



**GENERAL DUTY • MIL-SPEC • LIGHTWEIGHT • SPECIALS**

# **BRAIDED GROUND STRAPS**

**OCTOBER 2014**







*SERIES 107*

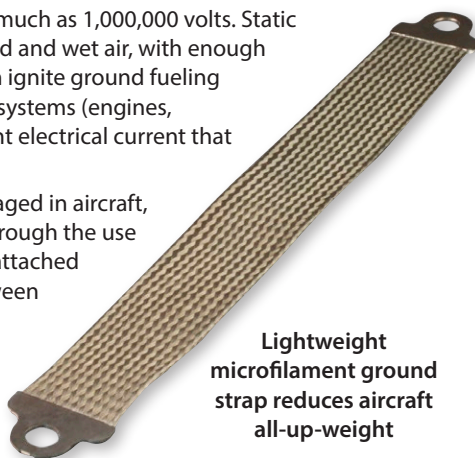
# Braided Ground Straps

**for electrostatic discharge, lightning strike and power equipment grounding**

A single lightning strike can hit an aircraft with as much as 1,000,000 volts. Static electricity can charge an aircraft, particularly in cold and wet air, with enough electrical potential to result in a discharge that can ignite ground fueling equipment or fry avionics gear. Power generation systems (engines, alternators, starters, etc.) can also produce transient electrical current that can damage adjacent electronic systems.

Damage from these events is minimized and managed in aircraft, Navy ships, mass transit systems and elsewhere through the use of electrical bonding. Flexible bonding straps are attached between equipment and airframes as well as between structural elements and flight control surfaces to conduct destructive electrical surges to ground or to bus bar components capable of absorbing significant amounts of transient voltage

Glenair has designed and supplied a broad range of braided ground strap technologies to both commercial and military aerospace customers, as well as US Navy and a broad range of mass transit applications. Our ground strap technologies are exactly designed with appropriate conductive and dissipative materials for each application.



Lightweight microfilament ground strap reduces aircraft all-up-weight



- Ultra-lightweight ground straps with highly conductive or dissipative performance
- Exotic metal-clad microfilament braided solutions
- Significant contribution to weight reduction initiatives in commercial and military aircraft
- Heavy-duty variants for electrical potential grounding from engines, starters, and power units
- Mil-qualified designs for Navy shipboard applications
- Fast turnaround on requests for unusual and build-to-print requirements

# Braided Ground Straps



Lightweight or heavy-duty—Glenair keeps you grounded!

## LIGHTWEIGHT ARMORLITE™ MICROFILAMENT GROUND STRAPS



- Ultra lightweight metal-clad stainless steel braid material
- Low-profile lug design and assembly
- Available in seven widths and any length
- Low electrical resistance and high temperature tolerance
- High conductivity-to-weight / material-cross-section ratio
- Corrosion resistant materials for life-of-system durability
- Bend cycle durability up to 250,000 cycles per EN4199-001

## GENERAL DUTY, CONFIGURABLE GROUND STRAPS



- Designed for general-purpose military and commercial aerospace as well as mass transit and industrial applications
- Nickel-plated copper lugs with configurable mounting hole size options
- Broad range of standard-duty braid materials, including tin and silver-plated copper, stainless steel, and nickel 200
- Insulated sleeving option for environmental protection

## MIL-DTL-24749 TYPE IV QUALIFIED GROUND STRAPS FOR NAVY SHIPBOARD APPLICATIONS



- Meets the rigorous specifications of MIL-DTL-24749 Rev. B Type IV
- Tested to survive 1000 hours salt spray
- Unique Stainless Steel/Nickel hybrid braid
- Available in six standard configurations, with non-standard length/lug size configurations available
- Rugged square form-factor lug

