

# Earth Bonding System

## Overview



**The Glenair Earth Bonding system is a revolutionary method of creating an electrical bond between structures and equipment for the secure passage of high intensity current in case of electrical short circuit.**

### System Benefits

- Suitable for use with steel, stainless steel and aluminium\*
- Suitable for plate thickness 1.5 mm and above+
- Bond installed from one side
- Can be installed into a blind hole
- Permanent electrical connection providing low electrical resistance
- May be removed and replaced in case of damage
- Suitable for use on uneven surfaces
- Manufactured from non-corroding materials
- Cost effective as repeatable connections require limited tooling
- One person operation
- Extensive independent testing
- Recommended for use by major OEM's in RMT, Marine and Military Markets
  - ⇒ \* Other materials under evaluation
  - ⇒ + Subject to further tests on plates less than 1.5 mm thick

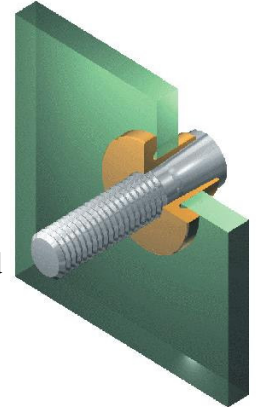


### How Does it Work?

The earth bond comprises two components:

1. A conical dowel having a male thread
2. A cylindrical flanged bush

A tensile force is applied to the dowel using a hand hydraulic tool with a pre-determined pulling force. As the dowel is pulled through the bush, the bush remains fixed in the structure and expands within the hole making electrical contact. The tool completes its cycle resulting in a permanent electrical connection.



### How do you Install it?

1. Drill a hole in the mounting plate to a pre-determined diameter depending on the plate material, plate thickness and stud size selected
2. Screw the bond into the nose of the hydraulic setting tool
3. Insert the bond into the hole so that the flange is flush with the plate
4. Pump the handle of the tool until an audible click is heard and release the tool from the stud
5. Attach termination and tighten to required torque value

**Connection is complete**



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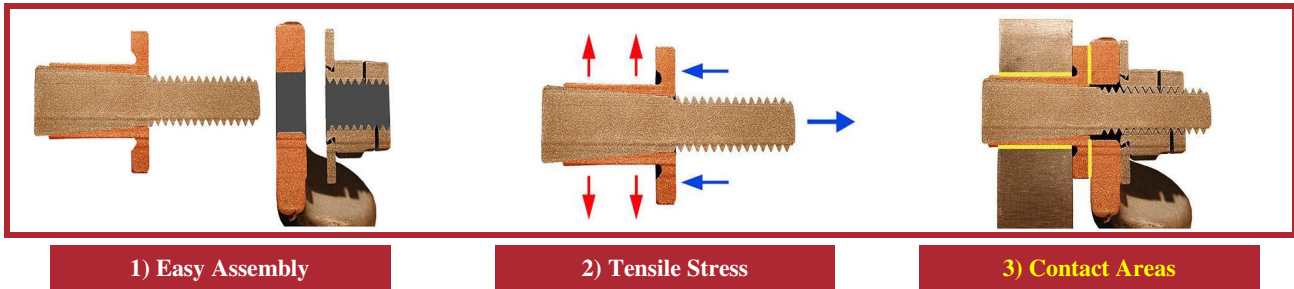
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## Typical Performance Values



### Principle of the Earth Bond



### Electrical Performance: Aluminium Plate

| Part Number  | 80958 – M6                | 80959 – M10               | 80960 – M6                | 80961-M10                 |
|--|---------------------------|---------------------------|---------------------------|---------------------------|
| Electrical resistance measured at a point between the terminal lug (copper tin plated) and the aluminium plate | 60 micro ohms<br>T = 2 mm | 50 micro ohms<br>T = 2 mm | 60 micro ohms<br>T = 4 mm | 20 micro ohms<br>T = 4 mm |
| Withstand short circuit test – 3 passes of high intensity current with no degradation of the connection        | 10 Ka                     | 20 Ka                     | 10 Ka                     | 20 Ka                     |
| Corrosion Test: 500 hours  | 90 micro ohms<br>T = 2 mm | 50 micro ohms<br>T = 4 mm | -                         | -                         |

T = Plate Thickness

### Mechanical Performance: Aluminium Plate

| Part Number   | 80958-M6             | 80959-M10           | 80960-M6            | 80961-M10           |
|---|----------------------|---------------------|---------------------|---------------------|
| Tensile force applied to the dowel or threaded stud to remove earth bond from the plate               | 250 daN<br>T = 2 mm  | 200 daN<br>T = 2 mm | 300 daN<br>T = 4 mm | 500 daN<br>T = 4 mm |
| Bending moment (IEC60068-2-21). Force applied at a point 5 mm from the end of the thread              | 34 daN<br>T = 1.5 mm | 100 daN<br>T = 2 mm | 200 daN<br>T = 4 mm | 300 daN<br>T = 4 mm |
| Pressure Seal: Pressure applied to both sides of bond for 2 hours with no leak between bush and plate | 6 Bar                | 6 Bar               | 6 Bar               | 6 Bar               |

