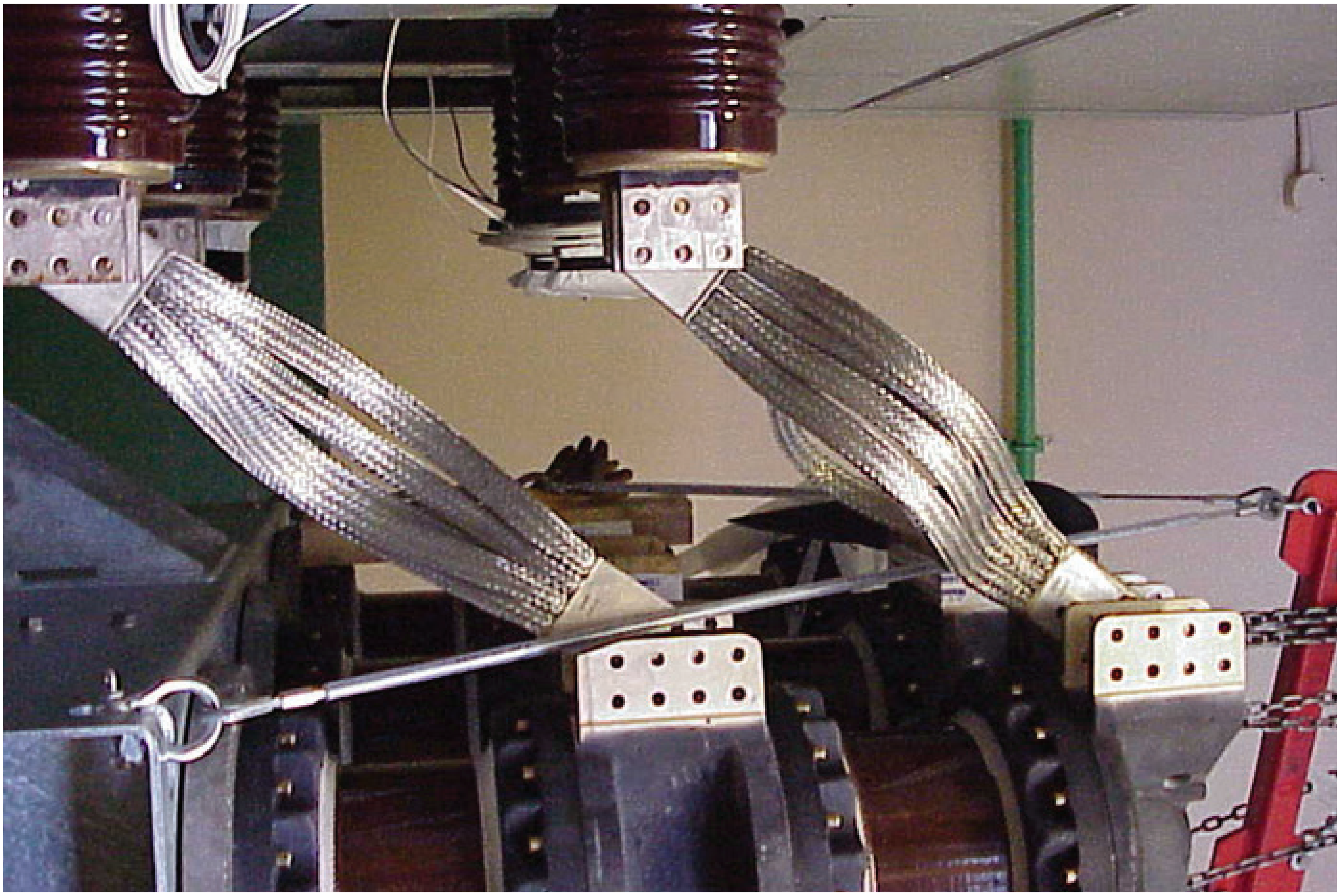
BURNDY®

PRODUCT GUIDE

Grounding Braid

HUBBELL

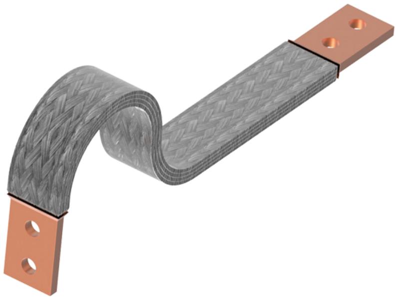


What is a Burndy Braid?