## CUSTOM CAPABILITIES



Hybrid Materials

Bent Lugs

Heavy Duty

Round Braid

Jacketing



# WEIGHT-SAVING, LOW-PROFILE ArmorLite™ ESD Grounding Straps



Single and dual layer, light and medium duty



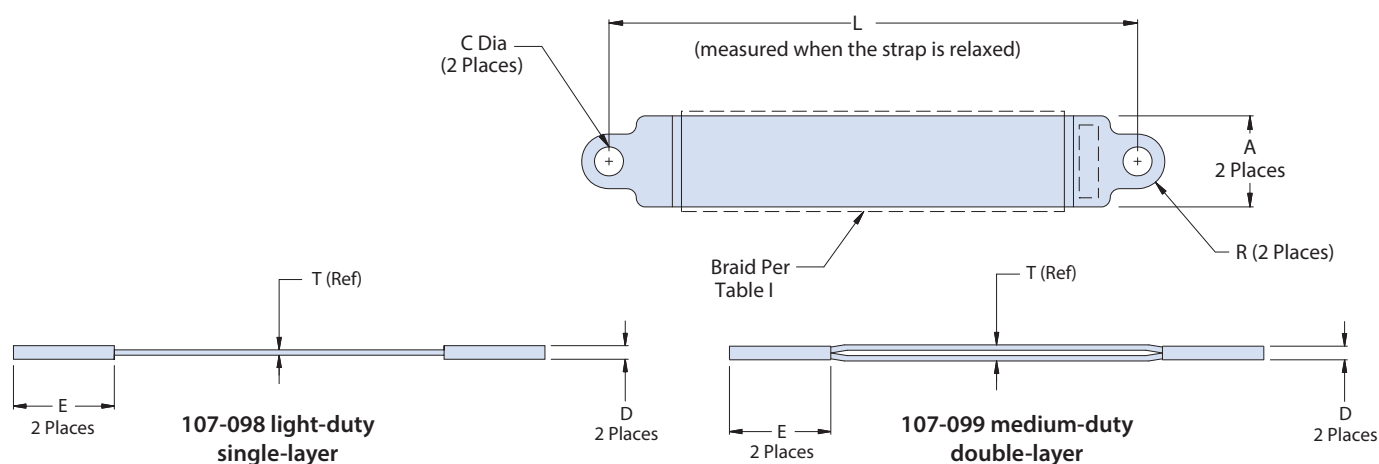
Lightweight Glenair technologies for spot grounding are broadly utilized for grounding airframe sections, dissipating static build-up in composite structures, dissipating lightning strike energy, and grounding individual moving parts in complex equipment such as aircraft landing gear

ArmorLite™ microfilament braid offers 70+% weight savings over standard NiCu braid—plus advantages in virtually every category due to Glenair's ability to fine-tune the makeup of the material cross-section (core, cladding and protective plating) to the exact requirements of each application. Glenair ArmorLite™ lightweight microfilament braids, and hybrid ArmorLite™ and nickel braids are now approved for use by every major airframe and equipment manufacturer.

**ARMORLITE™**



| How To Order       |   |    |     |    |
|--------------------|---|----|-----|----|
| Sample Part Number | 107-098   | -A | -12 | -6 |
| Grounding Strap    | -098 = Single layer light duty ArmorLite<br>-099 = Dual layer medium duty ArmorLite |    |     |    |
| Material           | A = ArmorLite microfilament stainless steel braid                                   |    |     |    |
| Width Code         | (See Table II)  |    |     |    |
| Length             | Dimension (L) in one inch increment   |    |     |    |



