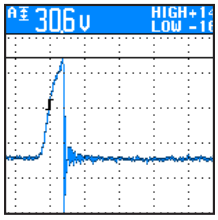
AEGIS® SGR
BEARING PROTECTION RING

Edition 2

$19.95

AEGIS® SHAFT GROUNDING RING BEARING PROTECTION HANDBOOK

Best Practices for New Motor Design, Motor Repair and Engineering Specifications, Shaft Voltage Testing, and Bearing Inspections



Electro Static Technology™
An ITW Company

COMPANY INFORMATION

Electro Static Technology, An ITW Company, is a global manufacturer and inventor of AEGIS® Bearing Protection Rings used in electric motors and other rotating equipment to safely discharge variable frequency drive (VFD) voltages to ground. AEGIS® Shaft Grounding Ring technology is installed in all ranges of motors from fractional horse power to large medium voltage motors used in virtually all commercial and industrial applications.

AEGIS® Shaft Grounding Ring technology is the only technology that combines both contact and non-contact nanogap technology to reliably protect bearings from electrical discharges that cause pitting, frosting and fluting damage. AEGIS® Ring Technology uses proprietary conductive micro fibers arranged circumferentially around the motor shaft and secured in our patented AEGIS® FiberLock™ channel which protects them during operation. The following patents apply: 8199453, 8169766, 7193836, 7136271, 7528513, 7339777, and other patents pending.

WARRANTY

Units are guaranteed for one year from date of purchase against defective materials and workmanship. Replacement will be made except for defects caused by abnormal use or mishandling. All statements and technical information contained herein, or presented by the manufacturer or their representative are rendered in good faith. User must assume responsibility to determine suitability of the product for intended use. The manufacturer shall not be liable for any injury, loss or damage, direct or consequential arising out of the use, or attempt to use the product.

SAFETY 

Follow all workplace safety policies and procedures applicable to electric motor repair and for all hazardous operations. Wear all applicable personal protective equipment (PPE) required by the applicable law. Employees should be informed of the relevant safety rules and employers should enforce compliance. The manufacturer shall not be liable for any injury, loss or damage, direct or consequential arising out of the use, or attempt to use the product or procedures described in this manual.

This book is generally reviewed every year and updated. Comments and suggestions are invited. Any errors or omissions in the data should be brought to the attention of the Editor. Additions and corrections to the Handbook in print will be in the Handbook published the following printed edition and, as soon as verified, on the Electro Static Technology Internet Web site.

Disclaimer-Application notes are intended as general guidance to assist with proper application of AEGIS® Bearing Protection Ring to protect motor bearings. All statements and technical information contained in the application notes are rendered in good faith. User must assume responsibility to determine suitability of the product for its intended use.

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ELECTRICAL APPARATUS SERVICE ASSOCIATION
EASA
Reliable Solutions Today!

ANSI/EASA Standard AR100-2010, Section 2, Mechanical Repair: *2.2 Bearings*

"Bearings should be inspected for fretting, fluting, frosting, scoring or other damage."

Electrical Motor Repair, Bearing Inspection, and Testing Services:

Electrical motor repair, bearing inspection, and testing services are focused on providing a total package of solutions for industrial and commercial customers. Especially important are services that relate to motors operated by variable frequency drive (VFD) inverters. Best practices in motor repair and analysis techniques will drive improved service offerings which improve the service to end users.

Best Practices and Service Portfolio:

Assess motors with shaft voltage testing when operated on variable frequency drives

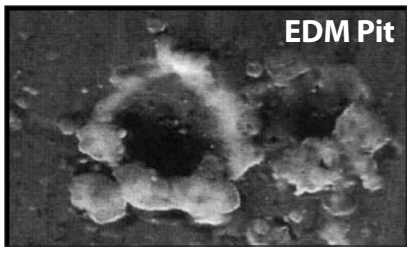
Ensure that best practices are followed for bearing protection during the repair

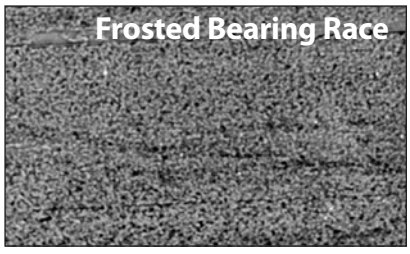
Give advice on preventing bearing failures for VFD driven motors

Inspect bearings for signs of electrical discharge machining (EDM) damage

Satisfy the customer with superior repair services

Customers demand repair, testing and analysis services to ensure uptime and reliability and often recognize the leading service providers with their business. Therefore, the value added service offerings explained in this manual will help the motor repair and service company meet customer requirements by offering best practices in motor repair for VFD driven equipment.





Be the leader in your industry!

Best Practices: The best practices in this handbook are intended to assist the motor service repair and manufacturing industry in protecting motors operated by variable frequency drives (VFD) and establish bearing protection standards for new motor desings.

- Adding AEGIS® Ring Technology to any new motor or motor repair for VFD driven motors is the best practice for motor shaft grounding in order to protect bearings from shaft voltages and bearing currents.
- In addition to AEGIS® rings, motors above 100 HP (75kW) should have the opposite bearing isolated to prevent high frequency circulating currents.
- When the recommendations are followed as part of the best repair practices, customers may be assured that their motors are repaired to the highest standards of service and reliability.

ANSI/EASA Standard AR100-2010 and Shaft Grounding Best practices: Going the extra mile will earn loyalty and repeat business. Motor manufacturers and service shops that solve their customer's problems and keep their motors operating in peak condition will be sought out and their recommendations followed.

- Operations and facilities engineers and managers count on the motor service and repair shop to keep abreast of the latest technology and best practices.
- AEGIS® Shaft Grounding Ring technology, proven in over a million installations worldwide, is an innovative and "one-of-a-kind" technology designed specifically for VFD induced bearing currents. The concept won first prize in 2007 from the IEEE in a paper titled "Design Aspects of Conductive Microfiber Rings for Shaft Grounding Purposes".

Bearing Inspection Report: Cutting and inspecting every bearing in motors that come in for repair, especially when the motor is operated on a variable frequency drive, will often provide vital information needed to make the best repair recommendations. Detection of electrical discharge machining pits or fluting in the bearings often requires repair services referred to in this manual.

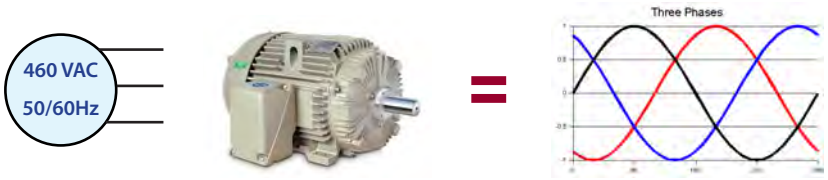
- Installing a Shaft Grounding Ring (AEGIS® SGR or iPRO) on any motor operated on variable frequency drives (VFD)
- Machining for an internal or external mounting of AEGIS® rings
- Isolating a motor bearing with an insulated sleeve; coating bearing housing with insulating material; adding a hybrid ceramic ball bearing or ceramic coated bearing to the repair for motors over 100 HP (75kW).

Provide Testing and Analysis Services: Offering the latest testing and analysis services for motors operated on variable frequency drives (VFD) improves system reliability and uptime. Services include vibration analysis, thermography, and now shaft voltage testing services.

- **New - Shaft Voltage Testing:** Using a portable oscilloscope like the Fluke 190 series together with the AEGIS® Shaft Voltage Probe kit allows a trained technician to easily measure shaft voltage on any VFD driven motor and detect if there is a potential for bearing discharges.
- Best accomplished:
  - At the plant or facility while the motor is operating
  - At initial startup to detect shaft voltages and prevent possible future problems
  - After the motor is repaired with AEGIS® Shaft Grounding Rings to verify their effectiveness
  - Periodically as part of a preventative maintenance program
- Adding shaft voltage testing services to current vibration analysis, thermography or other testing compliments the testing portfolio with an important value added service for customers.

Electric Motors Operating on Line Voltage

Balanced voltage condition

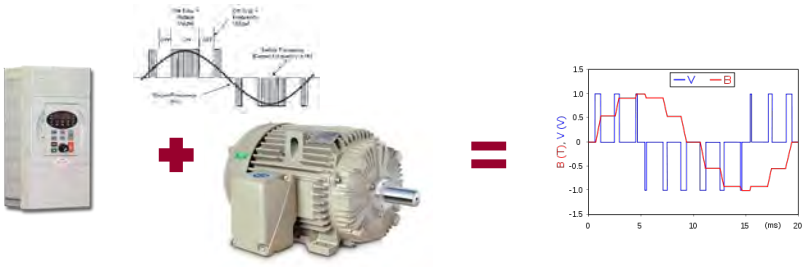


- Electric induction motors are designed for operation on 3 phase sine wave power - either 50 or 60 Hz.
- The input power is balanced in frequency, phase (120 degree phase shift) and in amplitude.
- Common mode voltage - the sum of the 3 phases always equal zero volts when properly balanced.

Note: Bearing protection generally not needed except for large frame motors.

Electric Motors Operated by Variable Frequency Drives (VFD)

Unbalanced voltage condition



- When operated by VFD, the power to the motor is a series of positive and negative pulses instead of a smooth sine wave.
- The input voltage is never balanced because the voltage is either 0 volts, positive, or negative with rapid switching between pulses in all three phases.
- The common mode voltage is usually a “square wave” or “6 step” voltage wave form.

Bearing protection needed to mitigate electrical discharge machining (EDM) damage in bearings.

There are two primary sources of bearing currents in VFD driven AC motors *(Bearing Currents A and B)*:

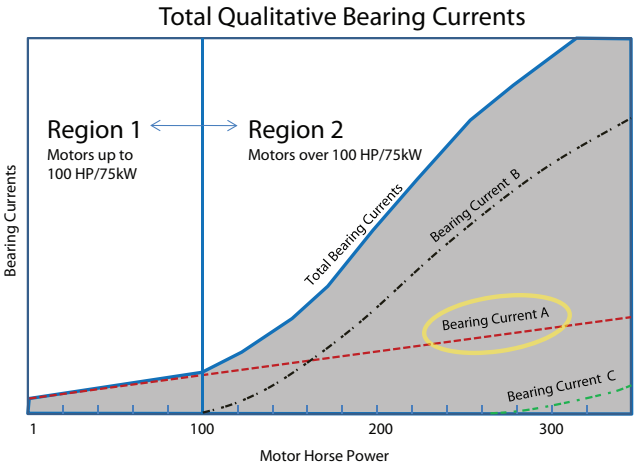
Bearing Current A: is a capacitive induced shaft voltage that discharges in the motor bearings. The VFD induced shaft voltages are capacitively coupled from stator to rotor through parasitic capacitance and create the possibility of bearing currents.

a. Virtually any motor from fractional HP to large motors may have bearing currents from this source.

a. Voltages can discharge through the motor bearings resulting in EDM pitting and fluting failure.

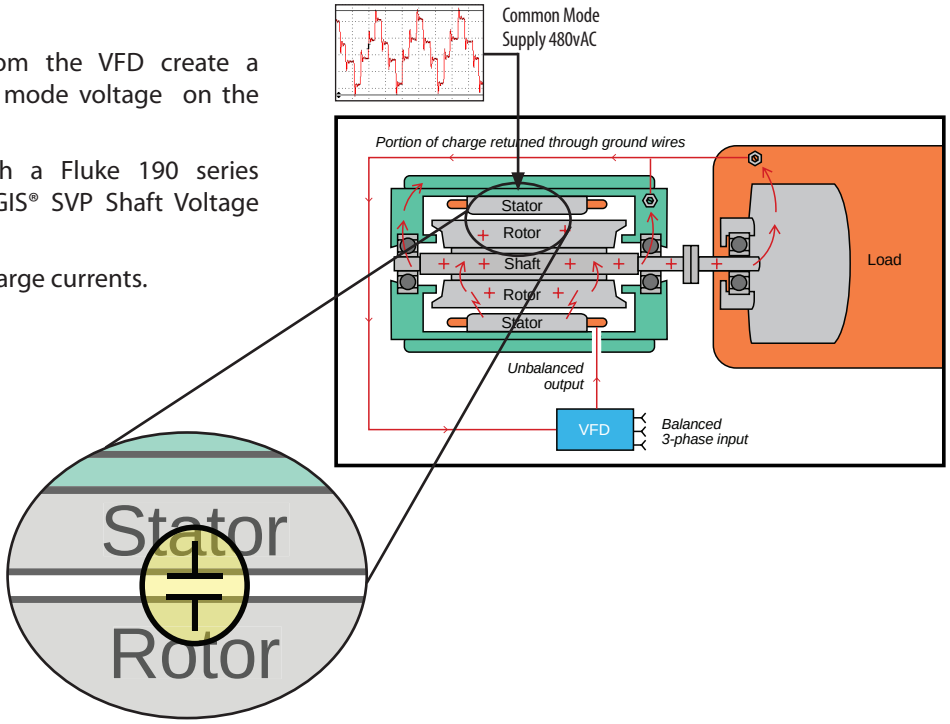
Best Practice: Ground the motor shaft with the AEGIS® Shaft Grounding Ring to provide a path of least resistance to ground and divert current away from the motor's bearings.

Ref: NEMA MG1 Part 31.4.4.3



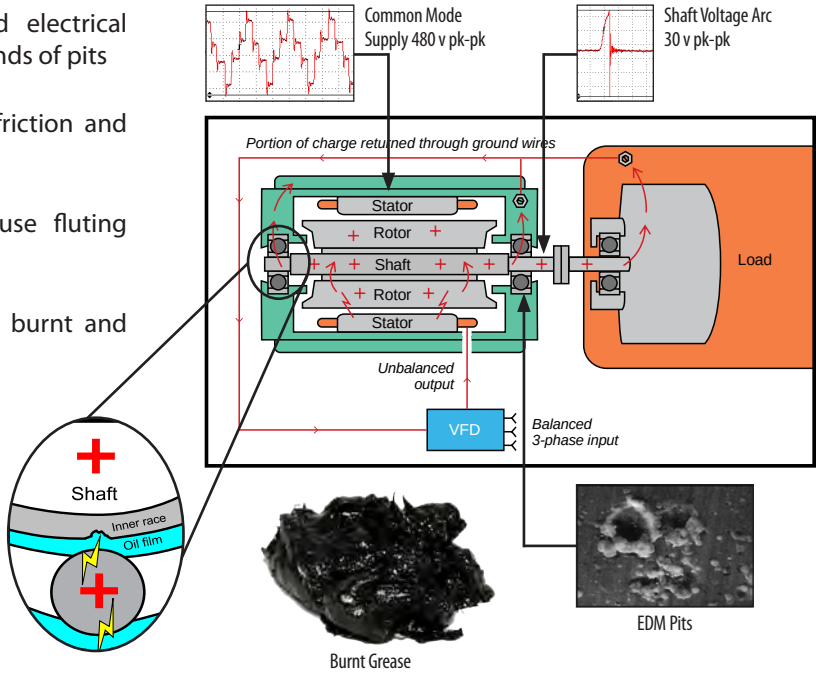
An Electric Motor works like a Capacitor *(Bearing Current A)*

- The pulses to the motor from the VFD create a capacitively coupled common mode voltage on the motor shaft.
- Voltages are measurable with a Fluke 190 series portable oscilloscope and AEGIS® SVP Shaft Voltage Probe Tip.
- Creates electrical bearing discharge currents.



Voltage arcs through the bearing

- Voltages arc through the bearings, and electrical discharge machining (EDM) creates thousands of pits
- Bearings degrade, resulting in increased friction and noise
- Eventually, the rolling elements can cause fluting damage to the bearing races
- Bearing lubrication/grease deteriorates, is burnt and fails
- Potential for costly unplanned downtime



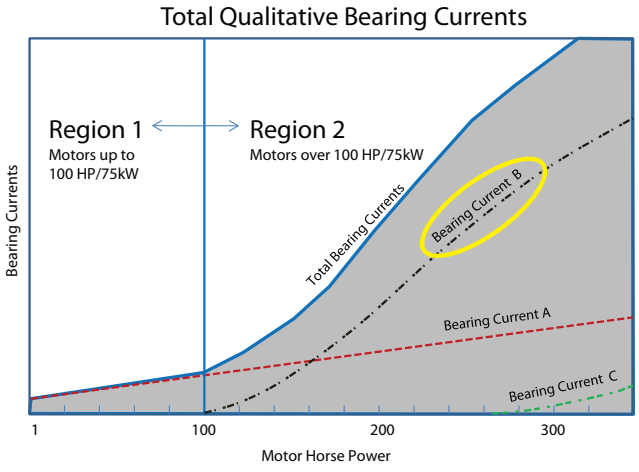
High Frequency Circulating Currents

Bearing Current B: High frequency circulating currents may flow due to a high-frequency flux produced by common-mode currents. High frequency inductive circulating currents from VFDs are in the KHz or MHz frequencies.

a. May be present in motors above 100 HP.

a. Circulate through the motor bearings, shaft to frame.

Best Practice: Interrupting the high frequency circulating current in the bearing is the best approach to mitigating potential bearing damage. Also, motors subject to Current B (high frequency circulating currents) will also be subject to Current A (capacitively induced shaft voltage) and therefore need an AEGIS® Shaft Grounding Ring.



A third source of bearing currents are circulating currents from 60Hz/50Hz Line Voltage (motors over 500 Frame):

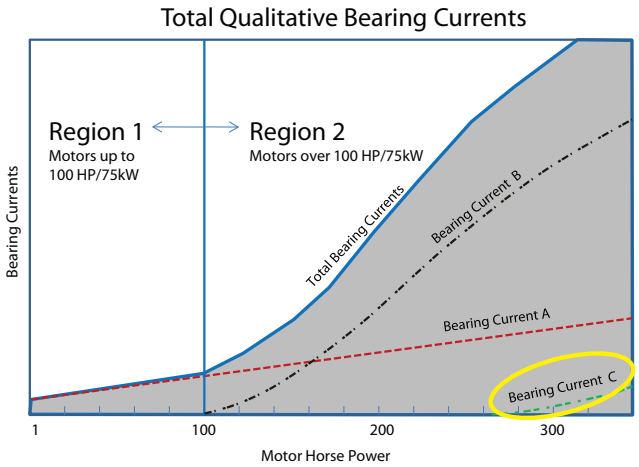
Bearing Current C: Sinusoidal voltage sources can cause circulating currents in large machines due to the motor's asymmetrical design. 50/60Hz operation can result in circulating currents due to motor magnetic asymmetries.

a. Usually present in very large machines only.

a. Circulate through the motor bearings, shaft to frame.

Best Practice: Interrupting the circulating current is the best approach to mitigating potential bearing damage.

