88 |
| 0.045 | 0.001 77 | 0.001 59 | 0.000 002 47 | 3.14 |
| 0.040 | 0.001 57 | 0.001 26 | 0.000 001 95 | 2.48 |
| 0.036 | 0.001 42 | 0.001 02 | 0.000 001 58 | 2.01 |
| 0.032 | 0.001 26 | 0.000 804 | 0.000 001 25 | 1.59 |
| 0.028 | 0.001 10 | 0.000 616 | 0.000 000 954 | 1.22 |

TABLE 1 Continued

| Diameter | | Cross-Sectional Area | | |
|------------------|------------------|----------------------|-------------------|--------------------|
| mm (R 20 Series) | in. ⁴ | mm ² | in. ^{2A} | kcmil ⁴ |
| 0.025 | 0.000 98 | 0.000 491 | 0.000 000 761 | 0.969 |
| 0.022 | 0.000 88 | 0.000 394 | 0.000 000 611 | 0.778 |
| 0.020 0 | 0.000 79 | 0.000 314 | 0.000 000 487 | 0.620 |
| 0.018 0 | 0.000 71 | 0.000 254 | 0.000 000 394 | 0.502 |
| 0.016 0 | 0.000 63 | 0.000 201 | 0.000 000 312 | 0.397 |
| 0.014 0 | 0.000 55 | 0.000 154 | 0.000 000 239 | 0.304 |
| 0.012 5 | 0.000 49 | 0.000 123 | 0.000 000 190 | 0.242 |
| 0.011 2 | 0.000 44 | 0.000 099 | 0.000 000 153 | 0.194 |
| 0.010 0 | 0.000 39 | 0.000 079 | 0.000 000 122 | 0.155 |

⁴The inch diameters, square inch areas, and circular mil areas are rounded values calculated from the metric diameters.

3.1.1 *Hard metric specification*—a specification for bare, insulated, or covered electrical conductors incorporating SI units as the standard, and including a series of standard sizes differing from those in inch-pound conductor specifications.

3.1.2 *soft metric conversion*—The addition of SI units, converted from U.S. customary units, to a specification for bare, insulated, or covered electrical conductors which includes the inch-pound units as the standard and retains the customary series of standard sizes.

4. Standard Reference Temperature

4.1 For the purpose of this specification, all wire dimensions and properties shall be considered as occurring at the internationally standardized reference temperature of 20°C.

TABLE 1 Standard Metric Diameters and Cross-Sectional Areas of Solid Round Wires at 20°C

| Diameter | | Cross-Sectional Area | | |
|------------------|------------------|----------------------|-------------------|--------------------|
| mm (R 20 Series) | in. ⁴ | mm ² | in. ^{2A} | kcmil ⁴ |
| 18.0 | 0.7087 | 254.5 | 0.3944 | 502.2 |
| 16.0 | 0.6299 | 201.1 | 0.3116 | 396.8 |
| 14.0 | 0.5518 | 153.9 | 0.2386 | 303.8 |
| 12.5 | 0.4921 | 122.7 | 0.1902 | 242.2 |
| 11.2 | 0.4409 | 98.52 | 0.1527 | 194.4 |
| 10.0 | 0.3937 | 78.54 | 0.1217 | 155.0 |
| 9.00 | 0.3543 | 63.62 | 0.09861 | 125.6 |
| 8.00 | 0.3150 | 50.27 | 0.07791 | 99.2 |
| 7.10 | 0.2795 | 39.59 | 0.06137 | 78.14 |
| 6.30 | 0.2480 | 31.17 | 0.04832 | 61.52 |
| 5.60 | 0.2205 | 24.63 | 0.03818 | 48.61 |
| 5.00 | 0.1969 | 19.63 | 0.03043 | 38.75 |
| 4.50 | 0.1772 | 15.90 | 0.02465 | 31.39 |
| 4.00 | 0.1575 | 12.57 | 0.01948 | 24.80 |
| 3.55 | 0.1398 | 9.898 | 0.01534 | 19.53 |
| 3.15 | 0.1240 | 7.793 | 0.01208 | 15.38 |
| 2.80 | 0.1102 | 6.158 | 0.00954 | 12.15 |
| 2.50 | 0.0984 | 4.909 | 0.00761 | 9.69 |
| 2.24 | 0.0882 | 3.941 | 0.00611 | 7.78 |
| 2.00 | 0.0787 | 3.142 | 0.00487 | 6.20 |
| 1.80 | 0.0709 | 2.545 | 0.00394 | 5.02 |
| 1.60 | 0.0630 | 2.011 | 0.00312 | 3.97 |
| 1.40 | 0.0551 | 1.539 | 0.00239 | 3.04 |
| 1.25 | 0.0492 | 1.227 | 0.00190 | 2.42 |
| 1.12 | 0.0441 | 0.985 | 0.00153 | 1.94 |
| 1.00 | 0.0394 | 0.785 | 0.00122 | 1.55 |
| 0.900 | 0.0354 | 0.636 | 0.000986 | 1.26 |
| 0.800 | 0.0315 | 0.503 | 0.000779 | 0.992 |
| 0.710 | 0.0280 | 0.396 | 0.000614 | 0.781 |
| 0.630 | 0.0248 | 0.312 | 0.000483 | 0.615 |
| 0.560 | 0.0220 | 0.246 | 0.000382 | 0.486 |
| 0.500 | 0.0197 | 0.196 | 0.000304 | 0.388 |