| Table II: Mechanical/Electrical Parameters for ArmorLite Material |               |             |             |             |              |             |                                      |                              |              |                             |                     |                      |
|---|---------------|-------------|-------------|-------------|--------------|-------------|--------------------------------------|------------------------------|--------------|-----------------------------|---------------------|----------------------|
| Width Code  | A ± .03       | C           | R           | D           | E            | T           | Nom. Resistance mOhm/m* (AWG Equiv.) | Lug Junction Resistance mOhm | Weight gr/m* | Inductance nH/m (Ref. Only) | Test Current Amps** | Tensile Strength Lbf |
| 12  | .290 (7.37)   | .150 (3.81) | .145 (3.68) | .042 (1.06) | .480 (12.19) | .016 (.41)  | 48 (22)                              | 0.129                        | 9.0          | 1277                        | 37                  | 130                  |
| 20  | .480 (12.19)  | .200 (5.08) | .240 (6.10) | .042 (1.06) | .690 (17.53) | .016 (.41)  | 26 (19)                              | 0.111                        | 13.4         | 1170                        | 52                  | 216                  |
| 24  | .590 (14.99)  | .260 (6.60) | .295 (7.49) | .042 (1.06) | .790 (20.06) | .016 (.41)  | 23 (18)                              | 0.097                        | 17.9         | 1116                        | 62                  | 219                  |
| 32  | .820 (2.83)   | .390 (9.91) | .375 (9.53) | .052 (1.32) | .950 (24.13) | .021 (.53)  | 13 (16)                              | 0.089                        | 35.8         | 1047                        | 127                 | 483                  |
| 40  | .870 (22.10)  | .390 (9.91) | .375 (9.53) | .052 (1.32) | .950 (24.13) | .021 (.53)  | 11 (15)                              | 0.061                        | 40.3         | 1034                        | 141                 | 524                  |
| 48  | 1.080 (27.43) | .390 (9.91) | .375 (9.53) | .052 (1.32) | .950 (24.13) | .021 (.53)  | 8 (14)                               | 0.054                        | 53.8         | 983                         | 162                 | 590                  |
| 64  | 1.330 (33.78) | .390 (9.91) | .375 (9.53) | .052 (1.32) | .950 (24.13) | .021 (.53)  | 6 (12)                               | 0.047                        | 71.7         | 936                         | 208                 | 723                  |
| for 107-098 double-layer straps                                   |               |             |             |             |              |             |                                      |                              |              |                             |                     |                      |
| 48  | 1.080 (27.43) | .390 (9.91) | .375 (9.53) | .080 (2.03) | 1.15 (29.21) | .042 (1.06) | 4 (11)                               | 0.054                        | 107.6        | 976                         | 500                 | 590                  |
| 64  | 1.330 (33.78) | .390 (9.91) | .375 (9.53) | .080 (2.03) | 1.15 (29.21) | .042 (1.06) | 3 (10)                               | 0.047                        | 143.4        | 930                         | 650                 | 723                  |

\* Braid only, figures exclude termination lugs. \*\*Test current is defined as the current required to reach 200° C at ambient temperature

# GENERAL DUTY Series 107 Ground Straps



Five available materials with configurable lugs

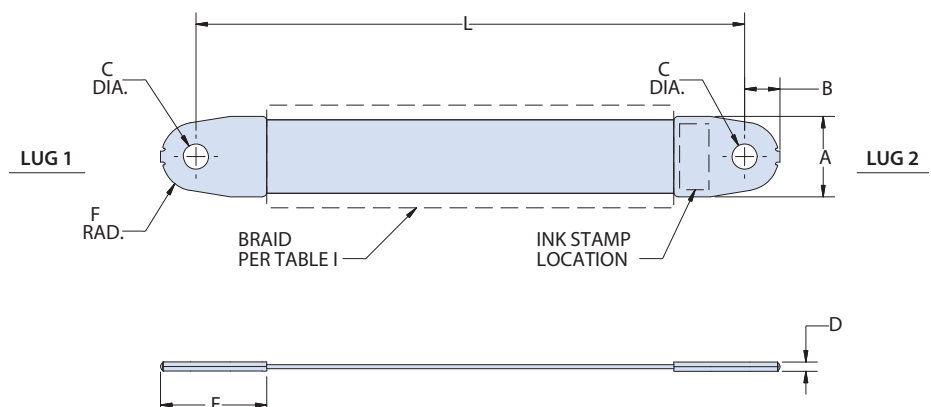


| How To Order        |  |   |      |   |   |       |
|---------------------|--|---|------|---|---|-------|
| Sample Part Number  | 107-133  | A | 1000 | E | H | -10 S |
| Product Series      | General-duty ground strap  |   |      |   |   |       |
| Braid Material Code | See Table I  |   |      |   |   |       |
| Size Code           | See Table II   |   |      |   |   |       |
| Lug 1 Hole          | See Table III (If specifying 2 different sizes, specify smaller hole as Lug 1) |   |      |   |   |       |
| Lug 2 Hole          | See Table III  |   |      |   |   |       |
| Length              | In 1 inch increments. Measured when part is relaxed.                           |   |      |   |   |       |
| Insulation          | S = Insulated Sleeve Omit for none   |   |      |   |   |       |

| Table I: Braid Material |                        |
|-------------------------|------------------------|
| Code                    | Braid Material         |
| A                       | Copper / Tin Plated    |
| B                       | Copper / Silver Plated |
| C                       | Copper / Nickel Plated |
| D                       | Stainless Steel        |
| E                       | Nickel 200             |