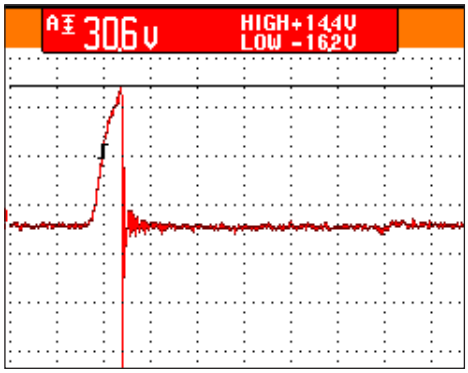
Ref: NEMA MG1 Part 31.4.4.3



AC Induction Motors

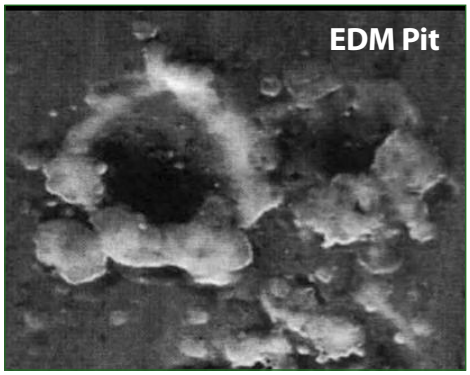
VFD OPERATION			NO VFD- 50/60 Hz line operation
Motors up to and including 100hp (Low Voltage)	Motors over 100hp to 500hp (Low Voltage-up to 600 volts AC)	Motors over 500hp (Medium Voltage-greater than 600 volts AC)	Motors over 500 Frame (Medium Voltage)
Bearing Current A	Bearing Current A & B	Bearing Current A, B & C	Bearing Current C
AEGIS® SGR	AEGIS® SGR	AEGIS® iPRO	AEGIS® iPRO (may not be needed)
Install AEGIS® SGR on DE or NDE	Install AEGIS® SGR opposite side of bearing insulation; usually DE	Install AEGIS® iPRO opposite side of bearing insulation; usually DE	Install AEGIS® iPRO opposite side of bearing insulation; usually DE
n/a	Isolate one bearing, usually the NDE to break the circulating current path	Isolate one bearing, usually the NDE to break the circulating current path	Isolate one bearing, usually the NDE to break the circulating current path

EDM Electrical Discharge Machining

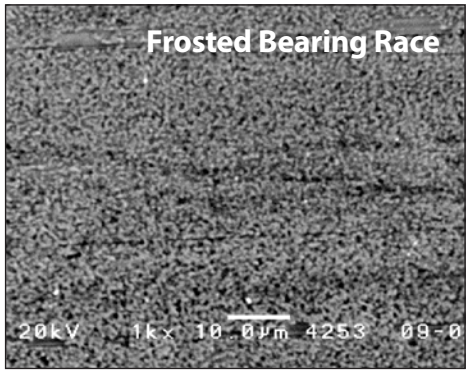


Because of the high-speed switching frequencies in PWM inverters, variable frequency drives induce shaft currents in AC motors. The switching frequencies of insulated-gate bipolar transistors (IGBT) used in these drives produce voltages on the motor shaft during normal operation through parasitic capacitance between the stator and rotor. These voltages, which can register 10-40 volts peak, are easily measured by touching an oscilloscope probe to the shaft while the motor is running.

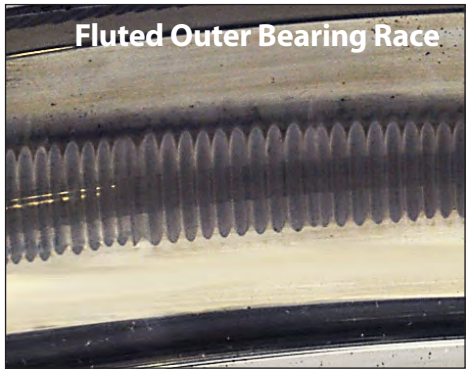
Reference: NEMA MG1 Section 31.4.4.3



Once these voltages reach a level sufficient to overcome the dielectric properties of the bearing grease, they discharge along the path of least resistance — typically the motor bearings — to the motor housing. During virtually every VFD switching cycle, induced shaft voltage discharges from the motor shaft to the frame via the bearings, leaving a small fusion crater (fret) in the bearing race. When this event happens, temperatures are hot enough to melt bearing steel and severely damage the bearing lubrication.



These discharges are so frequent (millions per hour) that before long the entire bearing race becomes marked with countless pits known as frosting. A phenomenon known as fluting may occur as well, producing washboard-like ridges across the frosted bearing race. Fluting causes excessive noise and vibration and in heating, ventilation, and air-conditioning systems, it is magnified and transmitted by the ducting. Regardless of the type of bearing or race damage that occurs, the resulting motor failure often costs many thousands or even tens of thousands of dollars in downtime and lost production.



Failure rates vary widely depending on many factors, but evidence suggests that a significant portion of failures occur only 3 to 12 months after system startup. Because many of today's AC motors have sealed bearings to keep out dirt and other contaminants, electrical damage has become the most common cause of bearing failure in AC motors with VFDs.

Bearing Inspection

Cutting and inspecting every bearing in motors that come in for repair, especially motors operated on variable frequency drives, will often provide vital information to make the best repair recommendation and improve performance.

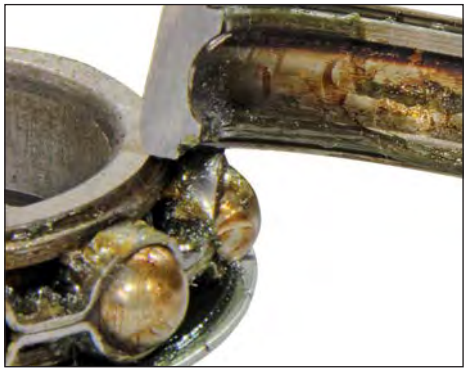
Report template available at: www.est-aegis.com/bearing

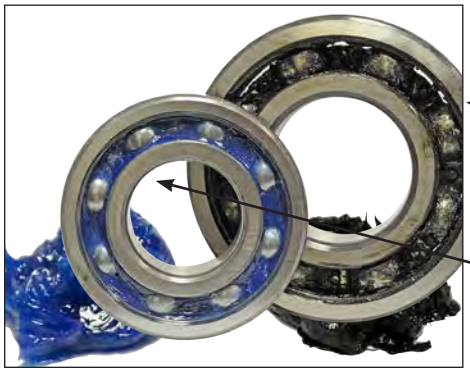
1. **Inspect the bearing** and bearing cavity and retain a sample of the lubricant if further analysis is warranted. Look for:
   a. Contamination
   b. Signs of excessive heat
   c. Hardening of grease
   d. Abnormal coloration (blackened grease)
   e. Excess grease escaping the bearing

2. **Cut the outer race** into halves.

Follow established safety precautions and use personal protective equipment including eye protection, hearing protection, face shield, gloves and protective clothing.

3. **Inspect the grease** and contamination in the bearing.
   a. ***Burnt Grease:*** Continuous electrical arcing in the motor bearings will often rapidly deteriorate the lubricating capability of the grease and cause bearing race damage. When an arc occurs, the oil component of the grease is heated beyond its temperature capacity.
   b. ***Contamination:*** In addition to the burnt grease, the arcing causes small metal particles to loosen from the bearing races/balls which are distributed in the grease. These particles are abrasive and intensify the bearing wear.



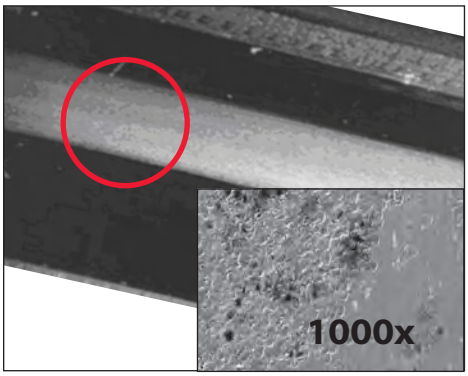


Burnt bearing grease is blackened and often times contaminated with metal particles.

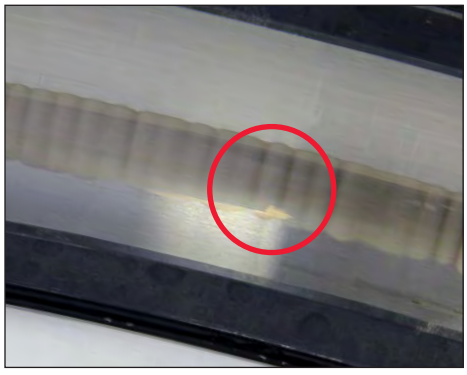
New bearing grease is available in many colors.

4. **Clean the bearing's** components using a degreaser or solvent. Follow all safety precautions.

5. **Inspect for evidence of Electrical Discharge Machining (EDM):** EDM are millions of microscopic electrical pits created when current discharges through the motor's bearings. The electrical voltage overcomes the dielectric of the bearing lubrication and instantaneously arcs through the inner race, through the ball and to the outer race. The individual pit is usually between 5 and 10 micron diameter.



6. **Frosting:** This will appear to be a grey discolored line around all or part of the bearing race and may be evident in the inner and outer race. The discoloration may be caused by wear or by electrical EDM. Examination under a microscope may be required to determine if the line is EDM or not. If the motor was operated on a VFD with no bearing protection there is a high likelihood that the frosting is from EDM.



7. **Fluting Damage:** Identified by a distinctive washboard pattern. Fluting can be identified with the naked eye or with 10x magnification. Fluting is sometimes confused with mechanical bearing damage so care should be taken to correctly assign electrical fluting damage to the pattern observed.

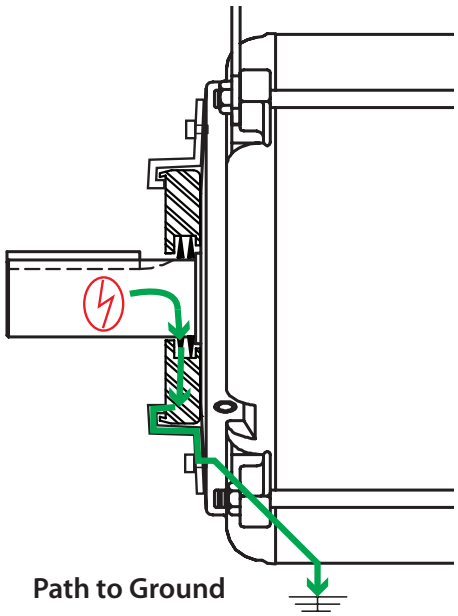
In addtion to using this manual please refer to other bearing failure analysis experts in order to determine the root cause of failure.

Grounding

The AEGIS® Ring conducts harmful shaft voltages away from the bearings to ground. Voltage travels from the shaft , through the conductive microfibers, through the housing of the ring, through the hardware (or conductive epoxy) used to attach the ring to the motor, to ground. All paths must be conductive.

Note: Overspray on end bracket must be removed to ensure a conductive path to ground. Clean all fits.

Photo courtesy of Independent Electric



Path to Ground

Shaft Preparation for Internal and External Installation

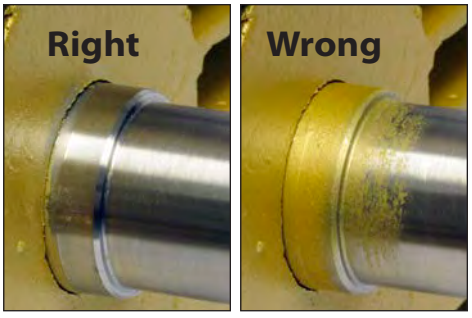
AEGIS® Rings should not operate over a keyway because the edges are very sharp. For proper performance:

Adjust or change spacer and screw lengths to avoid the keyway; or

Fill the keyway (in the area where the AEGIS® microfibers will be in contact with the shaft) with a fast-curing epoxy putty such as Devcon® Plastic Steel® 5 Minute® Putty(SF).

Motor shaft must be conductive:

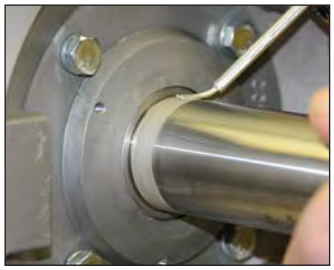
Shaft must be clean and free of any coatings, paint, or other nonconductive material (clean to bare metal). Depending on the condition of the shaft, it may require using emery cloth or Scotch-Brite™. If the shaft is visibly clean, a non petroleum based solvent may be used to remove any residue. If possible, check the conductivity of the shaft using an ohm meter.



Ohms test:

Place the positive and negative meter leads on the shaft at a place where the microfibers will contact the shaft. Each motor will have a different reading but in general you should have a maximum reading of less than 2 ohms. If the reading is higher, clean the shaft again and retest.

Shaft Preparation continued



Colloidal Silver Shaft Coating PN# CS015

Colloidal Silver Shaft Coating (CS015) is recommended for all applications. The silver coating enhances the conductivity of the shaft and also lessens the amount of corrosion that can impede the grounding path.

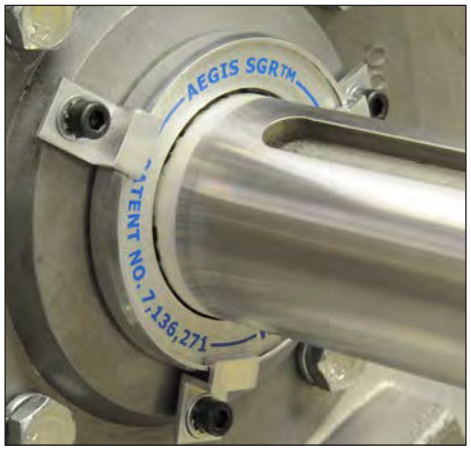
Treating the shaft of the motor prior to installing the AEGIS® Ring:

1. Shaft must be clean and free of any coatings, paint, or other nonconductive material. The shaft must be clean to bare metal.
2. Thoroughly stir the silver coating.

Apply a light coat of the AEGIS® Colloidal Silver Shaft Coating to the area where the AEGIS® microfibers are in contact with the motor shaft. Apply evenly all around the shaft. Allow to dry. Coating will cure at room temperature in 16-20 hours or in 30 minutes at 120-200˚C. A heat gun will cure the materials in seconds.

3. Apply a second coat for best coverage. Allow to dry. After coating is dry, install the AEGIS® Shaft Grounding Ring.

⚠ Follow all safety precautions. MSDS for CS015 available for download at www.est-aegis.com



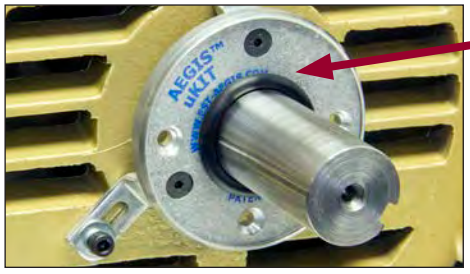
Install the AEGIS® SGR so that the aluminum frame maintains an even clearance around the shaft. AEGIS® conductive microfibers must be in contact with conductive metal surface of the shaft.

STOP **Do not use thread lock to secure the mounting screws as it may compromise the conductive path to ground.**

If thread lock is required, use a small amount of EP2400 AEGIS® Conductive Epoxy to secure the screws in place.

After installation, test for a conductive path to ground using an Ohm meter. Place one probe on metal frame of AEGIS® SGR and one probe on motor frame.

Motor must be grounded to common earth ground with drive according to applicable standards.



Where AEGIS® SGR is exposed to excessive debris, additional protection of the AEGIS® SGR fibers may be necessary.

Install an o-ring or v-slinger against the ring.

Contact AEGIS® Customer Service/Engineering for assistance with specific applications.

AEGIS® SGR for Low Voltage and iPRO for Medium Voltage Motors

LOW VOLTAGE MOTORS

Supply voltage: 600 VAC or less

Recommended Technology: AEGIS® SGR

Motors over 100 HP - recommend isolation of one bearing and AEGIS® SGR on the opposite bearing.

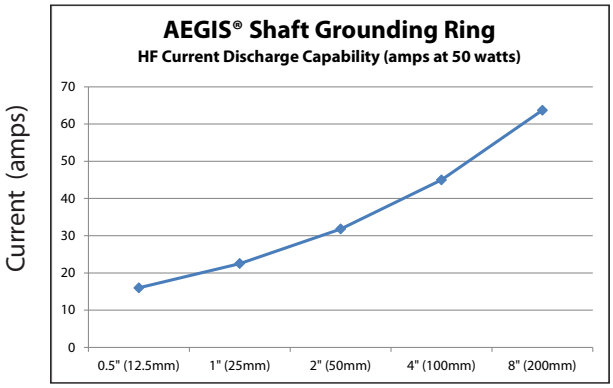
Description:

- Design Type: AEGIS® SGR
- Circumferential Conductive MicroFiber rows in FiberLock™ Channel
- Rows of fiber: 2
- Fiber overlaps shaft 0.030" (.76mm)
- OAL: 0.295" (7.5mm)
- OD: listed in AEGIS® Catalog

Mounting:

- Internal or External
- Select based on shaft diameter
- Split or Solid versions available
- Custom brackets optional

AEGIS® SGR Current Capability Chart



MEDIUM VOLTAGE MOTORS

Supply voltage: greater than 600 VAC

Recommended Technology: AEGIS® iPRO

Recommend isolation of one bearing and AEGIS® iPRO on the opposite bearing.

6 rows of Conductive MicroFiber

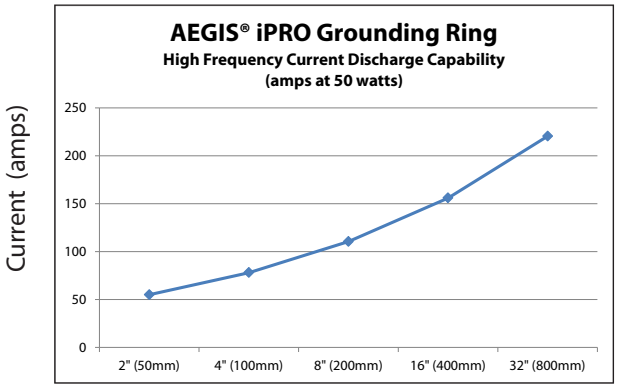
Description:

- Design Type: AEGIS® iPRO
- Circumferential Conductive MicroFiber rows in FiberLock™ Channel
- Rows of fiber: 6
- Fiber overlaps shaft 0.030" (.76mm)
- OAL: 0.625" (15.875mm)
- OD: Shaft + (refer to drawing)

Mounting:

- Internal or External
- Select based on shaft diameter
- Split or Solid versions available
- Custom brackets optional

AEGIS® iPRO Current Capability Chart



AEGIS® Installation - Internal

AEGIS® Bearing Protection Rings are ideally installed on the inside of the motor to provide protection from ingress of dirt and dust. Motor manufacturers commonly use this installation as a best practice in stock catalog motors equipped with AEGIS® rings.

Follow all safety precautions. MSDS for CS015 and EP2400 available for download at www.est-aegis.com

Follow AEGIS® best practices for motor shaft preparation and ring installation. Use AEGIS® Colloidal Silver Shaft Coating when installing AEGIS® rings to enhance the shaft conductivity and help prevent oxidation.

