## Comparison of AEGIS® Shaft Grounding Rings to Discrete-Point Brushes

<table>
<thead>
<tr>
<th>SHAFT GROUNDING EFFECTIVENESS</th>
<th>AEGIS® Bearing Protection Ring: 360˚ Circumferential Conductive Microfiber Shaft Grounding Ring</th>
<th>Discrete-Point Brushes: Carbon Block, Filament Bundle, and Toothbrush Type</th>
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<tbody>
<tr>
<td><strong>Design life</strong></td>
<td>Longest life 'wear-to-fit' design outlasts the normal life of motor bearings.</td>
<td>Due to wear, these brushes require periodic replacement multiple times during the life of the motor’s bearings.</td>
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</table>
| **Shaft surface contact**     | 100% circumferential shaft contact through hundreds of thousands to millions of shaft voltage discharge points (depending on shaft diameter).  
                              | The greater the shaft diameter, the greater the number of contact points.  
                              | Nanogap electrical contact technology provides continuous shaft current discharges. | Brush contacts only 4% of the shaft’s circumference.  
Carbon block: spring pressure creates friction and wear.  
Effectiveness depends on environmental conditions such as temperature, pressure, humidity, and impurities as well as shaft speed and the pressure of the carbon block against the shaft. |
| **Grounding capacity for VFD high-frequency currents (dv/dt)** | High current carrying capacity increases as shaft diameter increases. The more fibers surrounding the shaft, the greater the current discharge capability.  
Specifically designed to discharge currents from VFD high-frequency switching. | Fixed current capacity depends on surface area of brush.  
Designed for DC and low-frequency currents, not high frequency VFD currents. |
| **Current distribution**      | Uniform current distribution 360˚ around the shaft surface where the microfibers are touching.  
Not affected by impurities, shaft speed, temperature, pressure, or humidity. | Current does not flow uniformly across the whole brush contact surface. It flows through a varying number of very small contact spots.  
During operation, these contact spots are not evenly distributed and may decrease due to changing environmental conditions.  
Contact balance may be disrupted by:  
• Dust, vapors, or excessive humidity or temperature  
• Brush grades unsuitable for operating conditions (film too thick, current density too high or low, or poor ventilation)  
• Unequal current distribution resulting from unequal spring pressure |
| **Surface rate**              | Surface rate and RPMs do not affect performance.  
AEGIS® Shaft Grounding Ring’s performance proven in tests at surface rates over 180 ft/sec and 50,000 RPMs. | Higher surface rates result in faster wear, and more frequent brush replacement.  
Not effective at higher RPMs.  
Brush contact is difficult to maintain. |
| **Robust in respect to contamination** | Effective even in the presence of small amounts dirt, dust, grease, or other contaminants. Microfibers “sweep” contaminants away from the shaft surface. | Easily fouled by dirt, dust and grease.  
Oil or grease may interrupt contact between the shaft and brush.  
Contaminants can clog the spring loaded brush, causing it to stick and lose contact with the shaft. |
| **Load on shaft**             | No load on shaft — Microfibers touch and slightly overlap the shaft surface.  
No measurable friction. | Spring load on shaft causes drag and decreases motor efficiency. |
## INSTALLATION

<table>
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<th>Inside motor</th>
<th>Discrete-Point Brushes: Carbon Block, Filament Bundle, and Toothbrush Type</th>
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<td>Because AEGIS® rings last the service life of the motor bearings and therefore do not require replacement or maintenance, they can be installed inside the motor. Internal installation is ideal for severe-duty applications, this type of installation protects the ring from high-pressure washdowns, chemicals, dirt, dust, particulates, and other contaminants. AEGIS® rings produce no dust to interfere with motor function or performance. AEGIS® rings have no humidity requirements to function properly. Can be bolted to the bearing retainer. Motors with AEGIS® Rings factory-installed are available from all major motor manufacturers.</td>
<td>Wear necessitates routine brush maintenance and replacement, making internal installation impractical and costly. Wear creates dust particles that can foul or clog motor windings and contaminate bearing lubrication. Particles can collect in the brush holder and cause the carbon block or spring to jam. Environments inside motors do not meet the humidity and temperature conditions required to maintain contact spots for conduction.</td>
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<td>Outside motor</td>
<td>Easily installed on motor end bell using press fit, screws, or conductive epoxy. Brackets or uKITS simplify installation on motors with shaft shoulders, slingers, or other end bell protrusions. Self-centering for easy alignment. Slim design minimizes shaft length requirements.</td>
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## MAINTENANCE

| Wear | Mechanical wear due to friction shortens the effective life of these brushes. Hotspotting can create electrical wear from arcing, and pitting of the shaft surface can increase mechanical resistance and decrease the effectiveness of discrete contact brushes. |
| Brush maintenance | None required | Carbon dust from wear can jam the spring. Routine maintenance required to clean brush holder and spring mechanism of contaminants, coatings, oil, and grease. Spring may require calibration or replacement to maintain electrical contact pressure. A highly resistive glaze may form on brush surface, requiring periodic cleaning. |
| Shaft maintenance | Colloidal Silver Shaft Coating is recommended to inhibit oxidation and create a highly conductive shaft surface. Rust is not conductive and must be removed from any area where fibers touch the shaft. | Carbon block brush operation may create a highly-resistive film on motor shaft which interferes with shaft grounding effectiveness. Routine maintenance may be required to clean shaft of oxidation, coatings, and contamination. |
| Replacement | Not required during life of motor bearings | Needs periodic replacement due to wear |

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