| Table II: Size Code / Dimensions |             |             |             |             |       |                          |
|----------------------------------|-------------|-------------|-------------|-------------|-------|--------------------------|
| Size Code                        | A           | B           | D           | E           | F     | Available Lug Hole Codes |
| 250                              | 0.37 (9.4)  | 0.16 (4.1)  | 0.100 (2.5) | 0.52 (4.0)  | 0.156 | A                        |
| 500                              | 0.69 (17.5) | 0.33 (8.4)  | 0.100 (2.5) | 1.04 (8.0)  | 0.313 | B – G                    |
| 781                              | 0.75 (19.1) | 0.33 (8.4)  | 0.100 (2.5) | 1.04 (8.0)  | 0.313 | D – G                    |
| 1000                             | 0.88 (22.4) | 0.39 (9.9)  | 0.100 (2.5) | 1.17 (9.5)  | 0.375 | E – H                    |
| 1500                             | 1.01 (25.7) | 0.46 (11.7) | 0.100 (2.5) | 1.29 (11.1) | 0.438 | E – I                    |
| 2000                             | 1.29 (32.8) | 0.61 (15.5) | 0.100 (2.5) | 1.61 (15.1) | 0.594 | F – K                    |

| Table III: Lug Hole Size Codes |                           |                  |
|--------------------------------|---------------------------|------------------|
| Lug 1 & 2 Hole Size Code       | C Dia.                    | Stud Size (Ref.) |
| A                              | .114 / .122 (2.9 / 3.1)   | #4               |
| B                              | .142 / .152 (3.6 / 3.9)   | #6               |
| C                              | .168 / .178 (4.3 / 4.5)   | #8               |
| D                              | .193 / .203 (4.9 / 5.2)   | #10              |
| E                              | .260 / .275 (6.6 / 7.0)   | 1/4              |
| F                              | .323 / .338 (8.2 / 8.6)   | 5/16             |
| G                              | .385 / .400 (9.8 / 10.2)  | 3/8              |
| H                              | .448 / .463 (11.4 / 11.8) | 7/16             |
| I                              | .510 / .525 (13.0 / 13.3) | 1/2              |
| J                              | .573 / .588 (14.6 / 14.9) | 9/16             |
| K                              | .635 / .650 (16.1 / 16.5) | 5/8              |



## MATERIAL/FINISH

Lugs: Copper/Electroless Nickel plate

Sleeving: Viton M23053/13, Sumitomo FE3 or SM60. Meets outgassing requirements of NASA SP-R-0022A.

Solder: 97 Tin / 3 Copper

# QUALIFIED MIL-DTL-24749 REV B TYPE IV Stainless Steel/Nickel Ground Straps



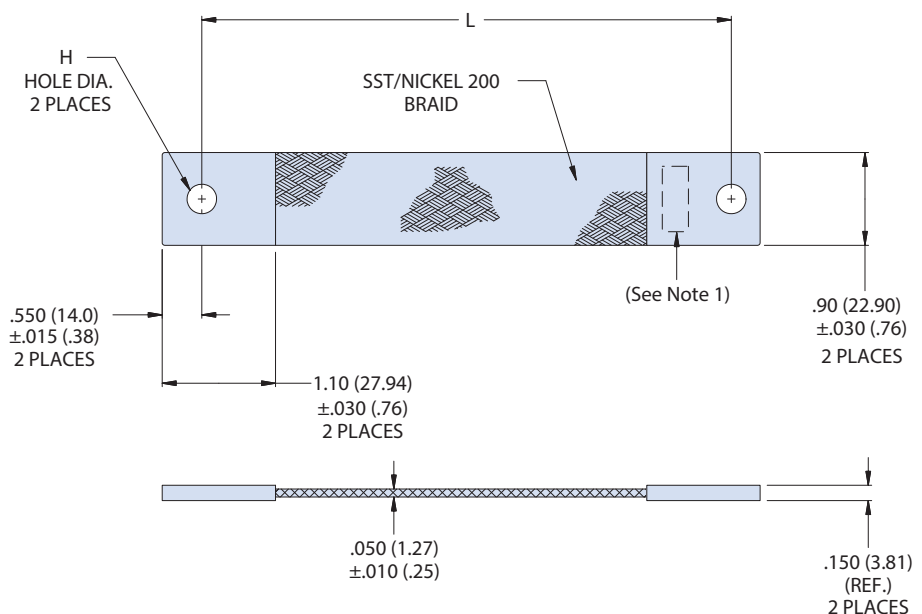
Mil-qualified for harsh-environment shipboard applications