Press Fit Installation into:
- Bearing Retainer
- Custom Bracket

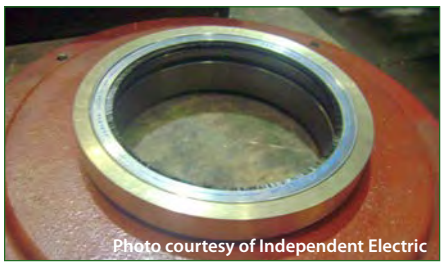
Bore Specification: 0.002" – 0.004" interference [.05 mm - .10 mm]
English: Ring OD tolerance +0 / -0.001" Bore tolerance +0.001 / -0"
Metric: Ring OD tolerance +0 / -0.025 mm Bore tolerance +0.025 / -0 mm

Bolt-through installation into:
- Bearing Retainer
- Custom Bracket

Drill/tap holes per AEGIS® Ring drawing location
- Flat head cap screws
- Socket head cap screws/lock washer

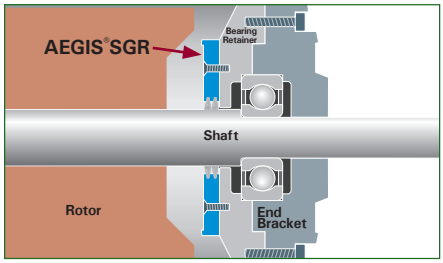
STOP Do not use non-conductive thread-lock

Use EP2400 Conductive Epoxy if thread lock is needed to secure the screws in place.



In some motors it may be desirable to attach an additional machined spacer to locate the ring further away from the bearing grease cavity.

A grease seal may be added to reduce grease ingress to the fibers.



Common AEGIS® Ring installation internal to the motor is on the motor's bearing retainer. Installation can be done with bolt through hardware or AEGIS® Conductive Epoxy.

For epoxy installation, bearing retainer must be clean & free of any coatings, paint, or other nonconductive material where AEGIS® SGR will be mounted. This is the discharge path to ground therefore metal to metal contact is essential.

Epoxy Mounting – Internal

AEGIS® Conductive Epoxy was specially developed and tested to stringent vibration and pull test requirements to ensure a strong and reliable long term adhesive bond.

STOP Do not use a substitute epoxy as only the AEGIS® EP2400 has been tested and approved for AEGIS® ring installation.

AEGIS® Installation - External

AEGIS® Bearing Protection Rings may be installed on the outside of the motor but care must be taken to protect the ring from excessive ingress of dirt and dust.

Follow AEGIS® best practices for motor shaft preparation and ring installation. Use AEGIS® Colloidal Silver Shaft Coating when installing AEGIS® rings to enhance the shaft conductivity and help prevent oxidation.

An o-ring or "v" slinger may be installed against the AEGIS® Ring to help prevent excessive ingress of dirt, dust or liquid.

Standard bracket or uKIT bracket Installation:

- Standard Brackets (3 or 4 depending on ring size)
- uKIT includes various bracket options
- Custom brackets available

To view product line or download the AEGIS® Catalog visit www.est-aegis.com

Severe Duty Motors: Install **Garlock SGi** with AEGIS® Shaft Grounding Technology. For technical Information visit www.klozure.com

- Garlock SGi – Shaft Grounding Bearing Isolator may be installed into a bearing isolator cavity
- Motor End Bracket may be bored out to allow for Garlock SGi to be installed
- Solid or Split version available

Bolt-through installation into:

- End Bracket
- Custom Bracket

Drill/tap holes per AEGIS® Ring drawing location

- Flat head cap screws
- Socket head cap screws/lock washer

Do not use non-conductive thread-lock

Use EP2400 Conductive Epoxy if thread lock is needed to secure the screws in place.

Epoxy Mounting – External

Motor end bracket must be clean & free of any coatings, paint, or other nonconductive material where AEGIS® SGR will be mounted using conductive epoxy. This is the discharge path to ground therefore metal to metal contact is essential.

Curing can be achieved in 4 hours at or above 75° F (24°C). For faster curing times, maximum conductivity and adhesion, heat the bond to between 150°-250° F (66°-121° C) for 10 minutes and allow to cool.

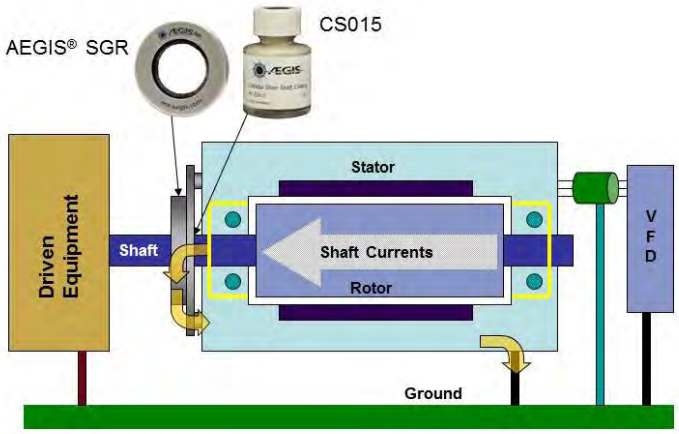
Pot-life is approximately 10 minutes at 75° F (24° C).

AEGIS® Conductive Epoxy was specially developed and tested to stringent vibration and pull test requirements to ensure a strong and reliable long term adhesive bond.

Do not use a substitute epoxy as only the AEGIS® EP2400 has been tested and approved for AEGIS® ring installation.

Motors up to and including 100 HP (75 kW) - Low Voltage

Internal or external installation



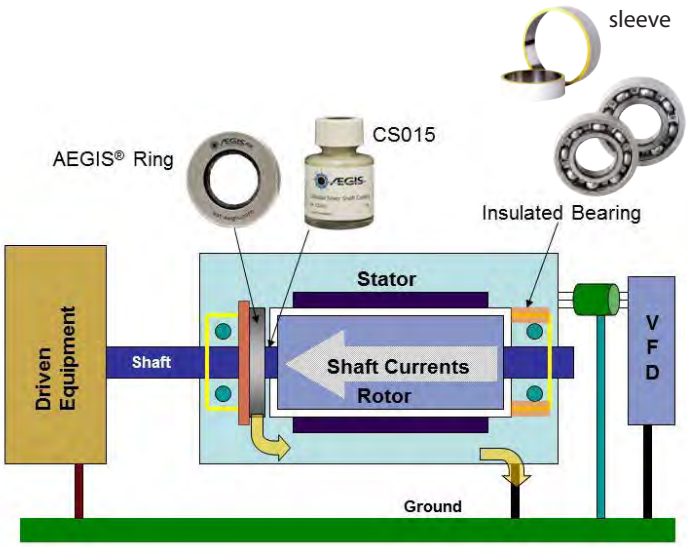
General recommendations: For induction motors either foot mounted, c-face or d-flange mounted motors with single row radial ball bearings on both ends of the motor. Motors may be installed either horizontally or vertically in the customer's application.

- Install one AEGIS® SGR Bearing Protection Ring on either the drive end or the non-drive end of the motor to discharge capacitive induced shaft voltage.
- AEGIS® SGR may be installed either internally or externally.
- Use AEGIS® Colloidal Silver Shaft Coating (PN# CS015) on motor shaft where fibers touch.

Product recommendation: AEGIS® SGR

Follow all safety precautions. MSDS available for download at www.est-aegis.com

Motors Greater than 100 HP (75 kW)



Install AEGIS® Ring on opposite end of insulation

For <u>horizontally</u> mounted motors with <u>single row radial ball bearings</u> on both ends of the motor:

- Non-Drive end: Bearing housing must be isolated with insulated sleeve or coating or use insulated ceramic or hybrid bearing to disrupt circulating currents.
- Drive end: Install one AEGIS® Bearing Protection Ring .
- AEGIS® Ring can be installed internally on the back of the bearing cap or externally on the motor end bracket.
- Use AEGIS® Colloidal Silver Shaft Coating (PN# CS015) on motor shaft where fibers touch.

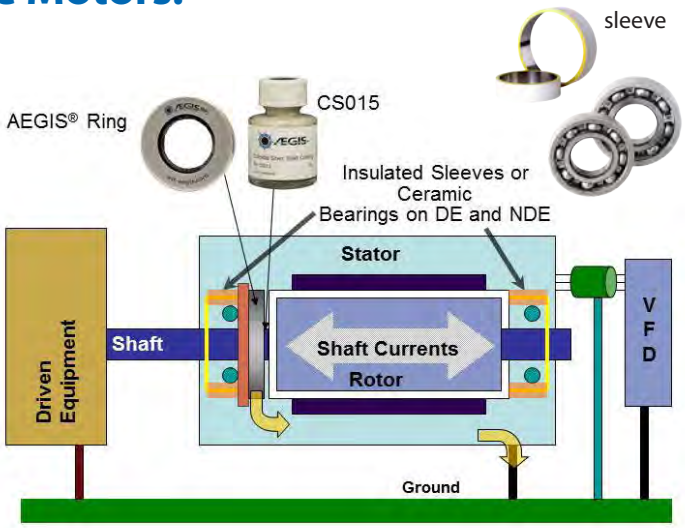
Product recommendation:

- **Low Voltage Motors up to 500HP: AEGIS® SGR**
- **Low Voltage Motors over 500HP: AEGIS®iPRO**
- **Medium Voltage Motors: AEGIS® iPRO**

Motors Where Both Bearings are Insulated - Any HP/kW Low Voltage or Medium Voltage Motors:

- Install one AEGIS® Bearing Protection Ring, drive end preferred, to protect bearings in attached equipment (gearbox, pump, fan bearing and encoder, etc...).
- AEGIS® Ring can be installed internally on the back of the bearing cap or externally on the motor end bracket.
- Colloidal Silver Shaft Coating PN CS015 is required for this type of application.

Product recommendation:
- **Low Voltage Motors: AEGIS® SGR**
- **Medium Voltage Motors: AEGIS® iPRO**



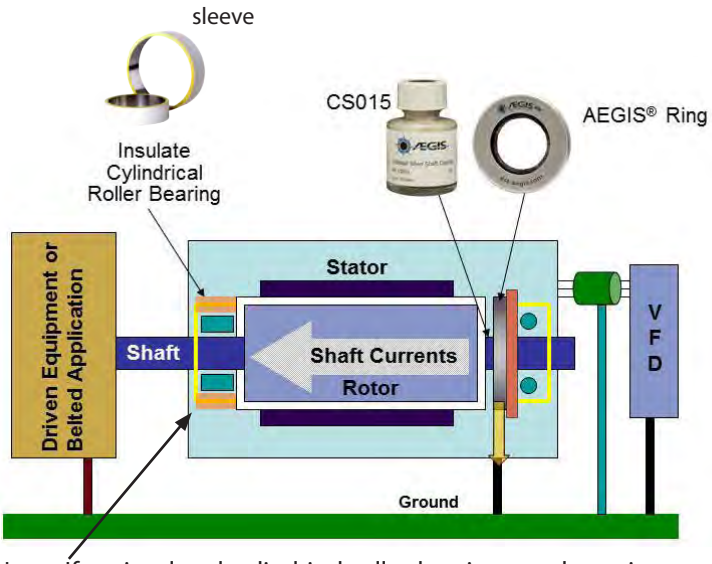
Install AEGIS® Ring on opposite end of insulation

STOP Bearings in attached equipment may be at risk from VFD induced shaft voltage unless AEGIS® Shaft Grounding is installed.

Motors with Cylindrical Roller, Babbitt or Sleeve Bearings:

- Cylindrical Roller Bearing, Babbitt, or Sleeve bearing: Bearing housing should be isolated or use insulated bearing.
- Motors with insulated cylindrical roller bearing DE: Install AEGIS® Bearing Protection Ring on opposite drive end (NDE).
- AEGIS® Ring can be installed internally on the back of the bearing cap or externally on the motor end bracket.
- Colloidal Silver Shaft Coating PN CS015 is required for this type of application.

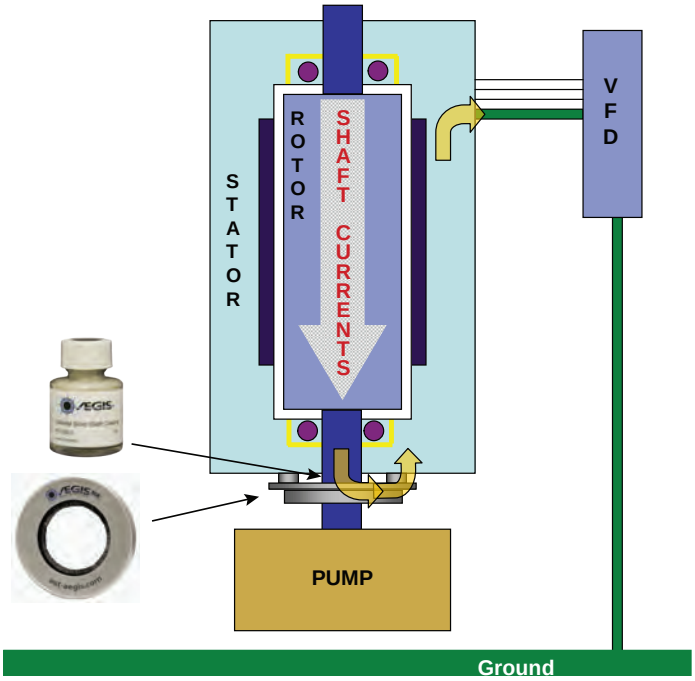
Product recommendation:
- **Low Voltage Motors: AEGIS® SGR**
- **Medium Voltage Motors: AEGIS® iPRO**



Note: If an insulated cylindrical roller bearing or sleeve is not possible, then isolate the opposite bearing and install an AEGIS® Ring at the cylindrical roller bearing side.

Install AEGIS® Ring on opposite end of insulation

Vertical Solid Shaft Motors up to and including 100 HP (75 kW) - Low Voltage:

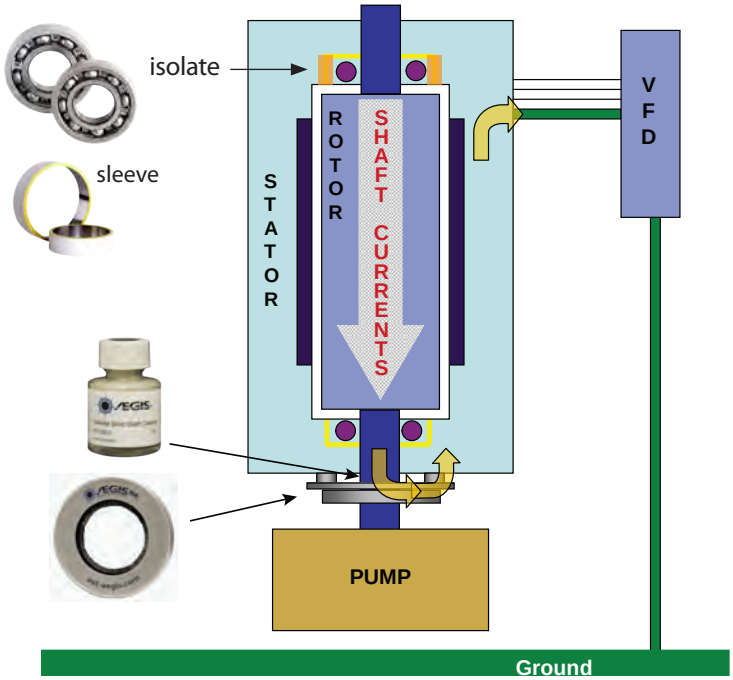


- Lower Bearing: Install one AEGIS® SGR Bearing Protection Ring.
- AEGIS® SGR can be installed internally on the back of the bearing cap or externally on the motor end bracket.
- Colloidal Silver Shaft Coating PN CS015 is required for this type of application.

Product recommendation: AEGIS® SGR

Follow all safety precautions. MSDS available for download at www.est-aegis.com

Vertical Solid Shaft Motors Greater than 100 HP (75 kW):



- Upper Bearing: Bearing journal must be isolated or insulated ceramic or hybrid ceramic bearing installed.
- Bottom Bearing: Install one AEGIS® Bearing Protection Ring.
- AEGIS® Ring can be installed internally on the back of the bearing cap or externally on the motor end bracket.
- Colloidal Silver Shaft Coating PN CS015 is required for this type of application.

Product recommendation:
- **Low Voltage Motors: AEGIS® SGR**
- **Medium Voltage Motors: AEGIS® iPRO**

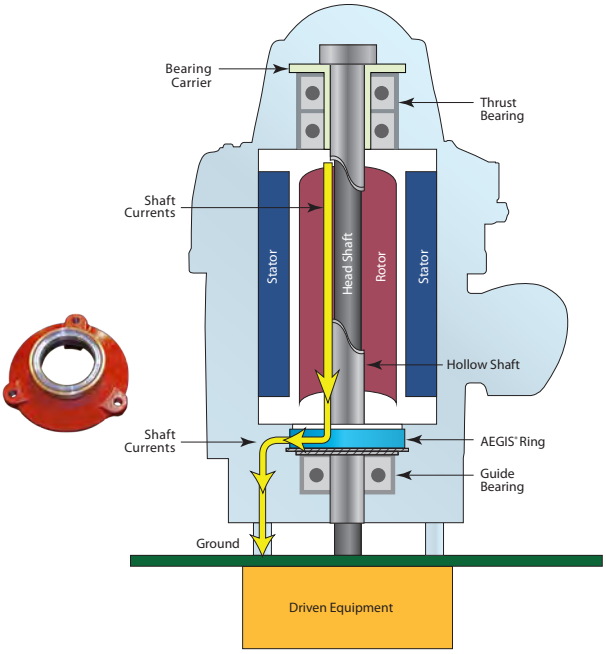
Vertical Hollow Shaft Motors up to and including 100 HP (75 kW) - Low Voltage :

- Lower Bearing: Install one AEGIS® SGR Bearing Protection Ring.
- AEGIS® SGR can be installed internally on the back of the bearing cap.
- Colloidal Silver Shaft Coating PN CS015 is required for this type of application.

Product recommendation: AEGIS® SGR

Note: For external installation, the AEGIS® Ring must run on the motor or pump shaft at the lower bearing. Ring must not be mounted around the steady bushing.

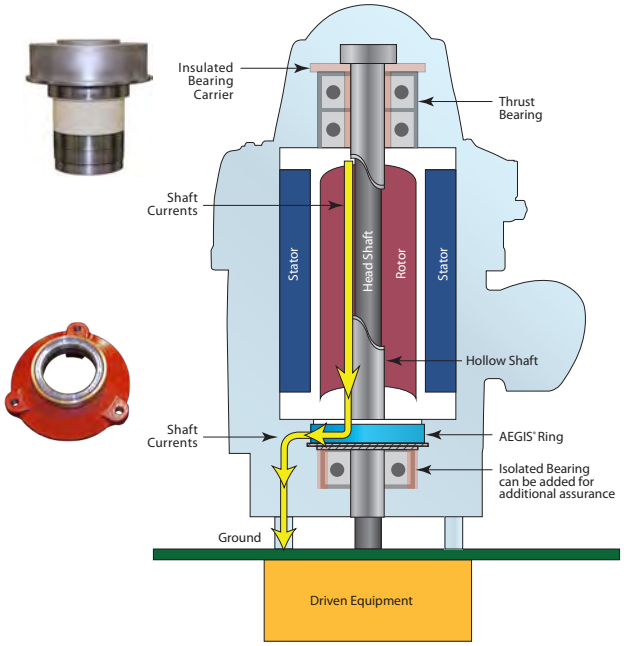
Upper bearing may be isolated with insulated bearing carrier for added protection.



Vertical Hollow Shaft Motors Greater than 100 HP (75 kW) :

- Upper Bearing: Bearing carrier must be isolated or insulated ceramic or hybrid ceramic bearing installed.
- Lower Bearing: Install one AEGIS® Bearing Protection Ring.
- AEGIS® Ring can be installed internally on the back of the bearing cap.
- Colloidal Silver Shaft Coating PN CS015 is required for this type of application.