Burndy braid is utilized to create flexible electrical connections between stationary equipment, components and a grounding system. An advantage of braid is that it may be utilized to provide a low resistance path to ground to ensure safety and to protect electrical equipment from fault currents.

Burndy braid is manufactured from high conductivity copper strands that allow high currents to flow and efficiently dissipate heat. Then the copper strands are terminated by two ends made of compressed copper tubing with drilled stud holes known as ferrules. In the industry, we often refer to braid as a grounding braid or flexible braid. Burndy offers braids in various configurations to suit your installation requirements and applications.

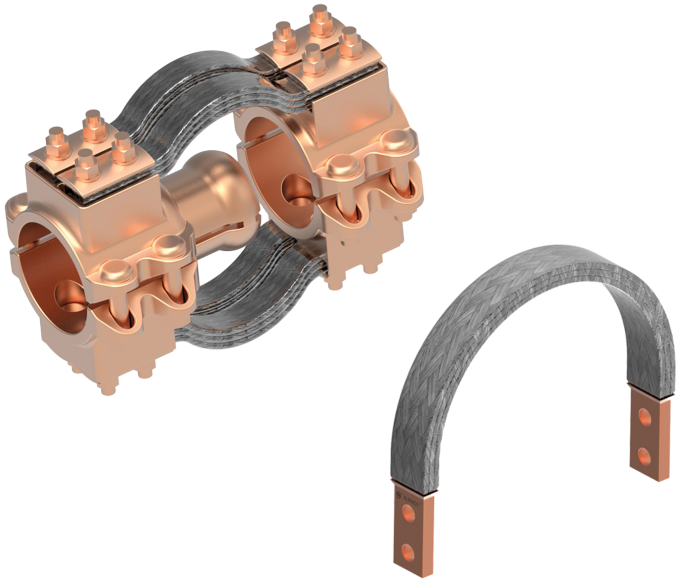
Braid is incredibly versatile with multiple variations and can be adapted for use in most any application.



Burndy UL Listed and CSA Certified braids available in many different sizes and hole patterns

More capabilities than ever.

- Maximum width 4″
- Customizable Braid Length
- Ferrule Thickness up to 1.00″
- Customizable Hole Patterns
- Competitive Pricing
- UL Listed & CSA Certified Solutions
- Available in many different sizes and styles
- Tin Plated Braid
- Ferrules available unplated, tin plated, or silver plated with many hole drilling options



Braid Numbering System

Below is a guide on the basics of our Braid Numbering System.

Please note that other sizes, materials, and options may be available.

Contact the factory for more information.

B 3 2 G 2 4 4 N T N

BURNDY Braid

Braids Horizontally Stacked
Blank = 1 Braid
2 = 2 Braids
3 = 3 Braids
4 = 4 Braids

Braids Vertically Stacked
Blank = 1 Braid
2 = 2 Braids
3 = 3 Braids
4 = 4 Braids

Braid Types Codes
BB024L
BB036L
BB048L
BB067L
BB100L
BD
BE
BF
BG
Other variations may be available

Length
Length of braid in inches
Examples:
9 = 9″
12 = 12″

Hole Size
U if undrilled
Examples:
T14 - 1/4″
T12 - 1/2″
2N - 2-Hole NEMA
4N - 4-Hole NEMA

Plating
TN - Tin Plated
W = Hot Tin Dipped
NK = Nickel Plated
SV = Silver Plated
Blank = No Plating

Braid Cable Size Chart

Braid Type	Equivalent Circular Area (kcmil)	Equivalent AWG Size	Weight per Foot (lb)
BB024L	24.1	#6	0.09
BB036L	36.2	#5	0.10
BB048L	48.0	#3	0.14
BB067L	67.2	-	0.23
BD	76.8	#1	0.27
BB100L	100.8	1/0	0.36
BE	153.6	3/0	0.59
BF	230.4	4/0	0.78
BG	307.2	300 kcmil	1.11

Custom lengths available.