Glenair MIL-DTL-24749 Rev B Type IV ground straps solve harsh-environment shipboard corrosion and electrical resistance problems with a unique 50% Stainless Steel 316L / 50% Nickel 200 36AWG blend braid, and passivated Stainless Steel lugs. These US Navy-approved ground straps are qualified to the rigorous standards of M24749, and are tested beyond the mil-spec to survive 1000 hours salt spray. Allowed usages for Type IV straps can be found in MIL-STD-1310H.

| How To Order        |  |     |    |    |    |
|---------------------|--|-----|----|----|----|
| Sample Part Number  | MS24749  | -IV | -B | -L | -H |
| Product Series      | MIL-DTL-24749 Rev. B Type IV bond strap  |     |    |    |    |
| Bond Strap Type     | IV = Flat CRES 316 / Nickel 200 braid with mounting lugs   |     |    |    |    |
| Standard Size Code  | <b>A</b> = 6.0" length; .90" width, .406 H dia. <b>D</b> = 6.0" length; .90" width, .282 H dia.<br><b>B</b> = 12.0" length; .90" width, .406 H dia. <b>E</b> = 12.0" length; .90" width, .282 H dia.<br><b>C</b> = 18.0" length; .90" width, .406 H dia. <b>F</b> = 18.0" length; .90" width, .282 H dia.<br><b>N</b> = for non-standard sizes |     |    |    |    |
| Non-Standard Length | Non-Standard length in inches (omit for standard sizes)  |     |    |    |    |
| Hole Diameter       | Non-Standard diameter in inches (omit for standard sizes)  |     |    |    |    |

- Meets the rigorous specifications of MIL-DTL-24749 Rev. B
- Tested to survive 1000 hours salt spray
- Unique Stainless Steel/Nickel hybrid braid
- Available in six standard configurations, with non-standard length/lug size configurations available



## NOTES

1. Lugs are ink stamped or electro-etched per M24749 Rev B. Minimum character height shall be .06 (1.52)
2. Metric dimensions (mm) indicated in parentheses
3. Codes A – F are standard lengths. To order non-standard straps, omit Standard Size Code and enter length (in inches) in part number.

## MATERIAL/FINISH

Lugs - 316L Stainless Steel/Passivate

Braid - 316L Stainless Steel 36 AWG, 50%; 200 Nickel 36 AWG, 50%

## Special application ground straps



Fast turnaround on unusual/build-to-print requests



Custom and made-to-order configurations of our popular ground strap designs may be built to exact customer specifications, leveraging the light weight, abrasion-resistance, and conductivity of Glenair ArmorLite™ and/or conventional braid materials. Custom ground strap configuration begins with selection of core filament material, cladding material, and protection material elements to create the right weight and duty of grounding device for each application. From small form-factor straps designed to resolve electrostatic discharge, to larger form-factor flat and round braids for lightning strike and heavy equipment grounding—Glenair has the right weight and duty of strap for the broad range of military and commercial aircraft, Navy, and satellite applications.



**Hybrid braid materials and customizable lug material options**

**Specialized lug configurations including integrated bonding hardware and angled lugs**

**Heavy-duty braid and lug configurations**



**Round cross-section braid**



**Harsh environment and chemical-resistant ground strap jacketing**

## GROUND CONTROL EARTH BOND SYSTEM



| How To Order   |   |
|----------------|---|
| <b>600-120</b> | Hydraulic Setting Tool for 1/4" Earth Bonds |
| <b>600-123</b> | Hydraulic Setting Tool for 3/8" Earth Bonds |
| <b>600-124</b> | Hydraulic Setting Tool for M6 Earth Bonds   |
| <b>600-125</b> | Hydraulic Setting Tool for M10 Earth Bonds  |

The tools feature one hand operation and ram retract mechanism actuated by release trigger. Consult factory for control gauges and earth bond part numbers for each material type and size.



*Out of This World*  
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