Product recommendation:
- **Low Voltage Motors: AEGIS® SGR**
- **Medium Voltage Motors: AEGIS® iPRO**



Application notes are intended as general guidance to assist with proper application of AEGIS® Bearing Protection Ring to protect motor bearings. All statements and technical information contained in the application notes are rendered in good faith. User must assume responsibility to determine suitability of the product for its intended use.

AEGIS® Shaft Grounding Rings Provide Both Contact and Noncontact Grounding

The Only Product of its Kind

AEGIS® Bearing Protection Ring uses Revolutionary Nanogap Technology

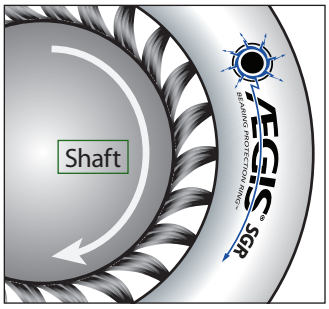
- Unique contact/non-contact design
- 360 degrees circumferential conductive micro fiber ring
- Multiple row design – greatest reliability
- Ensures unmatched shaft grounding and performance

AEGIS® SGR
BEARING PROTECTION RING

The AEGIS® Bearing Protection Ring's patented Nanogap Technology ensures effective electrical contact even when physical contact is broken . Only AEGIS® Nanogap Technology provides both maintenance-free contact and noncontact bearing protection for the normal service life of the motor's bearings as well as the most reliable operation of any shaft grounding technology.

Proprietary Conductive Microfibers Last for the Service Life of the Motor

The AEGIS® Bearing Protection Ring's unique design features hundreds of thousands to millions of specially engineered conductive microfibers that encircle the motor shaft. With so many electrical transfer points the ring provides continuous electrical contact, whether its fibers are physically touching the shaft or not. This patented "nanogap" technology enables both contact and noncontact shaft grounding — 100% of the time.

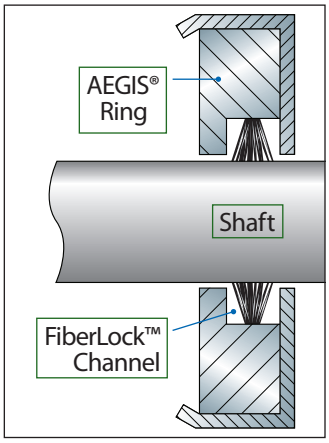


Specially Designed Microfibers Flex Without Breaking

Designed with specific mechanical and electrical characteristics that minimize wear and maintain conductivity, AEGIS® microfibers will last for the life of the motor. Based on wear of less than 0.001" (0.025mm) during 10,000 hours of testing, proven to withstand over 200,000 hours of continuous operation.

Through our patented design, AEGIS® conductive microfibers exhibit minimal wear and the ability to flex without breaking. In testing, they were proven to withstand 2 million direction reversals (to 1800 RPM) with no fiber fatigue or breakage.

AEGIS® Rings are designed with an optimal fiber overlap to the shaft of 0.030" (0.76mm).



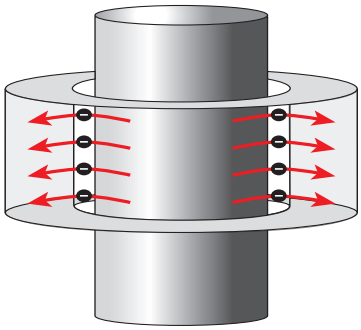
Patented FiberLock™ Channel Secures and Protects Fibers

AEGIS's patented, protective FiberLock™ channel locks the ring's conductive microfibers securely in place around the motor shaft, allowing them to flex without breaking. The channel also helps protect the fibers from excessive dirt, oil, grease, and other contaminants.

Ensures Unmatched Grounding With or Without Shaft Contact

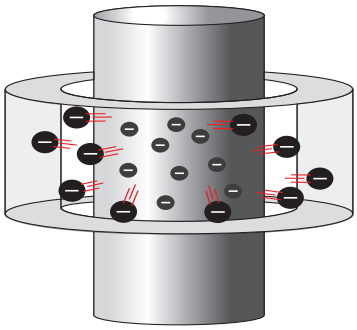
At any point in time, the AEGIS® microfibers are in mechanical contact with the shaft and those that aren't are in nanogap proximity due its unique design. Thanks to the patented Electron Transport Technology™, all of the ring's fibers remain in electrical contact with the motor shaft providing unmatched grounding 100% of the time. This technology ensures electrical contact for the life of the motor through mechanical contact and three simultaneous nanogap noncontact current transfer processes. These processes ensure effective grounding even in the presence of grease, oil, dust and other contaminants, regardless of the motor's speed. No other product works with and without contacting the motor shaft to provide the long-term and maintenance-free bearing protection of the AEGIS® Ring.

Tunneling of Electrons



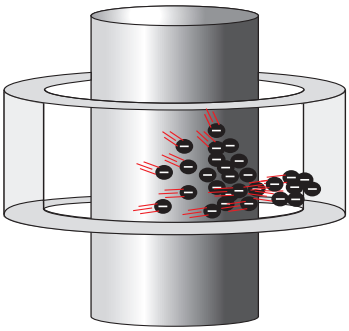
This mechanism is based on the ability of electrons to "tunnel" across an insulating barrier, and works for gaps smaller than 2 nm.

Field Emissions of Electrons



Field emission is a form of quantum tunneling whereby electrons move through a barrier in the presence of a high electric field. It provides grounding across gaps of 2 nm to 5 µm. The electric field from the shaft voltages creates the conditions for the AEGIS® ring fibers to take advatage of field emission electron transfer from the shaft.

Townsend Avalanche of Gaseous Ions



This process results from the cascading effect of secondary electrons released by collisions and the impact ionization of gas ions accelerating across gaps greater than 5 µm. This ionization creates negative and positive ions which neutralize the shaft voltage.

AEGIS® Bearing Protection Ring vs. Contact-Only Brush

The chart below compares the design and performance characteristics of AEGIS® Rings to those of conventional and discrete-point grounding brushes that work only through contact with the motor shaft. Due to its patented design and proprietary conductive microfibers, the AEGIS® Ring maintains electrical contact with the motor shaft even if mechanical contact is broken. No other shaft grounding brush provides such exceptional bearing protection.

Performance Characteristic	AEGIS® Ring	Contact-Only Brush
Continuous circumferential ring design	Yes	No
Contact and Noncontact electrical shaft grounding	Yes	No
Protective fiber channel	Yes	No
Ultra-low wear fibers / wear-to-fit fiber design	Yes	No
Maintenance-free	Yes	No
Effective in presence of dust, dirt, oil, and grease	Yes	No

Manufacturer's Specification

Fiber Flexibility	AEGIS® Rings are constructed with patented AEGIS® FiberLock™ channel to allow conductive micro fibers to bend and flex within their elastic design limits. Fibers are distributed 360 degrees inside the FiberLock™ channel to provide maximum shaft surface contact with multiple rows. Fiber length is designed with an optimal shaft overlap of 0.030" (0.76mm).
Fiber wear	Usually less than 0.001" in 10,000 hours. Fiber wear length is designed for expected life of 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® Bearing Protection Ring Maintenance Requirements	None
Oil and Grease on Motor Shaft	Small amounts of oil and/or grease are acceptable as long as 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.
Directional rotation	Motor may be operated in clockwise or counter clockwise rotation. Motor may change directional rotation without limitations.
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 any specific application with AEGIS® engineering.
Maximum temperature rating	410 F/210 C - Verify application specific temperatures with AEGIS® engineering.
Minimum temperature rating	-112 degrees F/-80C - 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 1-866-738-1857
Hazardous areas	Not certified for hazardous environments (Class 1 Division 1, Division 2 or Class 1 Zone 1, Zone 2)
CE and UL requirements	AEGIS® Rings are classified as a "component" and as such are not subject to the requirements of any Directive. The application of CE or UL Mark is not applicable to this component.

Testing and Analysis Services - Measuring Shaft Voltages

Shaft Voltage Test Report: Measuring the shaft voltage on VFD driven motors provides the end user with valuable information to determine if there is a potential risk of bearing damage from electrical bearing discharges. Surveying and documenting shaft voltage readings and wave forms will assist in determining the appropriate mitigation or solution.

Note: The best time for shaft voltage measurements are during initial start-up in new or repaired motors operated by the VFD. Shaft voltage measurements should be incorporated into preventive and predictive maintenance programs and may be combined with vibration analysis, thermography or other services.

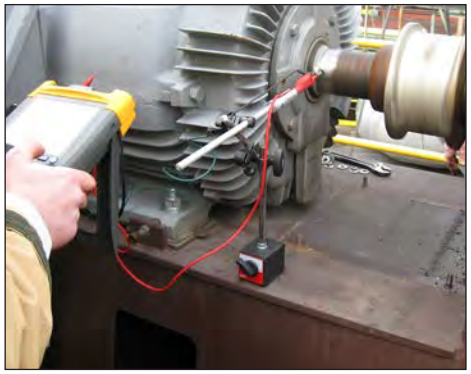
Report template available at: www.est-aegis.com/bearing

AEGIS® SVP Shaft Voltage Probe

The AEGIS® SVP Shaft Voltage Probe tip attaches to an oscilloscope voltage probe to easily and accurately measure the voltage on a rotating shaft. The high density of conductive microfibers ensures continuous contact with the rotating shaft. The AEGIS® SVP can be hand held or used with a magnetic base.

Caution: Use appropriate safety procedures near rotating equipment.

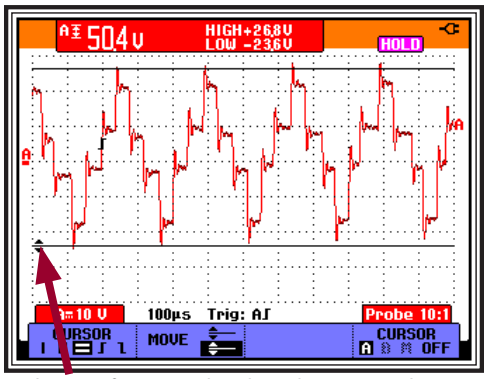
PN: SVP-KIT-3000MB



Recommended Testing Equipment

- Oscilloscope with a 10:1 probe. We recommend a minimum 100MHz bandwidth to accurately measure the waveform.
- AEGIS® SVP Shaft Voltage Probe Kit PN SVP-KIT-3000MB (for Fluke 199c and 190 II series) Contact EST if you have a different size voltage probe.
- **Recommend Fluke ScopeMeter® 190 Series or equivalent.**

Examples of Shaft Voltage Readings

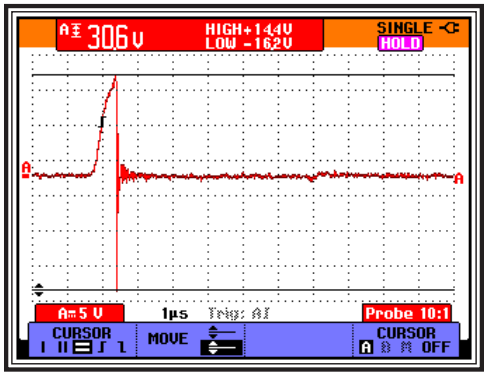


The use of cursors is handy to determine voltages at a specific spot in the reading.

High Peak to Peak common mode voltage –

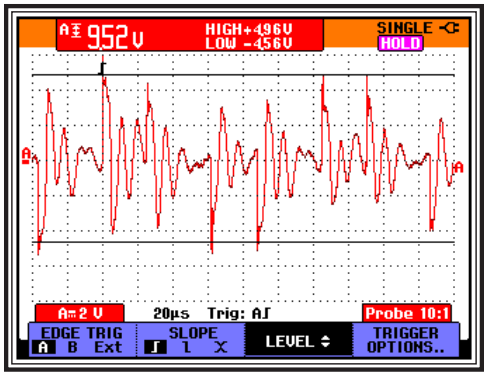
Typically 20 to 120 volts peak to peak. The waveform image shows the capacitive coupled common mode voltage on the shaft of the motor. The "six-step" wave form is the result of the 3 phases of pulses from the VFD. The timing of the pulse width modulation (PWM) pulses to the motor from the drive determines what the wave form looks like. Sometimes it will look like a square wave.

This six-step or square wave is what is seen when there is no bearing discharge and the peak to peak shaft voltage is at it's maximum level. The voltage level may eventually overcome the dielectric in most non-isolated bearings and begin discharging.



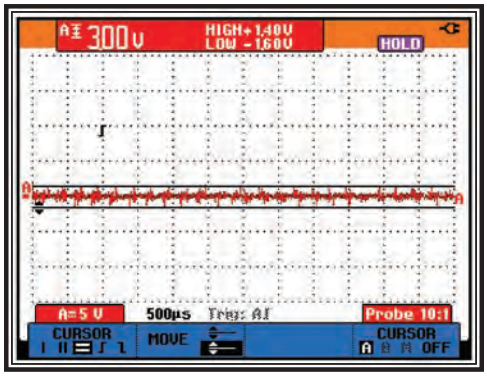
High amplitude EDM discharge pattern –

Typically EDM discharges can occur from 6 volts peak to 80 volts peak depending on the motor, the type of bearing, the age of the bearing, and other factors. The waveform image shows an increase in voltage on the shaft and then a sharp vertical line indicating a voltage discharge. This can occur thousands of times in a second, based on the carrier frequency of the drive. The sharp vertical discharge at the trailing edge of the voltage is an ultra high frequency dv/dt with a typical "discharge frequency" of 1 to 125 MHz (based on testing results in many applications).



Low amplitude voltage discharge pattern –

Typically the peak to peak voltages are 4 to 15 volts peak to peak. The waveform image shows a more continuous discharge pattern with lower dv/dt frequencies between 30 KHz to 1 MHz. The lower voltage is due to greater current flow in the bearings which is the result of the bearing lubrication becoming conductive. As discharges occur in the bearings, the lubrication is contaminated with carbon and metal particles. The lower impedance to the shaft voltages results in lower peak to peak voltages. This condition is usually found in motors that have been in operation for many months or years.



Peak to Peak voltage with AEGIS® ring installed –

With the AEGIS® ring installed, you will typically see discharge voltage peaks around 2 to 3 volts on a bare steel shaft surface. The voltage readings may be decreased with the application of AEGIS® Colloidal Silver Shaft Coating which allows for a more efficient electron transfer to the conductive micro fiber tips. The waveform image shows the low peak to peak waveform of a motor with the AEGIS® SGR ring installed and discharging the shaft voltages.

Set Amplitude

An EDM discharge pattern will show a climb in voltage and then a sharp vertical line. The sharp vertical line shows the moment of discharge to ground. Each motor will have its own unique parameters.

Control the vertical span of the displayed signal by adjusting the volts per division. The signal peak to peak should all be displayed on the screen. 5V is a good place to start and then adjust based on the conditions.

Press "mV" to increase vertical sensitivity

Press "V" to decrease vertical sensitivity

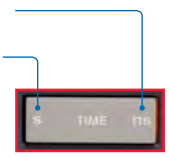
This is an example of amplitude set to 5 volts per division. The trace is clearly shown. If the peak extends beyond the screen, decrease the amplitude.

Set Time Period

Control the horizontal span of the displayed signal by adjusting the Time. 400µs (microseconds) is a good place to start and then adjust TIME based on the conditions.

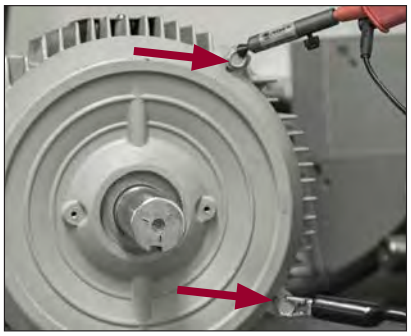
Press "ns" to increase horizontal sensitivity

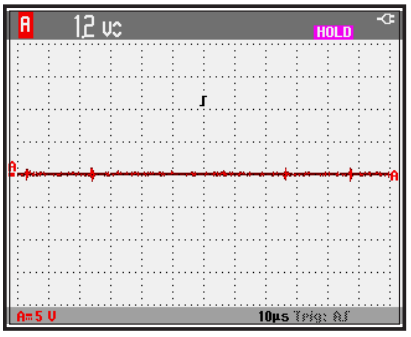
Press "s" to decrease horizontal sensitivity



This is an example of a Time period set to 4 microseconds (4/1,000,000). It clearly shows a climb in voltage and a sharp discharge to ground.

Taking the Measurements- EMI

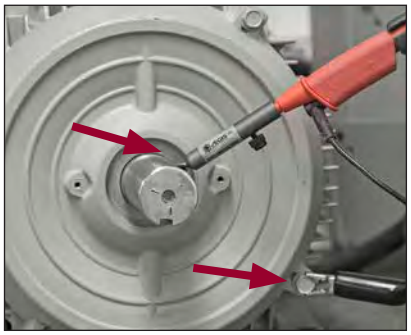


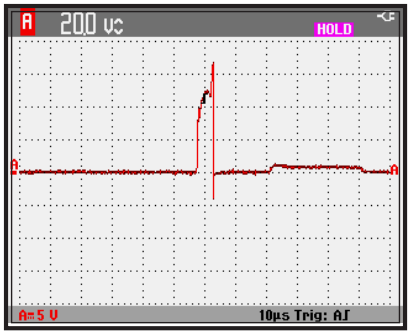


Ground Reference Reading: EMI

1. The reading displays ground noise or EMI being produced by the motor/drive system. This electrical noise may be present before and after installing the AEGIS® ring.
2. Find 2 ground points on the motor. Must be bare metal and conductive.
3. Place the SVP on one of the points and the probe grounding clip on the other point.
4. Measurements will vary depending on the motor size and conditions.

Taking the Measurements- Shaft Voltage





Shaft Voltage Reading

1. Shaft must be clean & free of any coatings, paint or other nonconductive material.
2. Secure the probe in place with magnetic base.
3. Align AEGIS® SVP on shaft end or side ensuring continuous contact. Avoid keyway if possible.
4. Place oscilloscope grounding lead on bare metal of motor ensuring conductive path to ground.
5. If you plan to create a report for the customer, save the image.

⚠ Follow all safety precaution when working with rotating equipment.

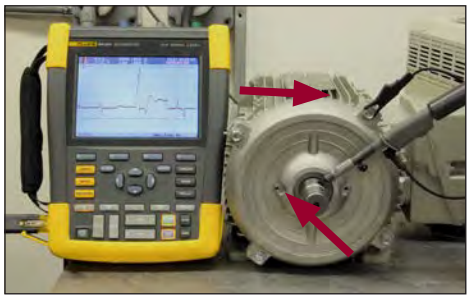
Measurements Using the AEGIS® Grounding Simulator

The AEGIS® Grounding Simulator can be used to simulate how the shaft voltages will change after an AEGIS® Ring is installed. It is a quick way of showing a "Before & After".