Contact the factory for more information.

Common Braid Variations

Ferrule Drilling

- Undrilled
- Elongated (Slotted) Holes
- Special Hole Patterns and Location
- Metric
- NEMA

Ferrule Plating

- Tin
- Silver
- Nickel
- Unplated

Braid Length

- Jumper (overall)
- Ferrule(s) Contact

Covered

- Tubular
- Heat Shrink

Split Braid Assemblies

- Stacked
- Side by Side

Multiple Ferrules

Preformed Configurations

- Offset Contact Surfaces
- Angular (e.g.: 90°, 180°) Bends
- Ferrule contact surfaces rotated 90° on braid axis

Combined Braid Assemblies

Combined Connector - Braid Assemblies

Ferrule Variations

- Belled / Unbelled
- Width / Thickness
- Contact Length
- Special Shaping
- Bent at Angle°

High Ampacity Requirements

Type B
1-Hole Ferrule End

Braid Family	AWG Equivalent	*Approximate Ampere Rating		
		△ 30°C	△ 45°C	△ 60°C
BB024L	#6 AWG	80	95	110
BB036L	#5 AWG	105	125	145
BB048L	#4 AWG	125	155	175
BB067L	#2 AWG	155	185	210
BD	#1 AWG	175	210	240
BE	3/0 AWG	280	335	385
BF	4/0 AWG	355	425	485
BG	300 kmcil	435	520	590

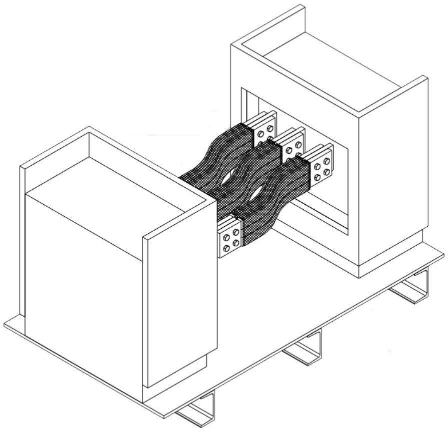
Type B
2-Hole Ferrule End

Braid Family	AWG Equivalent	*Approximate Ampere Rating		
		△ 30°C	△ 45°C	△ 60°C
BD	#1 AWG	175	210	240
BE	3/0 AWG	280	335	385
BF	4/0 AWG	355	425	485
BG	300 kcmil	435	520	590
B2D	#1 AWG	255	310	350
B2E	3/0 AWG	425	510	580
B2F	4/0 AWG	555	665	755
B2G	300 kcmil	685	825	935
B3D	#1 AWG	325	395	450
B3E	3/0 AWG	560	670	760
B3F	4/0 AWG	735	885	1005
B3G	300 kcmil	920	1105	1255
B4D	#1 AWG	390	475	540
B4E	3/0 AWG	680	820	930
B4F	4/0 AWG	926	1095	1245
B4G	300 kcmil	2260	1380	1560

**Approximate ampere ratings are calculated values based on a free air environment with a 30°C ambient temperature. These ratings are approximate and vary with ambient conditions, orientation of the braid, and other service conditions.*

Type BB-M-TN
1-Hole Ferrule End

Braid Family	AWG Equivalent	*Approximate Ampere Rating		
		△ 30°C	△ 45°C	△ 60°C
BB019M	#8 AWG	65	80	95
BB031M	#6 AWG	95	115	130
BB049M	#4 AWG	130	160	185
BB059M	#3 AWG	145	175	200
BB069M	#2 AWG	160	195	220
BB099M	#1 AWG	205	245	280
BB139M	2/0 AWG	250	300	345
BB197M	3/0 AWG	330	395	450



