

## US dimension units for cables – comparison with metric dimensions

In North American markets, cable cross-sections are usually stated as AWG (American Wire Gauge) sizes or, for large cable cross-sections (above AWG 4/0), using the unit “kcmil”. You will find these units in the relevant standards for designing cables by current rating.

Multi-standard cables must comply with both the specifications of the metric system (in which the cross-section in mm<sup>2</sup> is stated as the nominal size) as well the requirements of the AWG system. For this reason, both systems are compared below based on the nominal size.

**Please note that exact correspondences between the two systems do not exist** as the specifications of the two systems differ in terms of the cross-section and conductor resistance. The following table can be used to help you when selecting the correct nominal cross-section.

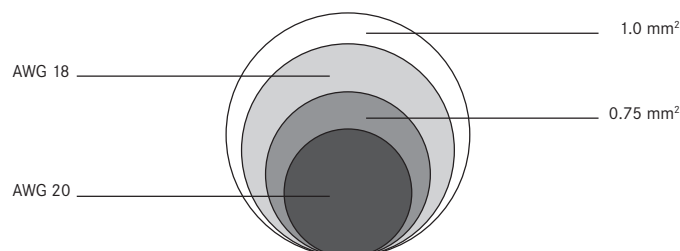
Standards required as part of project planning, such as UL 1581 or IEC 60228 (VDE 0295), must be applied accordingly.

Please note that when selecting appropriate connecting elements such as conductor end sleeves, the **actual** conductor cross-section is decisive. This is stated on the relevant product page.

Column 1a		Column 1b	Column 2	Column 3	Column 4	Column 5a	Column 5b
North American cross-section required		Geometric conversion	Metric nominal cross-section that meets the electrical requirements	Metric nominal cross-section required	North American size that meets the electrical requirements		
AWG	kcmil	mm <sup>2</sup>	mm <sup>2</sup>	mm <sup>2</sup>	AWG	kcmil	
	<b>750</b>	380.03	<b>400</b>	400		800	
	<b>500</b>	253.35	<b>300</b>	300		750	
	450	228.02	<b>240</b>	240		500	
	<b>400</b>	202.68				450	
	350	177.35	<b>185</b>	185		400	
	<b>300</b>	152.01				350	
	<b>250</b>	126.68	<b>150</b>	150		300	
<b>4/0</b>		107.22	<b>120</b>	120		250	
<b>3/0</b>		85.01	<b>95</b>	95	4/0		
<b>2/0</b>		67.43	<b>70</b>	70	3/0		
<b>1/0</b>		53.49			2/0		
<b>1</b>		42.41	<b>50</b>	50	1/0		
<b>2</b>		33.62	<b>35</b>	35	1		
<b>3</b>		26.67			2		
<b>4</b>		21.15	<b>25</b>	25	3		
<b>5</b>		16.77			4		
<b>6</b>		13.30	<b>16</b>	16	5		
<b>7</b>		10.55			6		
<b>8</b>		8.37	<b>10</b>	10	7		

Column 1a		Column 1b	Column 2	Column 3	Column 4	Column 5a	Column 5b
North American cross-section required		Geometric conversion	Metric nominal cross-section that meets the electrical requirements	Metric nominal cross-section required	North American size that meets the electrical requirements		
AWG	kcmil	mm <sup>2</sup>	mm <sup>2</sup>	mm <sup>2</sup>	AWG	kcmil	
9		6.63				8	
<b>10</b>		5.26	<b>6</b>	6		9	
11		4.17				10	
<b>12</b>		3.31	<b>4</b>	4		11	
13		2.62				12	
<b>14</b>		2.08	<b>2.5</b>	2.5		13	
15		1.65				14	
<b>16</b>		1.31	<b>1.5</b>	1.5		15	
17		1.04				16	
<b>18</b>		0.82	<b>1</b>	1		17	
19		0.65	<b>0.75</b>	0.75		18	
<b>20</b>		0.52				19	
21		0.41	<b>0.5</b>	0.5		20	
<b>22</b>		0.33	<b>0.34</b>	0.34		21	
23		0.26				22	
<b>24</b>		0.20	<b>0.25</b>	0.25		23	
25		0.16				24	
<b>26</b>		0.13	<b>0.14</b>	0.14		25	

### Principle of cross-section figures



#### Example 1:

The electro-technical project planning requirements as per North-American standards stipulate that you require a cable of AWG 20.

The relevant product page in the catalogue does not list any cables with this AWG size. A size of AWG 20 is listed in the above table in column 1a. Column 3 lists the metric nominal cross-section that, as a minimum, meets the electrical requirements of size AWG 20. Thus, you will require a cable with a nominal cross-section of 0.75 mm<sup>2</sup>.