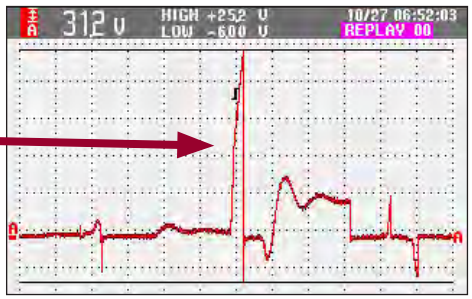
1. Take the Shaft Voltage Reading without Shaft Grounding
2. Take the Shaft Voltage Reading with the AEGIS® Grounding Simulator

AEGIS® Grounding Simulator

First Take the Shaft Voltage Reading without Shaft Grounding



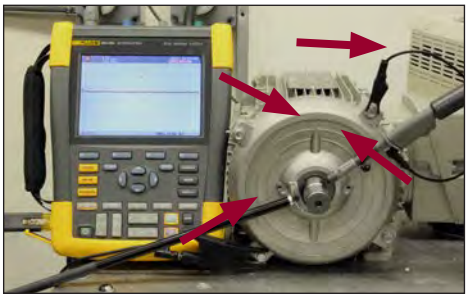
1. Shaft must be clean & free of any coatings, paint or other nonconductive material.
2. Secure the probe in place with magnetic base.
3. Align AEGIS® SVP on shaft end or side ensuring continuous contact. Avoid keyway if possible.
4. Place oscilloscope grounding lead on bare metal of motor ensuring conductive path to ground.
5. Save the image. Please refer to page 25 for this action.



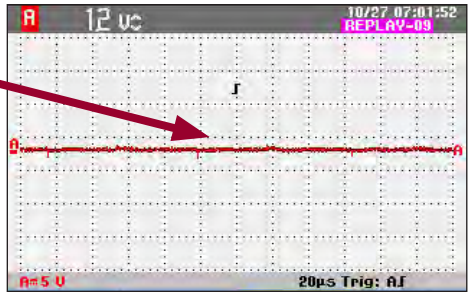
The voltage measurement of 31.2V peak to peak is an example of the voltage discharging through the bearings without AEGIS® shaft grounding.

⚠ Follow all safety precaution when working with rotating equipment.

Next Take the Shaft Voltage Reading with the Simulator Grounding the Shaft



1. Maintain the same setup as above.
2. Place the AEGIS® Grounding Simulator grounding lead on bare metal of motor ensuring conductive path to ground.
3. Place the Simulator against the shaft to simulate the AEGIS® SGR Bearing Protection Ring.
4. Save the image.



The voltage measurement of 1.2V peak to peak is an example of the voltage discharging through the Simulator to ground. The AEGIS® SGR Bearing Protection Ring will perform equally or better.

⚠ Follow all safety precaution when working with rotating equipment.

ScopeMeter Saving Images as .BMP on USB

1. Plug in a USB drive
2. Saving images as .BMP allow you to view your file without using the Fluke software on your computer.
3. You will not be able to change the file name as you are saving it but you can change it later.
4. Hold Image on screen
5. Save
6. F1 Save
7. F1 again to change from INT to USB (this is not saving the file)
8. F4 Close
9. F3 to save to USB
10. Press Clear to Clear menu
11. To view USB saved files, use a computer.

AEGIS® SVP Part Numbers:

Catalog Number	Includes:
SVP-KIT-3000MB	3 SVP tips, probe holder with two piece extension rod (total length of probe holder with extension rod is 18 inches), AEGIS® Grounding Simulator, and magnetic base.
SVP-KIT-3000	3 SVP tips, probe holder with two piece extension rod, and AEGIS® Grounding Simulator.
SVP-TIP-3000	3 SVP tips
Fits Fluke Voltage Probe VPS410 and VPS200; for other sizes see our website www.est-aegis.com	

AEGIS® SVP Tip Installation

Fluke VPS410 10:1 probe

1. Remove the protective cap

2. Remove the plastic sleeve

3. Probe with sleeve removed

4. Attach ground lead

5. Install the AEGIS® SVP tip over the probe tip

6. Secure the tip to the probe using the thumb screw. Be careful not to over tighten.

Setting the ScopeMeter Parameters

The following pages describe the parameters we use to capture shaft voltages. Although not all meters have the same options, the basic concept is the same.

To demonstrate, we will use the Fluke 190-204 ScopeMeter® 4 channel - 200 MHz. Refer to your owner's manual for a different meter.

Use the toggle keys in the middle to toggle through the menu. Always press the ENTER button to confirm your actions.

ScopeMeter Parameters Set Readings "ON"

Press the **A** button for channel A. Menu will appear at the bottom.

Press **SCOPE**
Press **F1** to toggle **ON**
Press **SCOPE** to clear menu.

ScopeMeter Parameters DC Coupling

Press the **A** button for channel A. Menu will appear at the bottom.

Press **F2 COUPLING** to toggle between the DC and AC Coupling.
Choose **DC** and press **ENTER**.
Press **CLEAR** to clear menu.

DC Coupling will pick up DC and AC voltages.

ScopeMeter Parameters Set Voltage Peak-Peak

Press the **SCOPE** button.
A menu will appear at the bottom.

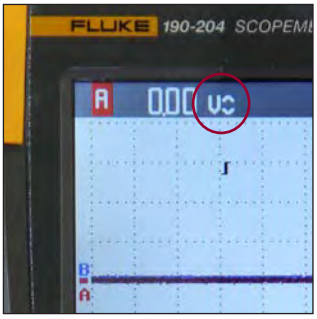
Press **F2 READING**. Cursor to desired channel and press **ENTER**.

Use up/down arrows to choose **Peak** and press **ENTER**.

ScopeMeter Parameters Set Voltage Peak-Peak

Choose **Peak to Peak** and press **ENTER.**

Press **CLEAR** to remove the menu bar.



Voltage **Peak to Peak** is now set.

ScopeMeter Parameters Set Polarity and Bandwidth

Press **A** button
Menu will appear at the bottom.

Press **F4 INPUT A OPTIONS**

Column 1 choose **Normal** and press **ENTER.**
Column 2 choose **Full** and press **ENTER.**
Press **CLEAR** to clear the menu.

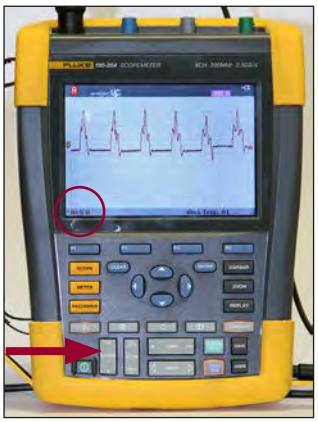
ScopeMeter Parameters Set Waveform Averages "OFF" and Waveform "Normal"

To show specific voltage measurements instead of averages:
Press the **SCOPE** button
Press **F4 WAVEFORM OPTIONS**

Move cursor to 3rd column
Averages: **OFF**
Press **ENTER**

In column 4
Waveform: **Normal**
Press **ENTER**
Press **CLEAR** to clear the menu

ScopeMeter Parameters Set Voltage Amplitude



Amplitude will need to be adjusted according to the conditions.
Set to show complete sign wave from top peak to bottom peak using the **RANGE** button.

In this example the amplitude is too small.
Increase **RANGE** (mV) to show more detail.

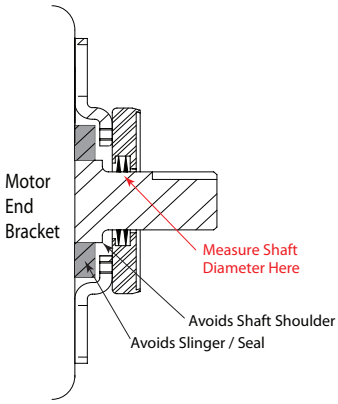
In this example the amplitude is too large.
Decrease **RANGE** (V) to show top and bottom peaks.

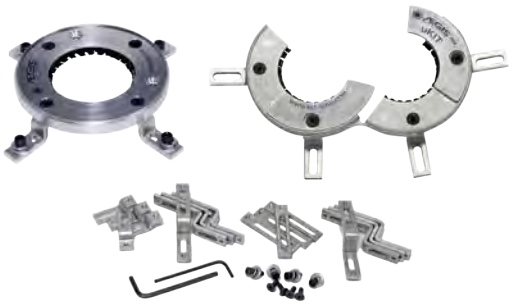
For standard NEMA or IEC frame motors, the AEGIS® uKIT is the best option. It avoids most shaft shoulders and slingers/seals.

AEGIS® uKit includes 4 different bracket sizes to suit most situations.

STOP *Question to ask:* **Does the motor have a shaft shoulder?**

If **YES or NOT SURE**, then the AEGIS® uKIT is a great options because it avoids the shaft shoulder area, any slingers/seals or irregular shaped end bracket.



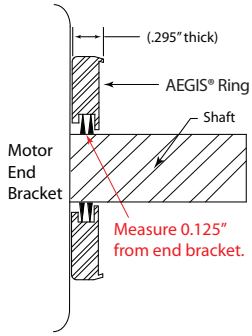


AEGIS® uKIT is be attached to motor with screws/washers provided or with conductive epoxy. AEGIS® EP2400 Conductive Epoxy sold separately.

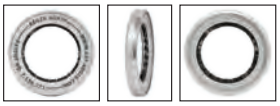
See AEGIS® website for bolt hole circle and installation instructions.

See page 38 for more details.

If **NO**, the ring can be mounted directly to the end bracket using screws or conductive epoxy.



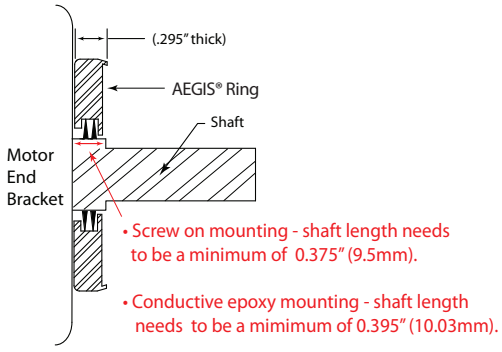
Measure shaft diameter at a point 0.125" from motor end bracket. Then refer to the parts list to locate the correct part number and mounting option of your choosing.



Example shaft measurement 0.445" fits between

Solid Ring with Conductive Epoxy	Split Ring* with Conductive Epoxy	Solid Ring Catalog Number	Split Ring* Catalog Number	Bolt Through* Catalog Number	Min. Shaft Diameter	Max. Shaft Diameter
SGR-9.0-0AW	SGR-9.0-0A4W	SGR-9.0-1	SGR-9.0-1A4	SGR-9.0-3FH	0.396	0.435
SGR-10.1-0AW	SGR-10.1-0A4W	SGR-10.1-1	SGR-10.1-1A4	SGR-10.1-3FH	0.436	0.480
SGR-11.2-0AW	SGR-11.2-0A4W	SGR-11.2-1	SGR-11.2-1A4	SGR-11.2-3FH	0.481	0.520

If **YES** and you want to mount the ring to fit the shaft shoulder then you need to measure the length of the shoulder. See note in red below. If still applicable, measure shaft shoulder diameter then refer to parts list (as shown above) to locate the correct SGR part number.



Custom Option for Short Shaft Shoulders: If the shaft shoulder is between .1875" and 0.375" we offer a custom part with fibers closer to the back of the ring. To order this option, add an "X" or "AX" to the suffix of the part.

Example:

Standard SGR	Short Shoulder SGR
PN: SGR-6.9-0A4W	PN: SGR-6.9-0A4WX
PN: SGR-6.9-0AW	PN: SGR-6.9-0AWX
PN: SGR-6.9-1	PN: SGR-6.9-1AX
PN: SGR-6.9-1A4	PN: SGR-6.9-1A4X
PN: SGR-6.9-3FH	PN: SGR-6.9-3FHAX

If the shoulder is less than 0.1875", then refer to the uKIT.

AEGIS® SGR Bearing Protection Ring Options

pg. 38-39

uKIT - SGR with Universal Mounting Bracket
Sized for NEMA and IEC Frame motors
Solid and Split Ring
Can be mounted with hardware or conductive epoxy

pg. 40-41

Conductive Epoxy Mounting (-0AW, -0A4W)
Shaft diameters: 0.311" to 6.02"
Solid and Split Ring
Quick and easy installation to metal motor frame
Conductive Epoxy Included

pg. 40-41

Standard Mounting Brackets (-1)
Shaft diameters: 0.311" to 6.02"
3 to 4 mounting brackets, 6-32 x 1/4" cap screws and washers
Quick and easy installation to most surfaces

pg. 40-41

Split Ring (-1A4)
Shaft diameter: 0.311" to 6.02"
4 to 6 mounting brackets, 6-32 x 1/4" cap screws and washers
Installs without decoupling motor

pg. 40-41

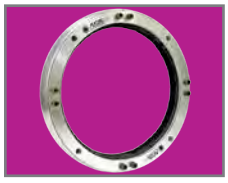
Bolt Through Mounting (-3FH)
Shaft diameters: 0.311" to 6.02"
6-32 x 1/2" flat head screws
2 mounting holes up to shaft size 3.895"
4 mounting holes for larger sizes

pg.42

Press Fit Mounting (-0A6)
Shaft diameters: 0.311" to 6.02"
Clean dry 0.004" press fit
Custom sizes available

pg. 43

NEMA-IEC Mounting Kits
Shaft diameter: see chart for standard kits
Custom kits available for other shaft diameters
Clears any slinger, shaft shoulder or protrusion



pg.44

Large SGR, iPRO, WTG
Large Rings over 6.02"
iPRO for Medium Voltage Motors
WTG for Wind Turbine Generators

pg.45

Accessories
SVP - AEGIS® Shaft Voltage Probe
CS015 - AEGIS® Colloidal Silver Shaft Coating
EP2400 - AEGIS® Conductive Epoxy

AEGIS® uKIT with Universal Mounting for NEMA and IEC Motors

Solid and Split Ring Design

- *Kit is designed to avoid any slinger or shaft shoulder. Order based on NEMA and IEC Frame size.*
- *Install with 3 or 4 brackets depending on motor end bracket design.*
- *uKIT can be attached to motor with screws/washers provided or with conductive epoxy. AEGIS® EP2400 Conductive Epoxy sold separately.*
- *See AEGIS® website for bolt hole circle and installation.*

AEGIS® SGR uKit Includes:

(1) AEGIS® SGR Bearing Protection Ring

(4) universal brackets of each size - 16 total

Hardware for NEMA Motors also Include:

(4) 5-40 x 3/8" flat head screws

(4) 6-32 x 3/8" socket head cap screws

(4) #6 split lock washers

(4) #6 flat washers

5/64" allen wrench

7/64" allen wrench

Hardware for IEC Motors also Include:

(4) 5-40 x 3/8" flat head screws

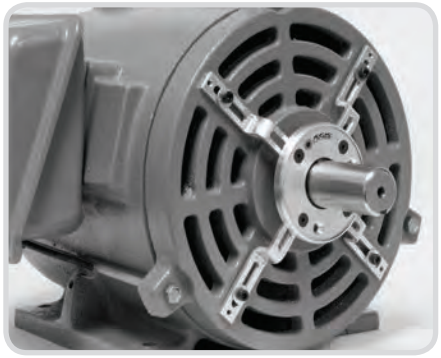
(4) M4 x 10 socket head cap screws

(4) M4 split lock washers

(4) M4 flat washers

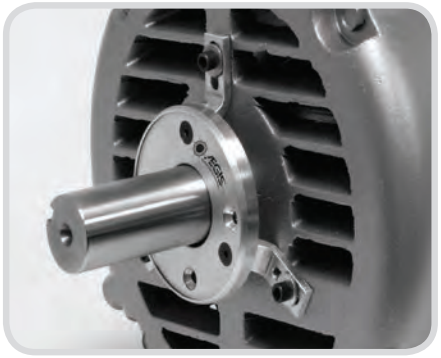
5/64" allen wrench

3mm allen wrench



Drill and tap hardware installation

AEGIS® EP2400 Conductive Epoxy installation



Solid Ring with 3 bracket installation

AEGIS® uKIT with Universal Mounting for NEMA and IEC Motors

NEMA uKIT Catalog Number Solid	NEMA uKIT Catalog Number Split	NEMA Motor shaft dia "u"	NEMA Frame
SGR-0.625-UKIT	SGR-0.625-UKIT-1A4	0.625"	56
SGR-0.875-UKIT	SGR-0.875-UKIT-1A4	0.875"	56HZ, 143T, 145T
SGR-1.125-UKIT	SGR-1.125-UKIT-1A4	1.125"	182T, 184T
SGR-1.375-UKIT	SGR-1.375-UKIT-1A4	1.375"	213T, 215T
SGR-1.625-UKIT	SGR-1.625-UKIT-1A4	1.625"	254T, 256T, 284TS, 286TS
SGR-1.875-UKIT	SGR-1.875-UKIT-1A4	1.875"	284T, 286T, 324TS, 326TS, 364TS, 365TS
SGR-2.125-UKIT	SGR-2.125-UKIT-1A4	2.125"	324T, 326T, 404TS, 405TS
SGR-2.375-UKIT	SGR-2.375-UKIT-1A4	2.375"	364T, 365T, 444TS, 445TS, 447TS, 449TS
SGR-2.875-UKIT	SGR-2.875-UKIT-1A4	2.875"	404T, 405T
SGR-3.375-UKIT	SGR-3.375-UKIT-1A4	3.375"	444T, 445T, 447T, 449T
SGR-3.625-UKIT	SGR-3.625-UKIT-1A4	3.625"	
SGR-3.875-UKIT	SGR-3.875-UKIT-1A4	3.875"	
SGR-4.375-UKIT	SGR-4.375-UKIT-1A4	4.375"	
SGR-4.875-UKIT	SGR-4.875-UKIT-1A4	4.875"	

IEC uKIT Catalog Number Solid	IEC uKIT Catalog Number Split	IEC Motor shaft dia "u"	IEC Frame
SGR-28-UKIT	SGR-28-UKIT-2A4	28mm	IEC 100L, 112M (2, 4, 6, 8 pole)
SGR-38-UKIT	SGR-38-UKIT-2A4	38mm	IEC 132S, 132M (2, 4, 6, 8 pole)
SGR-42-UKIT	SGR-42-UKIT-2A4	42mm	IEC 160M, 160L (2, 4, 6, 8 pole)
SGR-48-UKIT	SGR-48-UKIT-2A4	48mm	IEC 180M, 180L (2, 4, 6, 8 pole)
SGR-55-UKIT	SGR-55-UKIT-2A4	55mm	IEC 200L (2, 4, 6, 8 pole); IEC 225S, 225M (2 pole)
SGR-60-UKIT	SGR-60-UKIT-2A4	60mm	IEC 225S, 225M (4, 6, 8 pole) ; IEC 250M (2 pole)
SGR-65-UKIT	SGR-65-UKIT-2A4	65mm	IEC 250M (4, 6, 8 pole); IEC 280M, 280S, 315S, 315M,315L (2 pole)
SGR-70-UKIT	SGR-70-UKIT-2A4	70mm	
SGR-75-UKIT	SGR-75-UKIT-2A4	75mm	IEC 280S, 280M (4, 6, 8 pole); IEC 355M, 355L (2 pole)
SGR-80-UKIT	SGR-80-UKIT-2A4	80mm	IEC 315S, 315M, 315L (4, 6, 8 pole)
SGR-85-UKIT	SGR-85-UKIT-2A4	85mm	
SGR-90-UKIT	SGR-90-UKIT-2A4	90mm	
SGR-95-UKIT	SGR-95-UKIT-2A4	95mm	IEC 335L, 335M, 355L, 355M (4, 6, 8, 10 pole)