Type B-4N
Used in Power Distribution Applications,
Braid with 4-Hole NEMA Pad

Catalog Number	Cross Sectional Area (kcmil)	Braid Construction (W X H)	*Approximate Ampere Rating		
			△ 30°C	△ 45°C	△ 60°C
B22F184N	921.6	2 x 2	945	1135	1290
B22G184N	1228.8	2 x 2	1165	1400	1585
B23F184N	1382.4	2 x 3	1230	1475	1670
B23G184N	1843.2	2 x 3	1525	1830	2070
B24F244N	1843.2	2 x 4	1495	1795	2035
B24G244N	2457.6	2 x 4	1865	2235	2530
B32F364N	1382.4	3 x 2	1330	1595	1810
B32G364N	1843.2	3 x 2	1635	1960	2215
B33F364N	2073.6	3 x 3	1705	2045	2315
B33G364N	2764.8	3 x 3	2105	1520	2855

Approximate ampere ratings are calculated values based on a free air environment with a 30°C ambient temperature. These ratings are approximate and vary with ambient conditions, orientation of the braid, and other service conditions.

Ampacity of the Burndy Braid

Flexible copper braid generally has greater heat dissipation properties than flat bar, cable, or other conductors, and can be expected to have a greater current carrying capacity for given cross-sectional area. This is due to its greater surface area resulting from the woven construction of fine strands. However, ventilation, due to the vertical convection current of air, is appreciably better when the long axis of the braid is vertical rather than horizontal, so that the long sides of the braid, rather than the edges, are exposed to the moving air. This is particularly true when spaced braids are used in multiple as can be seen by comparing Figure 1 and 2.

To take full advantage of ventilation, the cooling convection current of air should be permitted to flow freely between the braids. Therefore, if possible, the braids should be spaced apart, rather than bunched together, as illustrated in Figure 3. The effectiveness of spacing is, of course, greater when the braids are in a vertical position.

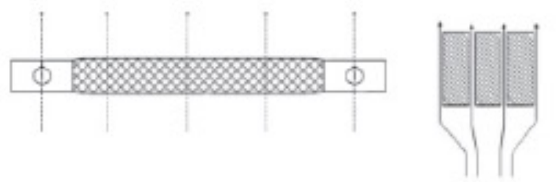


Figure 1
Conventional current have maximum cooling effect with braid in vertical position

