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Manufacturer's Specification

AEGIS® Bearing Protection Ring / AEGIS® SGR (Shaft Grounding Ring)

Product Application:
Shaft grounding for AC electric induction motors controlled or operated by pulse width modulation (PWM) variable frequency drives (VFD). Suitable shaft grounding requirements of VFD induced shaft voltage to protect motor bearings from electrical damage.

Sustainable (Green) Building and Manufacturing Design:
Incorporates design characteristics for both energy savings and sustainability. Variable Frequency Drives save energy but require sustainable motor specifications to protecting motor bearings from VFD-induced electrical bearing fluting failure. AEGIS® conductive microfiber shaft grounding ring improves reliability of VFD driven motors.

Bearing Damage from VFD Induced Shaft Voltage in all motors:
Variable frequency drives induce voltage onto the shaft of the driven electric motors through parasitic capacitance. These voltages seek a path to ground through the motor bearings causing electrical currents which result in pitting and fluting damage and motor failure.

Bearing Damage from High Frequency Circulating Currents on Motors above 100 HP (75 kW):
VFD-induced high frequency circulating currents result from the magnetic flux imbalances in the motor's windings. High frequency circulating currents through the motor bearings cause destructive bearing currents which may result in fluting damage and motor failure.

Shaft Grounding Ring for VFD-Induced Shaft Voltage on Electric Motors (all power ratings):
Application of shaft grounding rings is required on all VFD-driven motors to provide a conductive discharge path away from the motor bearings to ground. AEGIS® Bearing Protection Ring provides a maintenance-free circumferential ring of conductive microfibers that discharges voltages to ground.

Manufacturer's Application Recommendation for VFD Driven Motors: Low Voltage (up to 600 V AC)

Motors up to 100 HP (75 kW):	**Motors over 100 HP (75 kW):**
Install one AEGIS® Bearing Protection Ring on either the drive end or the non-drive end of the motor in accordance with manufacturer's installation instructions.	Drive end: Install one AEGIS® Bearing Protection Ring. Non-Drive end: Bearing housing must be isolated with insulated sleeve or coating or use insulated ceramic or hybrid bearing to disrupt circulating currents. Note: The recommendation above is the preferred configuration for most applications. Contact sales@est-aegis.com with any questions.

Note: For medium voltage motors and motors above 500 HP (375 kW) or for high current applications contact sales@est-aegis.com

Protecting Attached Equipment from VFD Induced Bearing Currents:
VFD-induced shaft voltages may also discharge through the bearing in attached equipment including gear boxes, pillow block bearings, break motor bearings, encoders etc. Applying AEGIS® Bearing Protection Ring to the motor shaft will discharge induced electrical voltages to ground and prevent voltages from seeking a discharge path through the attached equipment.
Note: Install one AEGIS® Bearing Protection Ring in all applications where motor has insulated bearings or ceramic ball bearings installed on both DE and NDE.

Design Specification (Electrical or Mechanical Section):
Whenever variable frequency PWM drives are installed to control AC motors, a maintenance-free, circumferential, conductive microfiber shaft grounding ring (SGR) shall be installed on the AC motor to discharge shaft currents to ground.
Recommended part: AEGIS®SGR Bearing Protection Ring

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Application Specifications:

Shaft Surface Condition:	Shaft surface must be conductive and be free of any coatings or finishes that reduce conductivity. In most cases, standard steel shaft finish from motor manufacturer is suitable for AEGIS® shaft grounding ring installation, however environmental factors could create a potential for decreased conductivity on the shaft of the motor by formation of a non-conductive surface layer such as rust or oxidation. Maintaining a conductive shaft surface is required to allow efficient discharge of VFD-induced shaft voltage to the AEGIS® Bearing Protection Ring. Recommend applying AEGIS® CS015 Colloidal Silver Shaft Coating to the motor shaft surface prior to installing AEGIS® SGR.
Shaft Surface finish:	Ra 130 micro-inch finish or better.
Shaft Surface Maintenance Requirements:	If a non-conductive corrosion forms on the motor shaft such as rust or other oxidation: (1) Unfasten the AEGIS® ring from the motor end bracket by removing the screws and brackets. (2) Slide the ring away from the motor housing. (3) Using very fine grit (#220 - #240) sand remove any non-conductive corrosion from the area where the fibers touch the shaft. (4) Apply AEGIS® Colloidal Silver Shaft Coating (PN: CS015) to the shaft surface and allow to dry. (5) Reinstall the AEGIS® Ring.
AEGIS® Conductive Shaft Surface Coating (Colloidal Silver CS015):	Applied to the motor shaft to enhance the conductivity of the motor shaft surface and help prevent non-conductive corrosion by filling in the machined surface with engineered silver <1 um flake. Silver is applied 360 degrees around the motor shaft where the fibers are in contact with the shaft. Silver particles are polished into the shaft surface by the AEGIS® SGR conductive microfibers. • RECOMMENDED: (1) All AEGIS® installations for motors below 100HP (75kW); (2) All motors between 100-500 HP (75-375 kW) when non-drive end bearing is insulated and AEGIS® SGR is on opposite end • REQUIRED: (1) Motors with cylindrical bearing; (2) Vertical Motor applications; (3) Critical Applications; (4) Voltage > 600 V; (5) Power rating > 500 HP (375 kW)
Fiber Flexibility:	AEGIS® Rings are constructed with patented AEGIS® FiberLock™ channel to allow conductive microfibers to bend and flex within their elastic design limits. Multiple rows of fibers are distributed 360 degrees inside the FiberLock™ channel to provide maximum shaft surface contact. Fiber length is designed with an optimal shaft overlap.
Fiber wear:	Usually less than 0.001"[0.03mm] in 10,000 hours. Fiber wear length designed for expected life 200,000+ hours based on testing. Wear rate may vary depending on conditions in individual applications. Fibers retain contact/noncontact function.
Friction:	Little or no frictional axial or radial fiber pressure applied to shaft. Extremely light contact only. Designed for minimal friction with no reduction in motor performance.
AEGIS® Ring Maintenance Requirements:	The AEGIS® Ring does not require maintenance. The shaft must remain conductive for shaft current discharge.
Replacement	Install new AEGIS® Ring whenever bearings are replaced on inverter-driven motors.
Oil and Grease on Motor Shaft:	Small amounts of oil and/or grease are acceptable if the shaft surface remains conductive. Fibers are designed to maintain contact with the motor shaft and "sweep" oil away from surface.
Dirt/dust:	Small amounts of dust and/or small particles are acceptable. Fibers "sweep" particles from shaft surface during operation. Shaft surface must remain conductive.
Eccentricity	0.010" [0.25mm] Total Indicator Runout in area where AEGIS® Ring is installed
Directional rotation:	Motor may be operated in clockwise or counter clockwise rotation. Motor may change directional rotation without limitations.