Solid Ring, Split Ring, and Bolt Through Mounting

Dimensions in inches

Solid Ring with Conductive Epoxy	Split Ring* with Conductive Epoxy	Solid Ring Catalog Number	Split Ring* Catalog Number	Bolt Through* Catalog Number	Min. Shaft Diameter	Max. Shaft Diameter	Outside Diameter	Thickness Max
SGR-6.9-0AW	SGR-6.9-0A4W	SGR-6.9-1	SGR-6.9-1A4	SGR-6.9-3FH	0.311	0.355	1.60	0.295
SGR-8.0-0AW	SGR-8.0-0A4W	SGR-8.0-1	SGR-8.0-1A4	SGR-8.0-3FH	0.356	0.395	1.60	0.295
SGR-9.0-0AW	SGR-9.0-0A4W	SGR-9.0-1	SGR-9.0-1A4	SGR-9.0-3FH	0.396	0.435	1.60	0.295
SGR-10.1-0AW	SGR-10.1-0A4W	SGR-10.1-1	SGR-10.1-1A4	SGR-10.1-3FH	0.436	0.480	1.60	0.295
SGR-11.2-0AW	SGR-11.2-0A4W	SGR-11.2-1	SGR-11.2-1A4	SGR-11.2-3FH	0.481	0.520	1.60	0.295
SGR-12.2-0AW	SGR-12.2-0A4W	SGR-12.2-1	SGR-12.2-1A4	SGR-12.2-3FH	0.521	0.560	1.60	0.295
SGR-13.2-0AW	SGR-13.2-0A4W	SGR-13.2-1	SGR-13.2-1A4	SGR-13.2-3FH	0.561	0.605	1.60	0.295
SGR-14.4-0AW	SGR-14.4-0A4W	SGR-14.4-1	SGR-14.4-1A4	SGR-14.4-3FH	0.606	0.645	1.60	0.295
SGR-15.4-0AW	SGR-15.4-0A4W	SGR-15.4-1	SGR-15.4-1A4	SGR-15.4-3FH	0.646	0.685	2.10	0.295
SGR-16.4-0AW	SGR-16.4-0A4W	SGR-16.4-1	SGR-16.4-1A4	SGR-16.4-3FH	0.686	0.730	2.10	0.295
SGR-17.6-0AW	SGR-17.6-0A4W	SGR-17.6-1	SGR-17.6-1A4	SGR-17.6-3FH	0.731	0.774	2.10	0.295
SGR-18.7-0AW	SGR-18.7-0A4W	SGR-18.7-1	SGR-18.7-1A4	SGR-18.7-3FH	0.775	0.815	2.10	0.295
SGR-19.7-0AW	SGR-19.7-0A4W	SGR-19.7-1	SGR-19.7-1A4	SGR-19.7-3FH	0.816	0.855	2.10	0.295
SGR-20.7-0AW	SGR-20.7-0A4W	SGR-20.7-1	SGR-20.7-1A4	SGR-20.7-3FH	0.856	0.895	2.10	0.295
SGR-21.7-0AW	SGR-21.7-0A4W	SGR-21.7-1	SGR-21.7-1A4	SGR-21.7-3FH	0.896	0.935	2.10	0.295
SGR-22.8-0AW	SGR-22.8-0A4W	SGR-22.8-1	SGR-22.8-1A4	SGR-22.8-3FH	0.936	0.980	2.10	0.295
SGR-23.9-0AW	SGR-23.9-0A4W	SGR-23.9-1	SGR-23.9-1A4	SGR-23.9-3FH	0.981	1.020	2.10	0.295
SGR-24.9-0AW	SGR-24.9-0A4W	SGR-24.9-1	SGR-24.9-1A4	SGR-24.9-3FH	1.021	1.060	2.10	0.295
SGR-25.9-0AW	SGR-25.9-0A4W	SGR-25.9-1	SGR-25.9-1A4	SGR-25.9-3FH	1.061	1.105	2.10	0.295
SGR-27.1-0AW	SGR-27.1-0A4W	SGR-27.1-1	SGR-27.1-1A4	SGR-27.1-3FH	1.106	1.145	2.10	0.295
SGR-28.1-0AW	SGR-28.1-0A4W	SGR-28.1-1	SGR-28.1-1A4	SGR-28.1-3FH	1.146	1.185	2.10	0.295
SGR-29.1-0AW	SGR-29.1-0A4W	SGR-29.1-1	SGR-29.1-1A4	SGR-29.1-3FH	1.186	1.230	2.10	0.295
SGR-30.3-0AW	SGR-30.3-0A4W	SGR-30.3-1	SGR-30.3-1A4	SGR-30.3-3FH	1.231	1.270	2.10	0.295
SGR-31.3-0AW	SGR-31.3-0A4W	SGR-31.3-1	SGR-31.3-1A4	SGR-31.3-3FH	1.271	1.310	2.10	0.295
SGR-32.3-0AW	SGR-32.3-0A4W	SGR-32.3-1	SGR-32.3-1A4	SGR-32.3-3FH	1.311	1.355	2.10	0.295
SGR-33.4-0AW	SGR-33.4-0A4W	SGR-33.4-1	SGR-33.4-1A4	SGR-33.4-3FH	1.356	1.395	2.10	0.295
SGR-34.4-0AW	SGR-34.4-0A4W	SGR-34.4-1	SGR-34.4-1A4	SGR-34.4-3FH	1.396	1.435	2.68	0.295
SGR-35.5-0AW	SGR-35.5-0A4W	SGR-35.5-1	SGR-35.5-1A4	SGR-35.5-3FH	1.436	1.480	2.68	0.295
SGR-36.6-0AW	SGR-36.6-0A4W	SGR-36.6-1	SGR-36.6-1A4	SGR-36.6-3FH	1.481	1.520	2.68	0.295
SGR-37.6-0AW	SGR-37.6-0A4W	SGR-37.6-1	SGR-37.6-1A4	SGR-37.6-3FH	1.521	1.560	2.68	0.295
SGR-38.6-0AW	SGR-38.6-0A4W	SGR-38.6-1	SGR-38.6-1A4	SGR-38.6-3FH	1.561	1.605	2.68	0.295
SGR-39.8-0AW	SGR-39.8-0A4W	SGR-39.8-1	SGR-39.8-1A4	SGR-39.8-3FH	1.606	1.645	2.68	0.295
SGR-40.8-0AW	SGR-40.8-0A4W	SGR-40.8-1	SGR-40.8-1A4	SGR-40.8-3FH	1.646	1.685	2.68	0.295
SGR-41.8-0AW	SGR-41.8-0A4W	SGR-41.8-1	SGR-41.8-1A4	SGR-41.8-3FH	1.686	1.730	2.68	0.295
SGR-43.0-0AW	SGR-43.0-0A4W	SGR-43.0-1	SGR-43.0-1A4	SGR-43.0-3FH	1.731	1.770	2.68	0.295
SGR-44.0-0AW	SGR-44.0-0A4W	SGR-44.0-1	SGR-44.0-1A4	SGR-44.0-3FH	1.771	1.810	2.68	0.295
SGR-45.0-0AW	SGR-45.0-0A4W	SGR-45.0-1	SGR-45.0-1A4	SGR-45.0-3FH	1.811	1.855	2.68	0.295
SGR-46.1-0AW	SGR-46.1-0A4W	SGR-46.1-1	SGR-46.1-1A4	SGR-46.1-3FH	1.856	1.895	2.68	0.295
SGR-47.1-0AW	SGR-47.1-0A4W	SGR-47.1-1	SGR-47.1-1A4	SGR-47.1-3FH	1.896	1.935	2.68	0.295
SGR-48.2-0AW	SGR-48.2-0A4W	SGR-48.2-1	SGR-48.2-1A4	SGR-48.2-3FH	1.936	1.980	2.68	0.295
SGR-49.3-0AW	SGR-49.3-0A4W	SGR-49.3-1	SGR-49.3-1A4	SGR-49.3-3FH	1.981	2.020	2.68	0.295
SGR-50.3-0AW	SGR-50.3-0A4W	SGR-50.3-1	SGR-50.3-1A4	SGR-50.3-3FH	2.021	2.060	3.10	0.295
SGR-51.3-0AW	SGR-51.3-0A4W	SGR-51.3-1	SGR-51.3-1A4	SGR-51.3-3FH	2.061	2.105	3.10	0.295
SGR-52.5-0AW	SGR-52.5-0A4W	SGR-52.5-1	SGR-52.5-1A4	SGR-52.5-3FH	2.106	2.145	3.10	0.295
SGR-53.5-0AW	SGR-53.5-0A4W	SGR-53.5-1	SGR-53.5-1A4	SGR-53.5-3FH	2.146	2.185	3.10	0.295
SGR-54.5-0AW	SGR-54.5-0A4W	SGR-54.5-1	SGR-54.5-1A4	SGR-54.5-3FH	2.186	2.230	3.10	0.295
SGR-55.7-0AW	SGR-55.7-0A4W	SGR-55.7-1	SGR-55.7-1A4	SGR-55.7-3FH	2.231	2.270	3.10	0.295
SGR-56.7-0AW	SGR-56.7-0A4W	SGR-56.7-1	SGR-56.7-1A4	SGR-56.7-3FH	2.271	2.310	3.10	0.295
SGR-57.7-0AW	SGR-57.7-0A4W	SGR-57.7-1	SGR-57.7-1A4	SGR-57.7-3FH	2.311	2.355	3.10	0.295
SGR-58.8-0AW	SGR-58.8-0A4W	SGR-58.8-1	SGR-58.8-1A4	SGR-58.8-3FH	2.356	2.395	3.10	0.295
SGR-59.8-0AW	SGR-59.8-0A4W	SGR-59.8-1	SGR-59.8-1A4	SGR-59.8-3FH	2.396	2.435	3.60	0.295
SGR-60.9-0AW	SGR-60.9-0A4W	SGR-60.9-1	SGR-60.9-1A4	SGR-60.9-3FH	2.436	2.480	3.60	0.295
SGR-62.0-0AW	SGR-62.0-0A4W	SGR-62.0-1	SGR-62.0-1A4	SGR-62.0-3FH	2.481	2.520	3.60	0.295
SGR-63.0-0AW	SGR-63.0-0A4W	SGR-63.0-1	SGR-63.0-1A4	SGR-63.0-3FH	2.521	2.560	3.60	0.295
SGR-64.0-0AW	SGR-64.0-0A4W	SGR-64.0-1	SGR-64.0-1A4	SGR-64.0-3FH	2.561	2.605	3.60	0.295
SGR-65.2-0AW	SGR-65.2-0A4W	SGR-65.2-1	SGR-65.2-1A4	SGR-65.2-3FH	2.606	2.645	3.60	0.295
SGR-66.2-0AW	SGR-66.2-0A4W	SGR-66.2-1	SGR-66.2-1A4	SGR-66.2-3FH	2.646	2.685	3.60	0.295
SGR-67.2-0AW	SGR-67.2-0A4W	SGR-67.2-1	SGR-67.2-1A4	SGR-67.2-3FH	2.686	2.730	3.60	0.295
SGR-68.4-0AW	SGR-68.4-0A4W	SGR-68.4-1	SGR-68.4-1A4	SGR-68.4-3FH	2.731	2.770	3.60	0.295
SGR-69.4-0AW	SGR-69.4-0A4W	SGR-69.4-1	SGR-69.4-1A4	SGR-69.4-3FH	2.771	2.810	3.60	0.295
SGR-70.4-0AW	SGR-70.4-0A4W	SGR-70.4-1	SGR-70.4-1A4	SGR-70.4-3FH	2.811	2.855	3.60	0.295
SGR-71.5-0AW	SGR-71.5-0A4W	SGR-71.5-1	SGR-71.5-1A4	SGR-71.5-3FH	2.856	2.895	3.60	0.295
SGR-72.5-0AW	SGR-72.5-0A4W	SGR-72.5-1	SGR-72.5-1A4	SGR-72.5-3FH	2.896	2.935	4.10	0.295
SGR-73.6-0AW	SGR-73.6-0A4W	SGR-73.6-1	SGR-73.6-1A4	SGR-73.6-3FH	2.936	2.980	4.10	0.295
SGR-74.7-0AW	SGR-74.7-0A4W	SGR-74.7-1	SGR-74.7-1A4	SGR-74.7-3FH	2.981	3.020	4.10	0.295
SGR-75.7-0AW	SGR-75.7-0A4W	SGR-75.7-1	SGR-75.7-1A4	SGR-75.7-3FH	3.021	3.060	4.10	0.295
SGR-76.7-0AW	SGR-76.7-0A4W	SGR-76.7-1	SGR-76.7-1A4	SGR-76.7-3FH	3.061	3.105	4.10	0.295
SGR-77.9-0AW	SGR-77.9-0A4W	SGR-77.9-1	SGR-77.9-1A4	SGR-77.9-3FH	3.106	3.145	4.10	0.295
SGR-78.9-0AW	SGR-78.9-0A4W	SGR-78.9-1	SGR-78.9-1A4	SGR-78.9-3FH	3.146	3.185	4.10	0.295
	*Custom Part-No Return		*Custom Part-No Return	*Custom Part-No Return				