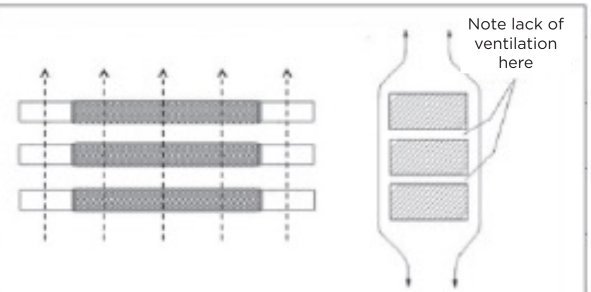


Figure 2
Ventilation less efficient with braid in horizontal position

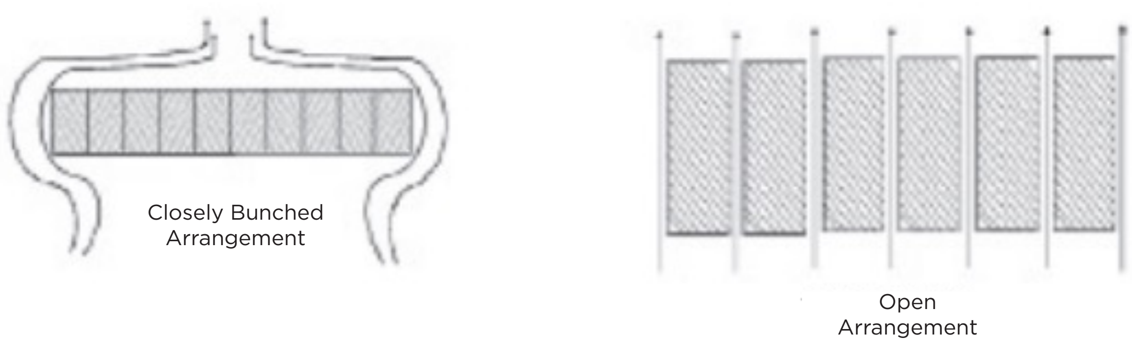


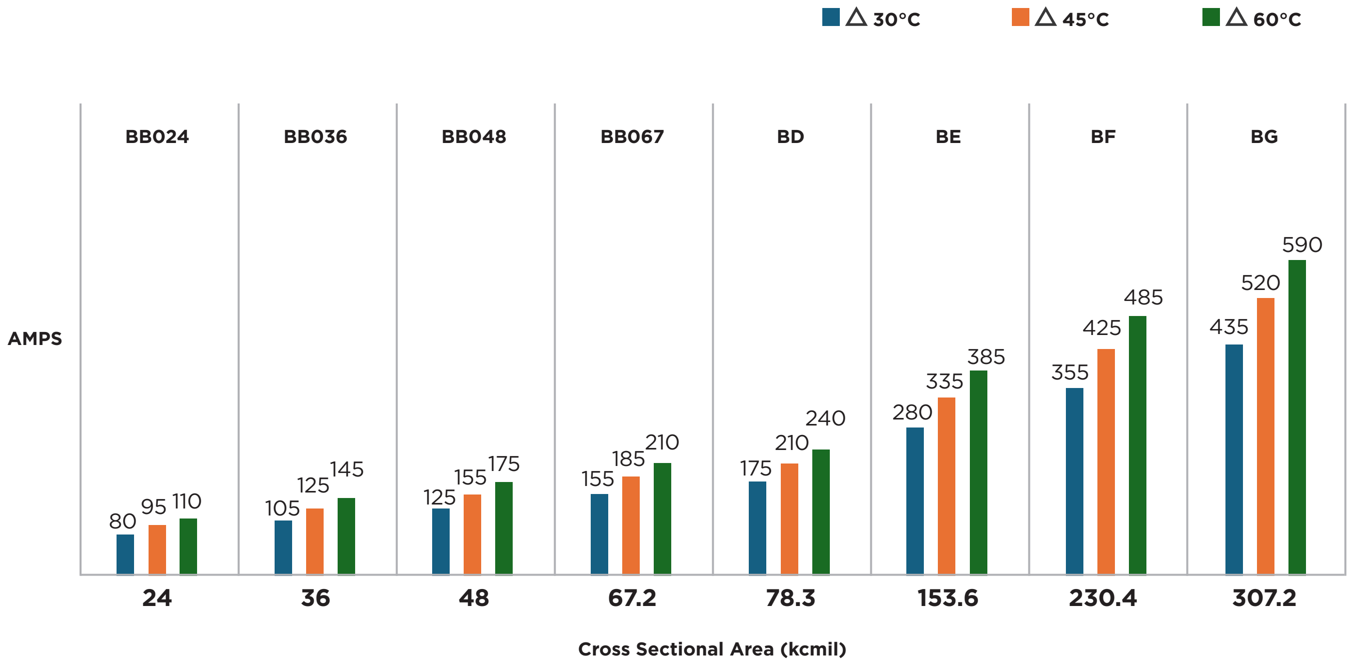
Figure 3
Cooling due to convection current much more effective with spaced braid

Ampacity Calculation

Calculating the ampacity of a braid is very complex as it is dependent on several variables. Some of these variables include, but are not limited to, size, braid orientation, braid material, number of stacked braid straps and other various operating environmental conditions such as ambient temperature, allowed operating temperature, and air flow (enclosure vs. open free air or forced air convection), and AC vs. DC current.

The chart below is a reference to utilize to select the proper braid for your amperage needed. Each of the braid types represented below is a single strap. It is assumed that the braid is in a horizontal position, is in free air, and the ambient temperature is 30°.