#### Example 2:

The electro-technical project planning requirements as per European standards stipulate that you require a cable of 0.75 mm<sup>2</sup>.

The product page in the catalogue lists only AWG figures or large metric cross-sections. Nominal cross-section 0.75 mm<sup>2</sup> is listed in the above table in column 4. Column 5a lists the AWG size that, at a minimum, meets the electrical requirements of a nominal cross-section of 0.75 mm<sup>2</sup>. Thus, you will require a cable with size AWG 18.

## General dimensions\*:

The base units are as follows:

In the British gravitational system:

**Length (ft) – force (lbf = Lb) – time (s)**

In the British absolute system:

**Length (ft) – mass (lb) – time (s)**

### 1. Measures of length

1 mil	= 0.0254 mm
1 inch (in;")	= 25.4 mm
1 foot (ft;')	= 0.305 m
1 yard (yd)	= 0.914 m
1 chain (ch)	= 20.1 m
1 statue mile	= 1.61 km
1 nautical mile	= 1.835 km
1 statute mile	= 1760 yards

### 2. Measures of volume

1 cubic inch	= 16.39 cm <sup>3</sup>
1 cubic foot	= 0.0283 m <sup>3</sup>
1 cubic yard	= 0.765 m <sup>3</sup>
1 US liquid gallon	= 3.79 l
1 pint	= 0.473 l
1 quart	= 0.946 l
1 brit gallon	= 4.53 l
1 barrel	= 119.2 l

### 3. Measures of area

1 circ. mil (CM)	= 0.507 · 10 <sup>-3</sup> mm <sup>2</sup>
1 kcmil (MCM)	= 0.5067 mm <sup>2</sup>
1 square inch (sq. in.)	= 645.16 mm <sup>2</sup>
1 square foot (sg.ft.)	= 0.0929 m <sup>2</sup>
1 square yard	= 0.836 m <sup>2</sup>
1 acre	= 0.00405 km <sup>2</sup>
1 square mile	= 2.59 km <sup>2</sup>
1 m <sup>2</sup>	= 10.764 sq. ft.

### 4. Units of mass

British gravitation system:

1 slug = 1 lbs · s<sup>2</sup>/ft

British absolute system:

1 pound = 1 lb

1 slug = 32.174 lb, with 32.174 ft/s<sup>2</sup>

as the standard value of gravitational acceleration

1 grain	= 64.80 mg
1 dram	= 1.770 g
1 ounce (oz)	= 16 drams = 28.35 g
1 pound (lb)	= 16 oz = 453.59 g
1 stone	= 14 lbs = 6.35 kg
1 US ton (short ton)	= 0.907 t
1 Brit. ton (long ton)	= 0.016 t

### 5. Units of force

British gravitational system:

pound-force 1 lbf = 1 Lb

British absolute system:

poundal 1 pdl = 1 lb · ft/s<sup>2</sup>

1 lbf = 32.174 pdl = 9.80665 lb · m/s<sup>2</sup>

### 6. Conversion to metric units

1 pound-force (lbf)	= 0.454 kp
1 Brit. ton-force	= 1016 kp
1 poundal (pdl)	= 0.1383 N
1 lbf	= 4.445 N

### 7. Electrical units per unit of length

1 µf per mile	= 0.62 µF/km
1 megohm per mile	= 1.61 MΩ · km
1 megohm per 1000 ft	= 3.28 Ω · km
1 ohm per 1000 yd	= 1.0936 Ω/km

### 8. Weights per unit of length

1 lb per foot	= 1.488 kg/m
1 lb per yard	= 0.469 kg/m
1 lb per mile	= 0.282 kg/m

### 9. Density

1 lb/ft<sup>3</sup> = 16.02 kg/m<sup>3</sup>

### 10. Specific weight

1 lbf/ft<sup>3</sup> = 16.02 kp/m<sup>3</sup>

### 11. Copper wire weight per mile

lb/mile	= Ø mm
5	= 0.404
6.5	= 0.51
7.5	= 0.55
10	= 0.64
20	= 0.90
40	= 1.27

### 12. Units of energy

1 horsepower	= 0.746 kW (H. P.)
1 Brit. therm. unit	= 0.252 kcal

Insulation wall thickness is often expressed in n/64 inches with n/64 inch equalling approx. 0.4 mm.

### 13. Further dimensions for wire weights and electrical field strengths:

lbf pr. MFeet	= 1.488 kg/km
lbf pr. Mile	= 0.282 kg/km
40 V/mil	= 1.6 kV/mm
80 V/mil	= 3.2 kV/mm
100 V/mil	= 4.0 kV/mm
250 V/mil	= 10.0 kV/mm

\* Most of these units are no longer in use and are provided purely for information purposes.