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Maximum surface rate/RPM:	No Maximum rating - There is no theoretical RPM limit as there is virtually no frictional contact with the shaft at high RPM. Verify specific application with AEGIS® Engineering.
Maximum temperature rating:	410°F (210°C) - Verify application specific temperatures with AEGIS® Engineering.
Minimum temperature rating:	-112°F (-80°C) - Verify application specific temperatures with AEGIS® Engineering.
Humidity:	0 to 90% - Verify application specific acceptable humidity with AEGIS® Engineering
RoHS Test Results: **Directive 2002/95/EC for the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment applies**	All materials used in manufacture of AEGIS® Rings are in compliance with Directive 2002/95/EC, Restriction of the use of certain Hazardous Substances in electrical and electronic equipment. No RoHS banned substances are present in excess of the maximum concentration values (MCV). (1) Following substances were found to be less than 0.1% by weight in homogeneous materials (required by RoHS directive): Lead (Pb) Mercury (Hg) Hexavalent chromium (Cr(VI)) Polybrominated biphenyl (PBB) Polybrominated diphenyl ether (PDPE) (2) Following substance is less than 0.01% by weight in homogeneous materials (required by RoHS directive): Cadmium (Cd) Note: Request RoHS Certification Letter from sales@est-aegis.com or call 866-738-1857
Hazardous areas:	**Not certified for Class 1 Division 1, Division 2 or Class 1 Zone 1, Zone 2.** AEGIS® Rings may be installed inside an explosion proof enclosure per IEEE Std 303™ 2004 or inside an XP motor.
CE and UL requirements:	AEGIS® SGR is classified as a "component" and as such is not subject to the requirements of any Directive. The application of CE or UL Mark is not applicable to this component.

Additional Installation Notes:

Installation Instructions:	Detailed instructions available at www.est-aegis.com
Corrosion Prevention:	Do not install AEGIS® Rings on rust-covered shafts or where rust is likely to accumulate on motor shaft surface. To assist in prevention of rust or oxidation apply AEGIS® Colloidal Silver Shaft Coating PN CS015 on clean shaft surface.
Thread Locking compound:	Do not use thread locking compound or any other non-conductive material to secure the screws of AEGIS® Rings. The screws are part of the conductive path for shaft voltages.
Excessive Vibration:	Installation bolts should be tightened and lock washers used. In some critical applications it may be also be desirable to use a thread locker. In this case you must use a conductive silver epoxy such **as EP2400** available from sales@est-aegis.com or 866-738-1857
Outdoor installations:	A cover should be installed to prevent rust on the shaft. Use AEGIS® Colloidal Silver Shaft Coating PN CS015 on motor shaft to help retard rust.
Wash-down Duty Applications:	Recommend AEGIS® Ring installed inside the motor. High pressure water should not be directed onto the conductive microfibers. Contact sales@est-aegis.com or call 866-738-1857 for recommendations regarding wash-down duty applications.
Severe Duty Environments:	For severe duty applications use AEGIS® Ring installed inside the motor or incorporate inside of a Bearing Isolator. AEGIS® PROSLR incorporates an o-ring dust and debris barrier.
Technical information:	Technical information contained in this specification is rendered in good faith. User must assume responsibility to determine suitability of the product for intended use. Contact AEGIS® Engineering by calling customer service: 866-738-1857 or email sales@est-aegis.com.