T = Plate Thickness

### Mechanical Performance: Steel + Stainless Steel Plate

| Part Number  | 80923-M6                   | 80924-M10                 | 80925-M6                  | 80926-M10                 |
|--|----------------------------|---------------------------|---------------------------|---------------------------|
| Electrical resistance measured at a point between the terminal lug (copper tin plated) and the steel plate           | 25 micro ohms<br>T = 2 mm  | 20 micro ohms<br>T = 2 mm | 25 micro ohms<br>T = 4 mm | 20 micro ohms<br>T = 4 mm |
| Electrical resistance measured at a point between the terminal lug (copper tin plated) and the stainless steel plate | 120 micro ohms<br>T = 2 mm | 70 micro ohms<br>T = 2 mm | 75 micro ohms<br>T = 4 mm | 60 micro ohms<br>T = 4 mm |
| With stand short circuit test-3 passes of high intensity current with no degradation of the connection.              | 10 Ka                      | 15 Ka                     | 10 Ka                     | 20 Ka                     |
| Corrosion test: 500 hours: 2 mm steel plate  | 30 micro ohms              | 25 micro ohms             | -                         | -                         |
| On 2 mm stainless steel plate  | 150 micro ohms             | 90 micro ohms             | -                         | -                         |

T = Plate Thickness

### Mechanical Performance: Steel + Stainless Steel Plate

| Part Number   | 80923-M6              | 80924-M10           | 80925-M6            | 80926-M10           |
|---|-----------------------|---------------------|---------------------|---------------------|
| Tensile force applied to the dowel or threaded stud to remove earth bond from the plate               | 400 daN<br>= 2 mm     | 500 daN<br>T = 2 mm | 500 daN<br>T = 4 mm | 800 daN<br>T = 4 mm |
| Bending moment (IEC60068-2-21). Force applied at a point 5 mm from the end of the thread              | 100 daN<br>T = 1.5 mm | 190 daN<br>T = 2 mm | 200 daN<br>T = 4 mm | 330 daN<br>T = 4 mm |
| Pressure seal: Pressure applied to both sides of bond for 2 hours with no leak between bond and plate | 6 Bar                 | 6 Bar               | 6 Bar               | 6 Bar               |

T = Plate Thickness



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## Details of Tests Performed by DERA

The earth bonding system has been independently tested by the 'Defence Evaluation and Research Agency' (DERA).

The Earth Bonding system has Lloyds Register Type Approval: Certificate number 02/00022 issued 27 March 2002. Application ENV1, ENV2, ENV5.

## Destructive Testing

| Test                    | Specification | Test Level                     | Comments    |
|-------------------------|---------------|--------------------------------|-------------|
| Tensile/Compression     | IEC60068-2-21 | Test to point of failure       | Destructive |
| Torsion                 | IEC60068-2-21 | Test to point of failure       | Destructive |
| Bending Moment          | IEC60068-2-21 | Test to point of failure       | Destructive |
| Withstand Short Circuit |               | M6 -3 x 5 Ka<br>M10 -3 x 10 Ka | Destructive |

## Sequential Testing

| Test                        | Specification         | Test Level                      | Comments  |
|-----------------------------|-----------------------|---------------------------------|---|
| Electrical Continuity       | IEC60512-2b           | Measure results                 | Initial & after test                                  |
| Pressure Seal               | IEC6006802017 Test Qa | 20 PSI                          | Record results  |
| Vibration                   | IEC60068-2-6          | 10-500 Hz @ 0.75 mm/4 gn        | Sinusoidal  |
| Shock                       | IEC60068-2-27         | 300g,3 ms, half sine            |   |
| Rapid Change of Temperature | IEC60068-14           | Temperature range<br>-25C + 70C | 16 cycles   |
| Endurance                   | IEC60068-2-52         |                                 | 10 cycles   |
| Salt Mist                   | IEC60068-2-52         |                                 | 500 hours continuous –<br>Marine environment solution |

The Earth Bonding system has been approved for use by the Ministry of Defence, Warship Support Agency and is NATO codified. The system has been endorsed by the following companies for Railway Mass Transit, Marine, Military and Industrial applications: Bombardier Transportation Projects, Alston, CAF, Siemens, General Dynamics, BAE Systems, Network Rail, London Underground Ltd, Stolt Off Shore – Sub Sea Applications.

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