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Standard Specification for Standard Metric Sizes of Electrical Conductors¹

This standard is issued under the fixed designation B682; 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— Editorial changes were made in Tables 1 and 2 in November 2015.

1. Scope

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 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

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

F205 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. Standard Reference Temperature

3.1 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.

4. Preferred Numbers

4.1 The diameters in Table 1 and preferred cross-sectional areas in Table 2 are rounded preferred numbers from R (Renard) series in accordance with ISO R388.

NOTE 2—The use of preferred numbers has many advantages and the values selected do not vary significantly from the calculated numbers of the series used. The preferred and second preference size designations, using a Renard series of numbers, provides a schedule of interrelated sizes for aluminum and copper conductors.

NOTE 3—Should sizes be needed either larger or smaller than those listed in Table 1 or Table 2, the respective R series may be expanded upward or downward.

¹ This specification is under the jurisdiction of ASTM Committee B01 on 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* volume information, refer to the standard's Document Summary page on the ASTM website.

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 ⁴ |
| 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 |
| 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 |

TABLE 1 *Continued*

| Diameter | | Cross-Sectional Area | | |
|------------------|------------------|----------------------|-------------------|--------------------|
| mm (R 20 Series) | in. ^A | mm ² | in. ^{2A} | kcMil ⁴ |
| 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 |

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. ^{2, A} | kcMil ⁴ | cmil 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 | |
| 0.450 | 0.0177 | 0.159 | 0.000247 | 0.314 | |
| 0.400 | 0.0157 | 0.126 | 0.000195 | 0.248 | |
| 0.355 | 0.0140 | 0.0990 | 0.000153 | 0.195 | |
| 0.315 | 0.0124 | 0.0779 | 0.000121 | | 154 |
| 0.280 | 0.0010 | 0.0616 | 0.0000954 | | 122 |
| 0.250 | 0.0098 | 0.0491 | 0.0000761 | | 96.9 |
| 0.224 | 0.0088 | 0.0394 | 0.0000611 | | 77.8 |
| 0.200 | 0.0079 | 0.0314 | 0.0000487 | | 62.0 |
| 0.180 | 0.0071 | 0.0254 | 0.0000394 | | 50.2 |
| 0.160 | 0.0063 | 0.0201 | 0.0000312 | | 39.7 |
| 0.140 | 0.0055 | 0.0154 | 0.0000239 | | 30.4 |
| 0.125 | 0.0049 | 0.0123 | 0.0000190 | | 24.2 |
| 0.112 | 0.0044 | 0.00985 | 0.0000153 | | 19.4 |
| 0.100 | 0.0039 | 0.00785 | 0.0000122 | | 15.5 |
| 0.090 | 0.0035 | 0.00636 | 0.00000986 | | 12.6 |