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

	AEGIS® Bearing Protection Ring: 360° Circumferential Conductive Microfiber Shaft Grounding Ring	Discrete-Point Brushes: Carbon Block, Filament Bundle, and Toothbrush Type
		
SHAFT GROUNDING EFFECTIVENESS		
Design life	Longest life "wear-to-fit" design outlasts the normal service life of motor's bearings.	Due to wear, these brushes require periodic replacement multiple times during the service life of the motor's bearings.
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 speed and RPMs do not affect performance. Wear-to-fit design ensures nanogap electrical contact is maintained even at high shaft speeds. AEGIS® Shaft Grounding Ring's performance proven in tests at surface speed over 180 ft/sec and 50,000 RPMs.	Higher surface speed result in faster wear, and more frequent brush replacement. Not effective at higher RPMs as brush contact is difficult to maintain at higher surface speeds.
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. Fibers maintain nanogap electrical contact to discharge shaft voltages.	Easily fouled by dirt, dust, grease and other contaminants. 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.

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INSTALLATION		
Inside motor	AEGIS® rings last the service life of the motor's bearings and 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 screwed directly to the bearing retainer. Motors with AEGIS® Rings factory-installed are available from all major motor manufacturers.	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 and lose shaft contact. Environments inside motors do not meet the humidity and temperature conditions required to maintain contact spots for conduction.
Outside motor	Easily installed on motor end bell using press fit, screws, or conductive epoxy. Brackets or AEGIS® uKITs simplify installation on motors with shaft shoulders, slingers, or other end bell protrusions. Slim design minimizes shaft length requirements.	Must be accessible for maintenance or replacement. Complex installation often requiring machining of bracket and tying up more than 1" of shaft length. Alignment and calibration are also difficult and time consuming. Process shutdown required for periodic motor maintenance.
MAINTENANCE		
Wear	Because they operate with ultra-low friction, AEGIS® rings exhibit virtually no wear. Wear-to-fit design ensures microfibers maintain nanogap electrical contact with motor shaft. Testing shows wear of less than 0.001" (0.025 mm) in 10,000 hours. Calculated microfiber brush life is greater than 200,000 hours.	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
Ease of brush maintenance	No maintenance required	Shutdown required for routine maintenance to replace or maintain brush and brush holder. Emergency shutdown and cleaning are required if brush sticks or jams in spring-loaded brush holder.
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.
Brush life	Lasts for the service life of the motor bearings. Estimated life is greater than 200,000 hours.	Depends on brush, but may be as short as 3~5 months