Solid Ring with Conductive Epoxy	Split Ring* with Conductive Epoxy	Solid Ring Catalog Number	Split Ring* Catalog Number	Bolt Through* Catalog Number	Min. Shaft Diameter	Max. Shaft Diameter	Outside Diameter	Thickness Max
SGR-79.9-0AW	SGR-79.9-0A4W	SGR-79.9-1	SGR-79.9-1A4	SGR-79.9-3FH	3.186	3.230	4.10	0.295
SGR-81.1-0AW	SGR-81.1-0A4W	SGR-81.1-1	SGR-81.1-1A4	SGR-81.1-3FH	3.231	3.270	4.10	0.295
SGR-82.1-0AW	SGR-82.1-0A4W	SGR-82.1-1	SGR-82.1-1A4	SGR-82.1-3FH	3.271	3.310	4.10	0.295
SGR-83.1-0AW	SGR-83.1-0A4W	SGR-83.1-1	SGR-83.1-1A4	SGR-83.1-3FH	3.311	3.355	4.10	0.295
SGR-84.2-0AW	SGR-84.2-0A4W	SGR-84.2-1	SGR-84.2-1A4	SGR-84.2-3FH	3.356	3.395	4.10	0.295
SGR-85.2-0AW	SGR-85.2-0A4W	SGR-85.2-1	SGR-85.2-1A4	SGR-85.2-3FH	3.396	3.435	4.60	0.295
SGR-86.3-0AW	SGR-86.3-0A4W	SGR-86.3-1	SGR-86.3-1A4	SGR-86.3-3FH	3.436	3.480	4.60	0.295
SGR-87.4-0AW	SGR-87.4-0A4W	SGR-87.4-1	SGR-87.4-1A4	SGR-87.4-3FH	3.481	3.520	4.60	0.295
SGR-88.4-0AW	SGR-88.4-0A4W	SGR-88.4-1	SGR-88.4-1A4	SGR-88.4-3FH	3.521	3.560	4.60	0.295
SGR-89.4-0AW	SGR-89.4-0A4W	SGR-89.4-1	SGR-89.4-1A4	SGR-89.4-3FH	3.561	3.605	4.60	0.295
SGR-90.6-0AW	SGR-90.6-0A4W	SGR-90.6-1	SGR-90.6-1A4	SGR-90.6-3FH	3.606	3.645	4.60	0.295
SGR-91.6-0AW	SGR-91.6-0A4W	SGR-91.6-1	SGR-91.6-1A4	SGR-91.6-3FH	3.646	3.685	4.60	0.295
SGR-92.6-0AW	SGR-92.6-0A4W	SGR-92.6-1	SGR-92.6-1A4	SGR-92.6-3FH	3.686	3.730	4.60	0.295
SGR-93.8-0AW	SGR-93.8-0A4W	SGR-93.8-1	SGR-93.8-1A4	SGR-93.8-3FH	3.731	3.770	4.60	0.295
SGR-94.8-0AW	SGR-94.8-0A4W	SGR-94.8-1	SGR-94.8-1A4	SGR-94.8-3FH	3.771	3.810	4.60	0.295
SGR-95.8-0AW	SGR-95.8-0A4W	SGR-95.8-1	SGR-95.8-1A4	SGR-95.8-3FH	3.811	3.855	4.60	0.295
SGR-96.9-0AW	SGR-96.9-0A4W	SGR-96.9-1	SGR-96.9-1A4	SGR-96.9-3FH	3.856	3.895	4.60	0.295
SGR-97.9-0AW	SGR-97.9-0A4W	SGR-97.9-1	SGR-97.9-1A4	SGR-97.9-3FH	3.896	3.935	5.10	0.295
SGR-99.0-0AW	SGR-99.0-0A4W	SGR-99.0-1	SGR-99.0-1A4	SGR-99.0-3FH	3.936	3.980	5.10	0.295
SGR-100.1-0AW	SGR-100.1-0A4W	SGR-100.1-1	SGR-100.1-1A4	SGR-100.1-3FH	3.981	4.020	5.10	0.295
SGR-101.1-0AW	SGR-101.1-0A4W	SGR-101.1-1	SGR-101.1-1A4	SGR-101.1-3FH	4.021	4.060	5.10	0.295
SGR-102.1-0AW	SGR-102.1-0A4W	SGR-102.1-1	SGR-102.1-1A4	SGR-102.1-3FH	4.061	4.105	5.10	0.295
SGR-103.3-0AW	SGR-103.3-0A4W	SGR-103.3-1	SGR-103.3-1A4	SGR-103.3-3FH	4.106	4.145	5.10	0.295
SGR-104.3-0AW	SGR-104.3-0A4W	SGR-104.3-1	SGR-104.3-1A4	SGR-104.3-3FH	4.146	4.185	5.10	0.295
SGR-105.3-0AW	SGR-105.3-0A4W	SGR-105.3-1	SGR-105.3-1A4	SGR-105.3-3FH	4.186	4.230	5.10	0.295
SGR-106.5-0AW	SGR-106.5-0A4W	SGR-106.5-1	SGR-106.5-1A4	SGR-106.5-3FH	4.231	4.270	5.10	0.295
SGR-107.5-0AW	SGR-107.5-0A4W	SGR-107.5-1	SGR-107.5-1A4	SGR-107.5-3FH	4.271	4.310	5.10	0.295
SGR-108.5-0AW	SGR-108.5-0A4W	SGR-108.5-1	SGR-108.5-1A4	SGR-108.5-3FH	4.311	4.355	5.10	0.295
SGR-109.6-0AW	SGR-109.6-0A4W	SGR-109.6-1	SGR-109.6-1A4	SGR-109.6-3FH	4.356	4.395	5.10	0.295
SGR-110.6-0AW	SGR-110.6-0A4W	SGR-110.6-1	SGR-110.6-1A4	SGR-110.6-3FH	4.396	4.435	5.60	0.295
SGR-111.7-0AW	SGR-111.7-0A4W	SGR-111.7-1	SGR-111.7-1A4	SGR-111.7-3FH	4.436	4.480	5.60	0.295
SGR-112.8-0AW	SGR-112.8-0A4W	SGR-112.8-1	SGR-112.8-1A4	SGR-112.8-3FH	4.481	4.520	5.60	0.295
SGR-113.8-0AW	SGR-113.8-0A4W	SGR-113.8-1	SGR-113.8-1A4	SGR-113.8-3FH	4.521	4.560	5.60	0.295
SGR-114.8-0AW	SGR-114.8-0A4W	SGR-114.8-1	SGR-114.8-1A4	SGR-114.8-3FH	4.561	4.605	5.60	0.295
SGR-116.0-0AW	SGR-116.0-0A4W	SGR-116.0-1	SGR-116.0-1A4	SGR-116.0-3FH	4.606	4.645	5.60	0.295
SGR-117.0-0AW	SGR-117.0-0A4W	SGR-117.0-1	SGR-117.0-1A4	SGR-117.0-3FH	4.646	4.685	5.60	0.295
SGR-118.0-0AW	SGR-118.0-0A4W	SGR-118.0-1	SGR-118.0-1A4	SGR-118.0-3FH	4.686	4.730	5.60	0.295
SGR-119.2-0AW	SGR-119.2-0A4W	SGR-119.2-1	SGR-119.2-1A4	SGR-119.2-3FH	4.731	4.770	5.60	0.295
SGR-120.2-0AW	SGR-120.2-0A4W	SGR-120.2-1	SGR-120.2-1A4	SGR-120.2-3FH	4.771	4.810	5.60	0.295
SGR-121.2-0AW	SGR-121.2-0A4W	SGR-121.2-1	SGR-121.2-1A4	SGR-121.2-3FH	4.811	4.855	5.60	0.295
SGR-122.3-0AW	SGR-122.3-0A4W	SGR-122.3-1	SGR-122.3-1A4	SGR-122.3-3FH	4.856	4.895	5.60	0.295
SGR-123.3-0AW	SGR-123.3-0A4W	SGR-123.3-1	SGR-123.3-1A4	SGR-123.3-3FH	4.896	4.935	6.10	0.295
SGR-124.4-0AW	SGR-124.4-0A4W	SGR-124.4-1	SGR-124.4-1A4	SGR-124.4-3FH	4.936	4.980	6.10	0.295
SGR-125.5-0AW	SGR-125.5-0A4W	SGR-125.5-1	SGR-125.5-1A4	SGR-125.5-3FH	4.981	5.020	6.10	0.295
SGR-126.5-0AW	SGR-126.5-0A4W	SGR-126.5-1	SGR-126.5-1A4	SGR-126.5-3FH	5.021	5.060	6.10	0.295
SGR-127.5-0AW	SGR-127.5-0A4W	SGR-127.5-1	SGR-127.5-1A4	SGR-127.5-3FH	5.061	5.105	6.10	0.295
SGR-128.7-0AW	SGR-128.7-0A4W	SGR-128.7-1	SGR-128.7-1A4	SGR-128.7-3FH	5.106	5.145	6.10	0.295
SGR-129.7-0AW	SGR-129.7-0A4W	SGR-129.7-1	SGR-129.7-1A4	SGR-129.7-3FH	5.146	5.185	6.10	0.295
SGR-130.7-0AW	SGR-130.7-0A4W	SGR-130.7-1	SGR-130.7-1A4	SGR-130.7-3FH	5.186	5.230	6.10	0.295
SGR-131.9-0AW	SGR-131.9-0A4W	SGR-131.9-1	SGR-131.9-1A4	SGR-131.9-3FH	5.231	5.270	6.10	0.295
SGR-132.9-0AW	SGR-132.9-0A4W	SGR-132.9-1	SGR-132.9-1A4	SGR-132.9-3FH	5.271	5.310	6.10	0.295
SGR-133.9-0AW	SGR-133.9-0A4W	SGR-133.9-1	SGR-133.9-1A4	SGR-133.9-3FH	5.311	5.355	6.10	0.295
SGR-135.0-0AW	SGR-135.0-0A4W	SGR-135.0-1	SGR-135.0-1A4	SGR-135.0-3FH	5.356	5.395	6.10	0.295
SGR-136.0-0AW	SGR-136.0-0A4W	SGR-136.0-1	SGR-136.0-1A4	SGR-136.0-3FH	5.396	5.435	6.60	0.295
SGR-137.1-0AW	SGR-137.1-0A4W	SGR-137.1-1	SGR-137.1-1A4	SGR-137.1-3FH	5.436	5.480	6.60	0.295
SGR-138.2-0AW	SGR-138.2-0A4W	SGR-138.2-1	SGR-138.2-1A4	SGR-138.2-3FH	5.481	5.520	6.60	0.295
SGR-139.2-0AW	SGR-139.2-0A4W	SGR-139.2-1	SGR-139.2-1A4	SGR-139.2-3FH	5.521	5.560	6.60	0.295
SGR-140.2-0AW	SGR-140.2-0A4W	SGR-140.2-1	SGR-140.2-1A4	SGR-140.2-3FH	5.561	5.605	6.60	0.295
SGR-141.4-0AW	SGR-141.4-0A4W	SGR-141.4-1	SGR-141.4-1A4	SGR-141.4-3FH	5.606	5.645	6.60	0.295
SGR-142.4-0AW	SGR-142.4-0A4W	SGR-142.4-1	SGR-142.4-1A4	SGR-142.4-3FH	5.646	5.685	6.60	0.295
SGR-143.4-0AW	SGR-143.4-0A4W	SGR-143.4-1	SGR-143.4-1A4	SGR-143.4-3FH	5.686	5.730	6.60	0.295
SGR-144.6-0AW	SGR-144.6-0A4W	SGR-144.6-1	SGR-144.6-1A4	SGR-144.6-3FH	5.731	5.770	6.60	0.295
SGR-145.6-0AW	SGR-145.6-0A4W	SGR-145.6-1	SGR-145.6-1A4	SGR-145.6-3FH	5.771	5.810	6.60	0.295
SGR-146.6-0AW	SGR-146.6-0A4W	SGR-146.6-1	SGR-146.6-1A4	SGR-146.6-3FH	5.811	5.855	6.60	0.295
SGR-147.7-0AW	SGR-147.7-0A4W	SGR-147.7-1	SGR-147.7-1A4	SGR-147.7-3FH	5.856	5.895	6.60	0.295
SGR-148.7-0AW	SGR-148.7-0A4W	SGR-148.7-1	SGR-148.7-1A4	SGR-148.7-3FH	5.896	5.935	7.10	0.295
SGR-149.8-0AW	SGR-149.8-0A4W	SGR-149.8-1	SGR-149.8-1A4	SGR-149.8-3FH	5.936	5.980	7.10	0.295
SGR-150.9-0AW	SGR-150.9-0A4W	SGR-150.9-1	SGR-150.9-1A4	SGR-150.9-3FH	5.981	6.020	7.10	0.295
	*Custom Part-No Return		*Custom Part-No Return	*Custom Part-No Return				

AEGIS® SGR - Press Fit Mounting

Dimensions in inches

Catalog Number	Min.shaft diameter	Max.shaft diameter	SGR OD Tolerance +0/-0.001	Thickness Max	Bore Tolerance +0.001/-0
SGR-6.9-0A6	0.311	0.355	1.580	0.295	1.576
SGR- 8.0-0A6	0.356	0.395	1.580	0.295	1.576
SGR-9.0-0A6	0.396	0.435	1.580	0.295	1.576
SGR-10.1-0A6	0.436	0.480	1.580	0.295	1.576
SGR-11.2-0A6	0.481	0.520	1.580	0.295	1.576
SGR-12.2-0A6	0.521	0.560	1.580	0.295	1.576
SGR-13.2-0A6	0.561	0.605	1.580	0.295	1.576
SGR-14.4-0A6	0.606	0.645	1.580	0.295	1.576
SGR-15.4-0A6	0.646	0.685	2.080	0.295	2.076
SGR-16.4-0A6	0.686	0.730	2.080	0.295	2.076
SGR-17.6-0A6	0.731	0.774	2.080	0.295	2.076
SGR-18.7-0A6	0.775	0.815	2.080	0.295	2.076
SGR-19.7-0A6	0.816	0.855	2.080	0.295	2.076
SGR-20.7-0A6	0.856	0.895	2.080	0.295	2.076
SGR-21.7-0A6	0.896	0.935	2.080	0.295	2.076
SGR-22.8-0A6	0.936	0.980	2.080	0.295	2.076
SGR-23.9-0A6	0.981	1.020	2.080	0.295	2.076
SGR-24.9-0A6	1.021	1.060	2.080	0.295	2.076
SGR-25.9-0A6	1.061	1.105	2.080	0.295	2.076
SGR-27.1-0A6	1.106	1.145	2.080	0.295	2.076
SGR-28.1-0A6	1.146	1.185	2.080	0.295	2.076
SGR-29.1-0A6	1.186	1.230	2.080	0.295	2.076
SGR-30.3-0A6	1.231	1.270	2.080	0.295	2.076
SGR-31.3-0A6	1.271	1.310	2.080	0.295	2.076
SGR-32.3-0A6	1.311	1.355	2.080	0.295	2.076
SGR-33.4-0A6	1.356	1.395	2.080	0.295	2.076
SGR-34.4-0A6	1.396	1.435	2.660	0.295	2.656
SGR-35.5-0A6	1.436	1.480	2.660	0.295	2.656
SGR-36.6-0A6	1.481	1.520	2.660	0.295	2.656
SGR-37.6-0A6	1.521	1.560	2.660	0.295	2.656
SGR-38.6-0A6	1.561	1.605	2.660	0.295	2.656
SGR-39.8-0A6	1.606	1.645	2.660	0.295	2.656
SGR-40.8-0A6	1.646	1.685	2.660	0.295	2.656
SGR-41.8-0A6	1.686	1.730	2.660	0.295	2.656
SGR-43.0-0A6	1.731	1.770	2.660	0.295	2.656
SGR-44.0-0A6	1.771	1.810	2.660	0.295	2.656
SGR-45.0-0A6	1.811	1.855	2.660	0.295	2.656
SGR-46.1-0A6	1.856	1.895	2.660	0.295	2.656
SGR-47.1-0A6	1.896	1.935	2.660	0.295	2.656
SGR-48.2-0A6	1.936	1.980	2.660	0.295	2.656
SGR-49.3-0A6	1.981	2.020	2.660	0.295	2.656
SGR-50.3-0A6	2.021	2.060	3.080	0.295	3.076
SGR-51.3-0A6	2.061	2.105	3.080	0.295	3.076
SGR-52.5-0A6	2.106	2.145	3.080	0.295	3.076
SGR-53.5-0A6	2.146	2.185	3.080	0.295	3.076
SGR-54.5-0A6	2.186	2.230	3.080	0.295	3.076
SGR-55.7-0A6	2.231	2.270	3.080	0.295	3.076
SGR-56.7-0A6	2.271	2.310	3.080	0.295	3.076
SGR-57.7-0A6	2.311	2.355	3.080	0.295	3.076
SGR-58.8-0A6	2.356	2.395	3.080	0.295	3.076
SGR-59.8-0A6	2.396	2.435	3.580	0.295	3.576
SGR-60.9-0A6	2.436	2.480	3.580	0.295	3.576
SGR-62.0-0A6	2.481	2.520	3.580	0.295	3.576
SGR-63.0-0A6	2.521	2.560	3.580	0.295	3.576
SGR-64.0-0A6	2.561	2.605	3.580	0.295	3.576
SGR-65.2-0A6	2.606	2.645	3.580	0.295	3.576
SGR-66.2-0A6	2.646	2.685	3.580	0.295	3.576
SGR-67.2-0A6	2.686	2.730	3.580	0.295	3.576
SGR-68.4-0A6	2.731	2.770	3.580	0.295	3.576
SGR-69.4-0A6	2.771	2.810	3.580	0.295	3.576
SGR-70.4-0A6	2.811	2.855	3.580	0.295	3.576
SGR-71.5-0A6	2.856	2.895	3.580	0.295	3.576
SGR-72.5-0A6	2.896	2.935	4.080	0.295	4.076
SGR-73.6-0A6	2.936	2.980	4.080	0.295	4.076
SGR-74.7-0A6	2.981	3.020	4.080	0.295	4.076
SGR-75.7-0A6	3.021	3.060	4.080	0.295	4.076
SGR-76.7-0A6	3.061	3.105	4.080	0.295	4.076
SGR-77.9-0A6	3.106	3.145	4.080	0.295	4.076
SGR-78.9-0A6	3.146	3.185	4.080	0.295	4.076

Custom Part-No Return

Catalog Number	Min.shaft diameter	Max.shaft diameter	SGR OD Tolerance +0/-0.001	Thickness Max	Bore Tolerance +0.001/-0
SGR-79.9-0A6	3.186	3.230	4.080	0.295	4.076
SGR-81.1-0A6	3.231	3.270	4.080	0.295	4.076
SGR-82.1-0A6	3.271	3.310	4.080	0.295	4.076
SGR-83.1-0A6	3.311	3.355	4.080	0.295	4.076
SGR-84.2-0A6	3.356	3.395	4.080	0.295	4.076
SGR-85.2-0A6	3.396	3.435	4.580	0.295	4.576
SGR-86.3-0A6	3.436	3.480	4.580	0.295	4.576
SGR-87.4-0A6	3.481	3.520	4.580	0.295	4.576
SGR-88.4-0A6	3.521	3.560	4.580	0.295	4.576
SGR-89.4-0A6	3.561	3.605	4.580	0.295	4.576
SGR-90.6-0A6	3.606	3.645	4.580	0.295	4.576
SGR-91.6-0A6	3.646	3.685	4.580	0.295	4.576
SGR-92.6-0A6	3.686	3.730	4.580	0.295	4.576
SGR-93.8-0A6	3.731	3.770	4.580	0.295	4.576
SGR-94.8-0A6	3.771	3.810	4.580	0.295	4.576
SGR-95.8-0A6	3.811	3.855	4.580	0.295	4.576
SGR-96.9-0A6	3.856	3.895	4.580	0.295	4.576
SGR-97.9-0A6	3.896	3.935	5.080	0.295	5.076
SGR-99.0-0A6	3.936	3.980	5.080	0.295	5.076
SGR-100.1-0A6	3.981	4.020	5.080	0.295	5.076
SGR-101.1-0A6	4.021	4.060	5.080	0.295	5.076
SGR-102.1-0A6	4.061	4.105	5.080	0.295	5.076
SGR-103.3-0A6	4.106	4.145	5.080	0.295	5.076
SGR-104.3-0A6	4.146	4.185	5.080	0.295	5.076
SGR-105.3-0A6	4.186	4.230	5.080	0.295	5.076
SGR-106.5-0A6	4.231	4.270	5.080	0.295	5.076
SGR-107.5-0A6	4.271	4.310	5.080	0.295	5.076
SGR-108.5-0A6	4.311	4.355	5.080	0.295	5.076
SGR-109.6-0A6	4.356	4.395	5.080	0.295	5.076
SGR-110.6-0A6	4.396	4.435	5.580	0.295	5.576
SGR-111.7-0A6	4.436	4.480	5.580	0.295	5.576
SGR-112.8-0A6	4.481	4.520	5.580	0.295	5.576
SGR-113.8-0A6	4.521	4.560	5.580	0.295	5.576
SGR-114.8-0A6	4.561	4.605	5.580	0.295	5.576
SGR-116.0-0A6	4.606	4.645	5.580	0.295	5.576
SGR-117.0-0A6	4.646	4.685	5.580	0.295	5.576
SGR-118.0-0A6	4.686	4.730	5.580	0.295	5.576
SGR-119.2-0A6	4.731	4.770	5.580	0.295	5.576
SGR-120.2-0A6	4.771	4.810	5.580	0.295	5.576
SGR-121.2-0A6	4.811	4.855	5.580	0.295	5.576
SGR-122.3-0A6	4.856	4.895	5.580	0.295	5.576
SGR-123.3-0A6	4.896	4.935	6.080	0.295	6.076
SGR-124.4-0A6	4.936	4.980	6.080	0.295	6.076
SGR-125.5-0A6	4.981	5.020	6.080	0.295	6.076
SGR-126.5-0A6	5.021	5.060	6.080	0.295	6.076
SGR-127.5-0A6	5.061	5.105	6.080	0.295	6.076
SGR-128.7-0A6	5.106	5.145	6.080	0.295	6.076
SGR-129.7-0A6	5.146	5.185	6.080	0.295	6.076
SGR-130.7-0A6	5.186	5.230	6.080	0.295	6.076
SGR-131.9-0A6	5.231	5.270	6.080	0.295	6.076
SGR-132.9-0A6	5.271	5.310	6.080	0.295	6.076
SGR-133.9-0A6	5.311	5.355	6.080	0.295	6.076
SGR-135.0-0A6	5.356	5.395	6.080	0.295	6.076
SGR-136.0-0A6	5.396	5.435	6.580	0.295	6.576
SGR-137.1-0A6	5.436	5.480	6.580	0.295	6.576
SGR-138.2-0A6	5.481	5.520	6.580	0.295	6.576
SGR-139.2-0A6	5.521	5.560	6.580	0.295	6.576
SGR-140.2-0A6	5.561	5.605	6.580	0.295	6.576
SGR-141.4-0A6	5.606	5.645	6.580	0.295	6.576
SGR-142.4-0A6	5.646	5.685	6.580	0.295	6.576
SGR-143.4-0A6	5.686	5.730	6.580	0.295	6.576
SGR-144.6-0A6	5.731	5.770	6.580	0.295	6.576
SGR-145.6-0A6	5.771	5.810	6.580	0.295	6.576
SGR-146.6-0A6	5.811	5.855	6.580	0.295	6.576
SGR-147.7-0A6	5.856	5.895	6.580	0.295	6.576
SGR-148.7-0A6	5.896	5.935	7.080	0.295	7.076
SGR-149.8-0A6	5.936	5.980	7.080	0.295	7.076
SGR-150.9-0A6	5.981	6.020	7.080	0.295	7.076

Custom Part-No Return

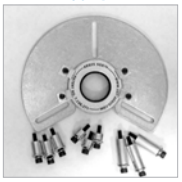
Kits with Aluminum Plates and Spacers

Includes AEGIS® SGR Bearing Protection Ring and all mounting hardware

NEMA Motors Solid	NEMA Motors Split	Motor Shaft Diameter "u"	NEMA Frame	Plate OD
SGR-0.625-NEMA	SGR-0.625-NEMA-1A4	0.625"	56	3.75"
SGR-0.875-NEMA	SGR-0.875-NEMA-1A4	0.875"	56HZ, 143T, 145T	5.60"
SGR-1.125-NEMA	SGR-1.125-NEMA-1A4	1.125"	182T, 184T	5.60"
SGR-1.375-NEMA	SGR-1.375-NEMA-1A4	1.375"	213T, 215T	5.60"
SGR-1.625-NEMA	SGR-1.625-NEMA-1A4	1.625"	254T, 256T, 284TS, 286TS	6.30"
SGR-1.875-NEMA	SGR-1.875-NEMA-1A4	1.875"	284T, 286T, 324TS, 326TS, 364TS, 365TS	6.30"
SGR-2.125-NEMA	SGR-2.125-NEMA-1A4	2.125"	324T, 326T, 404TS, 405TS	6.60"
SGR-2.375-NEMA	SGR-2.375-NEMA-1A4	2.375"	364T, 365T, 444TS, 445TS, 447TS, 449TS	6.60"
SGR-2.875-NEMA	SGR-2.875-NEMA-1A4	2.875"	404T, 405T	7.30"
SGR-3.375-NEMA	SGR-3.375-NEMA-1A4	3.375"	444T, 445T, 447T, 449T	7.60"

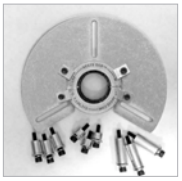
IEC Motors Solid	IEC Motors Split	IEC Shaft Diameter	IEC Frame	Plate OD
SGR-19-IEC	SGR-19-IEC-2A4	19mm	IEC 80 (2, 4, 6, 8 pole)	142mm
SGR-24-IEC	SGR-24-IEC-2A4	24mm	IEC 90S, 90L (2, 4, 6, 8 pole)	142mm
SGR-28-IEC	SGR-28-IEC-2A4	28mm	IEC 100L, 112M (2, 4, 6, 8 pole)	142mm
SGR-38-IEC	SGR-38-IEC-2A4	38mm	IEC 132S, 132M (2, 4, 6, 8 pole)	160mm
SGR-42-IEC	SGR-42-IEC-2A4	42mm	IEC 160M, 160L (2, 4, 6, 8 pole)	160mm
SGR-48-IEC	SGR-48-IEC-2A4	48mm	IEC 180M, 180L (2, 4, 6, 8 pole)	160mm
SGR-55-IEC	SGR-55-IEC-2A4	55mm	IEC 200L (2, 4, 6, 8 pole); IEC 225S, 225M (2 pole)	168mm
SGR-60-IEC	SGR-60-IEC-2A4	60mm	IEC 225S, 225M (4, 6, 8 pole) ; IEC 250M (2 pole)	168mm
SGR-65-IEC	SGR-65-IEC-2A4	65mm	IEC 250M (4, 6, 8 pole); IEC 280M, 280S, 315S, 315M, 315L (2 pole)	185mm
SGR-75-IEC	SGR-75-IEC-2A4	75mm	IEC 280S, 280M (4, 6, 8 pole); IEC 355M, 355L (2 pole)	193mm
SGR-80-IEC	SGR-80-IEC-2A4	80mm	IEC 315S, 315M, 315L (4, 6, 8 pole)	193mm

SOLID



1 AEGIS® SGR
1 mounting plate
3 screws (inches or metric)
3 washers
3 lock washers
3 spacers*

SPLIT



1 AEGIS® Split Ring SGR
1 split mounting plate
3 screws (inches or metric)
3 washers
3 lock washers
3 spacers*

Each kit includes 3 spacer lengths: 1/4", 1/2", and 1" for NEMA kits and 7mm, 17mm, and 27mm for IEC kits.

