

Wire gauge

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Wire gauge is a measurement of how large a wire is, either in diameter or cross sectional area. This determines the amount of electric current a wire can safely carry, as well as its electrical resistance and weight per unit of length. Wire gauge is applicable to both electrical and non-electrical wires, being important to electrical wiring and to structural cable.



A device for measuring standard wire gauge.

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Types of wire gauge

Wire Gauges may be broadly divided into two groups, the empirical and the geometrical. The first includes all the older gauge measurements, notably the Birmingham (B.W.G. or Stubs) and the Lancashire. The origin of the B.W.G. is obscure. The numbers of wire were in common use earlier than 1735. It is believed that they originally were based on the series of drawn wires, No. 1 being the original rod, and succeeding numbers corresponding with each draw, so that No. 10, for example, would have passed ten times through the draw plate. But the Birmingham and the Lancashire gauge, the latter being based on an averaging of the dimensions collated from a large number of the former in the possession of Peter Stubs of Warrington, have long held the leading position, and are still retained and used probably to a greater extent than the more recent geometrical gauges.

The first attempt to adopt a geometrical system was made by Messrs Brown & Sharpe in 1855. They established a regular progression of thirty-nine steps between the English sizes, No. 0000 (460 mils or about 12 mm) and No. 36 (5 mils or about 0.13 mm). Each diameter was multiplied by 0.890526 to give the next lower size. This is now the American wire gauge (AWG), and is used to a considerable extent in the United States.

The Imperial Standard Wire Gauge, which has been sanctioned by the British Board of Trade, was formulated by J. Latimer Clark. Following one of its recommendations, it differs from pre-existing gauges scarcely more than they differ among themselves, and is based on a rational system, the basis being the mil. No. 7/0, the largest size, is 0.50 in. (500 mils or 12.7 mm) in diameter, and the smallest, No. 50, is 0.001 in. (1 mil or about 25 μm) in diameter. Between these the diameter, or thickness, diminishes by 10.557%, and the weight diminishes by 20%.

None of the above systems of measurement are part of the metric system.

The current British Standard for metallic materials including wire is BS 6722:1986, which is a solely metric

standard, superseding 3737:1964, which used the SWG system.

Measuring

In commerce, the sizes of wire are estimated by a device, also called gauges, which consist of plates of circular or oblong form having notches of different widths around their edges to receive wire and sheet metals of different thicknesses. Each notch is stamped with a number, and the wire or sheet, which just fits a given notch, is stated to be of, say, No. 10, 11, 12, etc., of the wire gauge.

The circular forms of wire gauge measurement devices are the most popular, and are generally 3¾ in. (95 mm) in diameter, with thirty-six notches; many have the decimal equivalents of the sizes stamped on the back. Oblong plates are similarly notched. Rolling mill gauges are also oblong in form. Many gauges are made with a wedge-like slot into which the wire is thrust; one edge being graduated, the point at which the movement of the wire is arrested gives its size. The graduations are those of standard wire, or in thousandths of an inch. In some cases both edges are graduated differently in order to allow comparison between two systems of measurement. A few gauges are made with holes into which the wire has to be thrust. All gauges are hardened and ground to dimensions.

In some applications wire sizes are specified as the cross sectional area of the wire, usually in mm². Advantages of this system include the ability to readily calculate the physical dimensions or weight of wire, ability to take account of non-circular wire, and ease of calculation of electrical properties.

See also

- Wire gauge comparison chart
- IEC 60228, the metric wire-size standard used in most parts of the world.
- Circular mil, Electrical industry standard for wires larger than 4/0.
- American Wire Gauge (AWG), used primarily in the US and Canada
- Standard Wire Gauge (SWG), the British imperial standard BS3737, superseded by the metric.
- Jewelry wire gauge
- Body jewelry sizes

External links

- Wire Gauge to Diameter—Diameter to Wire Gauge Converter (http://www.66pacific.com/calculators/wire_calc.aspx) - Online calculator converts gauge to diameter or diameter to gauge for any wire size.
- Calculation: round electric cable diameter to circle cross-sectional area and vice versa (<http://www.sengpielaudio.com/calculator-cross-section.htm>)
- Wire gauge conversion chart (<http://www.dave-cushman.net/elect/wiregauge.html>)
- Standard wire sizes (http://www.kayelaby.npl.co.uk/miscellaneous_engineering_data/5_2/5_2.html), Kaye & Laby, NPL

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