Braid Amperage for Temp Rise Over Ambient Temp



Ampacity Calculation

Calculating thermal energy produced and thermal energy dissipated

Orientation: horizontal

$E_{in} = I^2 \times R$

I = current

R = resistance = $\frac{\rho L}{A_c}$

ρ = resistivity of the conductor

L = length of conductor

A_c = cross sectional area of the conductor

$E_{out} = Q_{conv} + Q_{rad}$

Q_{conv} = heat dissipated due to convection

Q_{rad} = heat dissipated due to radiation

Calculating heat dissipation via convection

$Q_{conv} = [h_v * A_v * (T_c - T_a)] + [h_{ht} * A_{ht} * (T_c - T_a)] + [h_{hb} * A_{hb} * (T_c - T_a)]$

h_v = vertical convection coefficient of free air $\frac{W}{m^2K}$

h_{ht} = horizontal convection coefficient of top surface of free air $\frac{W}{m^2K}$

h_{hb} = horizontal convection coefficient of bottom surface of free air $\frac{W}{m^2K}$

A_v = vertical surface of conductor (m^2)

A_{ht} = top horizontal surface area of conductor (m^2)

A_{hb} = bottom horizontal surface area of conductor (m^2)

T_a = ambient temperature (K)

T_c = conductor operating temperature (K)

Calculating heat dissipation via radiation

$Q_{rad} = \sigma \times e\ (T_c^4 - T_a^4) \times A$

σ = Stefan – Boltzmann Constant = 5.6073 x 10 – 8 ($\frac{W}{m^2K}$)

e = emmisivity (material property)

T_c = conductor operating temperature (K)

T_a = ambient temperature (K)

A = surface area of conductor (m^2)

Ampacity Calculation

Calculating ampacity

$$E_{in} = E_{out}$$

$$I^2 \times R = Q_{rad} + Q_{conv}$$

$$I^2 = \frac{Q_{rad} + Q_{conv}}{R}$$

$$I = \sqrt{\frac{\sigma \times e\,(T_c - T_a) \times A) + [h_v * A_v * (T_c - T_a) + [h_{ht} * A_{ht} * (T_c - T_a)] + [h_{hb} * A_{hb} * (T_c - T_a)]}{\frac{\rho L}{A_c}}}$$

Where:

σ = Stefan – Boltzmann Constant = 5.6073 x 10 – 8

ρ = resistivity (70°C operating temp.) = 2.0524×10^{-8} ohm (m)

L = length of conductor = 0.3048 m

A_c = cross section area of the conductor = 0.00064516 m^2

H_v = vertical convection coefficient of conductor = 5.5262

H_{ht} = horizontal convection coefficient of top surface of free air = 0

H_{bt} = horizontal convection coefficient of bottom surface of free air = 0

A_v = vertical surface area = 0.063266 m^2

A_{ht} = horizontal surface area of top surface of conductor = 0.001935 m^2

A_{bt} = horizontal surface area of bottom surface of conductor = 0.001935 m^2

T_{amb} = ambient temperature = 313.15 (K)

T_{cond} = conductor temperature = 343.15 (K)

e = emissivity = 0.4

A = surface area of conductor = 0.067097 m^2

NOTE:

For this example braid size and application, H_{ht} and H_{hb} are both 0 due to small surface area.

$$I = \sqrt{\frac{(5.6703 \times 10^{-8} \times 0.4\,(343.15^4 - 313.15^4) \times 0.0670966) + [5.5262 * 0.063226 * (30)] + [0 * 0.001935 * (30)] + [0 * 0.001935 * (30)]}{\frac{(2.0524 \times 10^{-8}) \times 0.3048}{0.000645516}}}$$

$$I = \sqrt{\frac{(6.4666) + [10.4820]}{9.6966 \times 10^{-6}}}$$

I = 1, 322.08

We provide a wide range of braids for all your connector needs and electrical connections to meet every one of your grounding and power needs.

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