Conductor Facts / Size Nomenclature

There are several designations used to describe conductor size in the wire and cable industry. The most common method used in the U.S. is the American Wire Gauge (AWG). Metric designations commonly follow a technique that states the diameter (mm), the total cross sectional area (mm2) or the number of strands and strand diameter. Other gauge systems also exist such as the British Wire Gage (BWG), the Standard (or Imperial) Wire Gage (SWG), etc.

Stranded constructions vary in the size, number and configuration of the individual strands. All stranded designation systems relate to the total cross-sectional area of the conductor. The cross-sectional area of metal determines the electrical resistance and current carrying capacity of the conductor and is important for the proper size selection for a specific application.

The American Wire Gauge (AWG), previously known as the Brown & Sharpe (B&S) Gage, is the standard designation for copper wire sizes in the United States. It was originally designed to standardize wire drawing and solid wire sizes in a mathematical progression. AWG is based on two reference diameters, 0.4600 inches (4/0 AWG) and 0.0050 inches (36 AWG). All gauge sizes are related to each other in a mathematical progression such that each size can be derived from any known AWG size and diameter (refer to ASTM B 258 for specific details). An increase of one AWG number signifies a 20.7% reduction in cross-sectional area and a 26.1% increase in length. A 3 AWG change doubles or halves the cross-sectional area and a 6 AWG change doubles or halves the diameter. For sizes smaller than 36 AWG, diameters are extrapolated using the same relationship. AWG sizes are also used to describe the size of a stranded conductor.

Sizes larger than 4/0 follow a “MCM” notation in which one MCM equals 1000 circular mils. MCM translates to cross-sectional area, and is more commonly used for large stranded conductor. Solid conductors in larger sizes are usually referred to as “rod” and designated by their diameters.

AWG Single End

The size of a single strand, commonly referred to as “single end”, is most often designated by its AWG size or by its diameter in inches.

AWG Stranded Sizes

AWG designations for stranded constructions usually refer to their AWG size or its stranding detail such as:

40 AWG
7 / 48 (7 strands of 48 AWG equivalent to 40 AWG overall)
22 AWG
7 / 30 (7 strands of 30 AWG equivalent to 22 AWG overall)

DID YOU KNOW?

For most stranded sizes…

> Stranding of 7 strands “reduces” the AWG number by 8. e.g. 7/38 is 30 AWG.

> Stranding of 19 strands “reduces” the AWG number by 12. e.g. 19/38 is 26 AWG.

> Stranding of 37 strands “reduces” the AWG number by 16. e.g. 37/26 is 10 AWG.

The construction of stranded conductors can vary depending on the application and properties required. Equivalent stranded AWG constructions must have similar cross-sectional areas, greater than or equal to 98% of the area of the nominal solid AWG size (ASTM B 8). Hence, similar stranded AWG sizes will also have similar electrical resistance and weight. For example a comparison of equivalent 20 AWG solid and representative 20 AWG stranded constructions:

Custom constructions are available, please contact the sales department

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CONSTRUCTION	NOMINAL CROSS-SECTIONAL AREA
20 AWG – Solid (0.0320 in)	1020 cmil (0.000804 in2)
20 AWG – 7 / 28 (7 / 0.0126 in)	1111 cmil (0.000873 in2)
20 AWG – 10 / 30 (10 / 0.0100 in)	1000 cmil (0.000785 in2)
20 AWG – 16 / 32 (16 / 0.0080 in)	1024 cmil (0.000804 in2)
20 AWG – 19 / 32 (19 / 0.0080 in)	1216 cmil (0.000955 in2)
20 AWG – 26 / 34 (26 / 0.0063 in)	1032 cmil (0.000810 in2)
20 AWG – 41 / 36 (41 / 0.0050 in)	1025 cmil (0.000805 in2)
20 AWG – 65 / 38 (65 / 0.0040 in)	1040 cmil (0.000817 in2)
20 AWG – 104 / 40 (104 / 0.00314 in)	1025 cmil (0.000785 in2)
Notes: Data from ASTM B 174, B 258 and B 286.	

Metric Single End

Metric designations for single end commonly use millimeter diameters. The standard metric diameters for single end approximate the AWG diameters, but the two progressions are sdarkly different. The following is an example of the similarities:

STANDARD METRIC AND COMPARABLE AWG SIZES							
Metric (mm)	0.100	0.112	0.125	0.140	0.160	0.180	0.200
(in)	0.00394	0.00441	0.00492	0.00551	0.0063	0.00709	0.00787
AWG	38	37	36	35	34	33	32
(in)	0.00397	0.00445	0.00500	0.00561	0.00630	0.00708	0.00795

Metric Stranded Sizes

Metric designations for stranded constructions usually refer to the cross-sectional area of the conductor or its stranding detail such as:

- 1 mm^2
- 19 / 0.25 mm
- 5 mm^2
- 37 / 0.40 mm

Many metric stranded constructions approximate the AWG sizes, but their cross-sectional area may differ sdarkly due to the use of standard metric single end diameters.

Metric Ropes

Metric ropes are usually designated by their cross-sectional area (mm^2). As with solid and regular stranded conductor, many constructions have a correlation with AWG, however, there can be differences in configuration and the final properties of the rope.

- 9 mm^2
- equivalent to an 8 AWG
- 107 mm^2
- equivalent to an 4/0 AWG

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