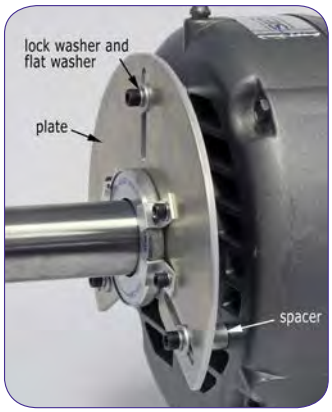
Mounting Plates with Hardware(no SGR)

On occasions when the shaft diameter is not one of the kitted NEMA sizes, select the correct SGR for the shaft diameter, note the SGR OD, then go to the chart to the right to determine the matching Mounting Plate. Plate can be used with a solid or split ring SGR.

SGR sold separately

English Hardware	Fits any SGR with OD as specified SGR OD:
SGR-M40-1A4	1.60" (40.6mm)
SGR-M53-1A4	2.10" (53.3mm)
SGR-M68-1A4	2.68" (68.1mm)
SGR-M78-1A4	3.10" (78.8mm)
SGR-M91-1A4	3.60" (91.4mm)
SGR-M104-1A4	4.10" (104.1mm)
SGR-M116-1A4	4.60" (116.8mm)
SGR-M129-1A4	5.10" (129.5mm)
SGR-M142-1A4	5.60" (142.2mm)
SGR-M154-1A4	6.10" (154.9mm)
SGR-M167-1A4	6.60" (167.6mm)
SGR-M180-1A4	7.10" (180.3mm)
Kit includes (1) mounting plate, (3) 1/4" spacers with screws and washers (3) 1/2" spacers with screws and washers (3) 1" spacers with screws and washers	

Metric Hardware	Fits any SGR with OD as specified SGR OD:
SGR-M40-2A4	1.60" (40.6mm)
SGR-M53-2A4	2.10" (53.3mm)
SGR-M68-2A4	2.68" (68.1mm)
SGR-M78-2A4	3.10" (78.8mm)
SGR-M91-2A4	3.60" (91.4mm)
SGR-M104-2A4	4.10" (104.1mm)
SGR-M116-2A4	4.60" (116.8mm)
SGR-M129-2A4	5.10" (129.5mm)
SGR-M142-2A4	5.60" (142.2mm)
SGR-M154-2A4	6.10" (154.9mm)
SGR-M167-2A4	6.60" (167.6mm)
SGR-M180-2A4	7.10" (180.3mm)
Kit includes (1) mounting plate, (3) 7mm spacers with screws and washers (3) 17mm spacers with screws and washers (3) 27mm spacers with screws and washers	



Custom Large SGR, iPRO, WTG

AEGIS® Large SGR

Shaft diameter 6.03" to 15.748"
For Motors up to and including 500hp (Low Voltage-up to 600 volts AC)

Outside Diameter: Shaft Diameter + 1.50"
Drawings available upon request

Solid and Split Ring design

Includes two mounting hardware options:

Bracket Mounting:	(6) Standard mounting brackets, (6) 6-32 x 1/4" SHCS with star washers
Bolt Through Mounting:	(4) 8-32 x 5/8" SHCS with lock washers

AEGIS® iPROSL

Shaft Diameter 3.00" to 30.00"
High Current Bearing Protection for Large Motors over 500hp and Generators (Medium Voltage-greater than 600 volts AC)

Outside Diameter: Slim Line Version-Shaft Diameter + 1.86"
Drawings available upon request

Solid and Split Ring design
6 rows of fiber

Includes bolt through mounting hardware: (4) 8-32 x 1" SHCS with lock washers

Custom Brackets available upon request

Ships with CS015 Colloidal Silver Shaft Coating

AEGIS® WTGSL Wind Turbine Grounding

Shaft Diameter 3.00" to 15.75"
High Current Bearing Protection for Wind Turbine Generators

Outside Diameter: Shaft Diameter + 1.86"
Drawings available upon request

Solid and Split Ring design
6 rows of fiber

Includes bolt through mounting hardware: (4) 8-32 x 1" SHCS with lock washers

Custom Brackets available upon request

Ships with CS015 Colloidal Silver Shaft Coating

AEGIS® Accessories

AEGIS® SVP Shaft Voltage Probe Kits
Conductive Microfiber tips for use with Fluke 190 Series II ScopeMeter®

For the first time you can easily and more accurately measure the voltage on a rotating shaft. The AEGIS® SVP Shaft Voltage Probe's unique design of high density conductive microfibers ensures continuous contact with the rotating shaft. Used with the Fluke 190 Series II ScopeMeter, you can determine if your motor is subject to potentially damaging bearing currents. Visit our website for a complete part list.

AEGIS® SVP Shaft Voltage Probe Kits

Catalog Number	Includes:
SVP-KIT-3000MB	3 SVP tips, probe holder with two piece extension rod (total length of probe holder with extension rod is 18 inches), AEGIS® Grounding Simulator, and magnetic base.
SVP-KIT-3000	3 SVP tips, probe holder with two piece extension rod, and AEGIS® Grounding Simulator.
SVP-TIP-3000	3 SVP replacement tips only
Fits Fluke VPS410 Voltage Probe. For other probe styles, see website.	
Installation: Pull off the hook clip from the voltage probe. Install the SVP tip over the voltage probe tip until seated against the probe shoulder. Secure with plastic screw. Do not over tighten screw.	
10:1 oscilloscope probe not included Magnetic base not sold separately	

AEGIS® Colloidal Silver Shaft Coating

Catalog Number	Coverage:
CS015	20-25 applications based on a 3″ shaft diameter
Used to improve the conductivity of the steel shaft surface. Apply to any VFD driven motor shaft prior to installing the AEGIS® Bearing Protection Ring.	
Note: Shelf life is 6 months	

AEGIS® Conductive Epoxy

Catalog Number	Coverage:
EP2400	2-3 applications
Used to install the AEGIS® Bearing Protection Ring without drilling and tapping into the motor end bell.	
Note: Shelf life is 9 months	

Motors Controlled by PWM Drives (VFD)
Electrical Bearing Damage Protection

Engineering Specification:

Construction Specification Institute Section 23 05 13
MOTORS 23 05 13

2.1 MOTORS

A. General Requirements:

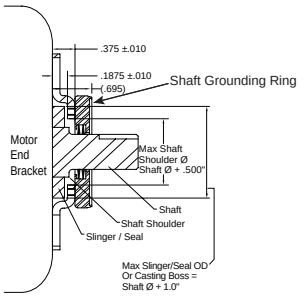
1. All motors operated on variable frequency drives shall be equipped with a maintenance free, conductive micro fiber, shaft grounding ring with a minimum of two rows of circumferential micro fibers to discharge electrical shaft currents within the motor and/or its bearings.

2. Application Note: Motors up to 100HP shall be provided with a minimum of one shaft grounding ring installed either on the drive end or non-drive end. Motors over 100HP shall be provided with an insulated bearing on the non-drive end and a shaft grounding ring on the drive end of the motor. Grounding rings shall be provided and installed by the motor pump manufacturer or contractor and shall be installed in accordance with the manufacturer's recommendations.

Recommended part: AEGIS® SGR Bearing Protection Ring

Recommended source: Electro Static Technology-ITW
Manufacturer of AEGIS® Bearing Protection Ring
Ph: 207.998.5140 | sales@est-aegis.com | www.est-aegis.com

Detail Sheet



Shaft Grounding Ring AEGIS uKIT

Web Resources:
www.est-aegis.com/specs.htm

For Specifying Engineer
Resource Page

Catalog Number	Min.shaft diameter inches	Max.shaft diameter inches	Min.shaft diameter mm	Max.shaft diameter mm
SGR-6.9-***	0.311	0.355	7.9	9.0
SGR-8.0-***	0.356	0.395	9.1	10.0
SGR-9.0-***	0.396	0.435	10.1	11.0
SGR-10.1-***	0.436	0.480	11.1	12.2
SGR-11.2-***	0.481	0.520	12.3	13.2
SGR-12.2-***	0.521	0.560	13.3	14.2
SGR-13.2-***	0.561	0.605	14.3	15.4
SGR-14.4-***	0.606	0.645	15.5	16.4
SGR-15.4-***	0.646	0.685	16.5	17.4
SGR-16.4-***	0.686	0.730	17.5	18.5
SGR-17.6-***	0.731	0.774	18.6	19.7
SGR-18.7-***	0.775	0.815	19.8	20.7
SGR-19.7-***	0.816	0.855	20.8	21.7
SGR-20.7-***	0.856	0.895	21.8	22.7
SGR-21.7-***	0.896	0.935	22.8	23.7
SGR-22.8-***	0.936	0.980	23.8	24.9
SGR-23.9-***	0.981	1.020	25.0	25.9
SGR-24.9-***	1.021	1.060	26.0	26.9
SGR-25.9-***	1.061	1.105	27.0	28.1
SGR-27.1-***	1.106	1.145	28.2	29.1
SGR-28.1-***	1.146	1.185	29.2	30.1
SGR-29.1-***	1.186	1.230	30.2	31.2
SGR-30.3-***	1.231	1.270	31.3	32.3
SGR-31.3-***	1.271	1.310	32.4	33.3
SGR-32.3-***	1.311	1.355	33.4	34.4
SGR-33.4-***	1.356	1.395	34.5	35.4
SGR-34.4-***	1.396	1.435	35.5	36.4
SGR-35.5-***	1.436	1.480	36.5	37.6
SGR-36.6-***	1.481	1.520	37.7	38.6
SGR-37.6-***	1.521	1.560	38.7	39.6
SGR-38.6-***	1.561	1.605	39.7	40.8
SGR-39.8-***	1.606	1.645	40.9	41.8
SGR-40.8-***	1.646	1.685	41.9	42.8
SGR-41.8-***	1.686	1.730	42.9	43.9
SGR-43.0-***	1.731	1.770	44.0	45.0
SGR-44.0-***	1.771	1.810	45.1	46.0
SGR-45.0-***	1.811	1.855	46.1	47.1
SGR-46.1-***	1.856	1.895	47.2	48.1
SGR-47.1-***	1.896	1.935	48.2	49.1
SGR-48.2-***	1.936	1.980	49.2	50.3
SGR-49.3-***	1.981	2.020	50.4	51.3
SGR-50.3-***	2.021	2.060	51.4	52.3
SGR-51.3-***	2.061	2.105	52.4	53.5
SGR-52.5-***	2.106	2.145	53.6	54.5
SGR-53.5-***	2.146	2.185	54.6	55.5
SGR-54.5-***	2.186	2.230	55.6	56.6
SGR-55.7-***	2.231	2.270	56.7	57.7
SGR-56.7-***	2.271	2.310	57.8	58.7
SGR-57.7-***	2.311	2.355	58.8	59.8
SGR-58.8-***	2.356	2.395	59.9	60.8
SGR-59.8-***	2.396	2.435	60.9	61.8
SGR-60.9-***	2.436	2.480	61.9	63.0
SGR-62.0-***	2.481	2.520	63.1	64.0
SGR-63.0-***	2.521	2.560	64.1	65.0
SGR-64.0-***	2.561	2.605	65.1	66.2
SGR-65.2-***	2.606	2.645	66.3	67.2
SGR-66.2-***	2.646	2.685	67.3	68.2
SGR-67.2-***	2.686	2.730	68.3	69.3
SGR-68.4-***	2.731	2.770	69.4	70.4
SGR-69.4-***	2.771	2.810	70.5	71.4
SGR-70.4-***	2.811	2.855	71.5	72.5
SGR-71.5-***	2.856	2.895	72.6	73.5
SGR-72.5-***	2.896	2.935	73.6	74.5
SGR-73.6-***	2.936	2.980	74.6	75.7
SGR-74.7-***	2.981	3.020	75.8	76.7
SGR-75.7-***	3.021	3.060	76.8	77.7
SGR-76.7-***	3.061	3.105	77.8	78.9
SGR-77.9-***	3.106	3.145	79.0	79.9
SGR-78.9-***	3.146	3.185	80.0	80.9

Catalog Number	Min.shaft diameter inches	Max.shaft diameter inches	Min.shaft diameter mm	Max.shaft diameter mm
SGR-79.9-***	3.186	3.230	81.0	82.0
SGR-81.1-***	3.231	3.270	82.1	83.1
SGR-82.1-***	3.271	3.310	83.2	84.1
SGR-83.1-***	3.311	3.355	84.2	85.2
SGR-84.2-***	3.356	3.395	85.3	86.2
SGR-85.2-***	3.396	3.435	86.3	87.2
SGR-86.3-***	3.436	3.480	87.3	88.4
SGR-87.4-***	3.481	3.520	88.5	89.4
SGR-88.4-***	3.521	3.560	89.5	90.4
SGR-89.4-***	3.561	3.605	90.5	91.6
SGR-90.6-***	3.606	3.645	91.7	92.6
SGR-91.6-***	3.646	3.685	92.7	93.6
SGR-92.6-***	3.686	3.730	93.7	94.7
SGR-93.8-***	3.731	3.770	94.8	95.8
SGR-94.8-***	3.771	3.810	95.9	96.8
SGR-95.8-***	3.811	3.855	96.9	97.9
SGR-96.9-***	3.856	3.895	98.0	98.9
SGR-97.9-***	3.896	3.935	99.0	99.9
SGR-99.0-***	3.936	3.980	100.0	101.1
SGR-100.1-***	3.981	4.020	101.2	102.1
SGR-101.1-***	4.021	4.060	102.2	103.1
SGR-102.1-***	4.061	4.105	103.2	104.3
SGR-103.3-***	4.106	4.145	104.4	105.3
SGR-104.3-***	4.146	4.185	105.4	106.3
SGR-105.3-***	4.186	4.230	106.4	107.4
SGR-106.5-***	4.231	4.270	107.5	108.5
SGR-107.5-***	4.271	4.310	108.6	109.5
SGR-108.5-***	4.311	4.355	109.6	110.6
SGR-109.6-***	4.356	4.395	110.7	111.6
SGR-110.6-***	4.396	4.435	111.7	112.6
SGR-111.7-***	4.436	4.480	112.7	113.8
SGR-112.8-***	4.481	4.520	113.9	114.8
SGR-113.8-***	4.521	4.560	114.9	115.8
SGR-114.8-***	4.561	4.605	115.9	117.0
SGR-116.0-***	4.606	4.645	117.1	118.0
SGR-117.0-***	4.646	4.685	118.1	119.0
SGR-118.0-***	4.686	4.730	119.1	120.1
SGR-119.2-***	4.731	4.770	120.2	121.2
SGR-120.2-***	4.771	4.810	121.3	122.2
SGR-121.2-***	4.811	4.855	122.3	123.3
SGR-122.3-***	4.856	4.895	123.4	124.3
SGR-123.3-***	4.896	4.935	124.4	125.3
SGR-124.4-***	4.936	4.980	125.4	126.5
SGR-125.5-***	4.981	5.020	126.6	127.5
SGR-126.5-***	5.021	5.060	127.6	128.5
SGR-127.5-***	5.061	5.105	128.6	129.7
SGR-128.7-***	5.106	5.145	129.8	130.7
SGR-129.7-***	5.146	5.185	130.8	131.7
SGR-130.7-***	5.186	5.230	131.8	132.8
SGR-131.9-***	5.231	5.270	132.9	133.9
SGR-132.9-***	5.271	5.310	134.0	134.9
SGR-133.9-***	5.311	5.355	135.0	136.0
SGR-135.0-***	5.356	5.395	136.1	137.0
SGR-136.0-***	5.396	5.435	137.1	138.0
SGR-137.1-***	5.436	5.480	138.1	139.2
SGR-138.2-***	5.481	5.520	139.3	140.2
SGR-139.2-***	5.521	5.560	140.3	141.2
SGR-140.2-***	5.561	5.605	141.3	142.4
SGR-141.4-***	5.606	5.645	142.5	143.4
SGR-142.4-***	5.646	5.685	143.5	144.4
SGR-143.4-***	5.686	5.730	144.5	145.5
SGR-144.6-***	5.731	5.770	145.6	146.6
SGR-145.6-***	5.771	5.810	146.7	147.6
SGR-146.6-***	5.811	5.855	147.7	148.7
SGR-147.7-***	5.856	5.895	148.8	149.7
SGR-148.7-***	5.896	5.935	149.8	150.7
SGR-149.8-***	5.936	5.980	150.8	151.9
SGR-150.9-***	5.981	6.020	152.0	152.9

*** PN suffix differs depending on mounting option

Fraction, Decimal and Millimeter Equivalents

Fraction	Decimal	mm
1/64	.0156	0.396
1/32	.0312	0.793
3/64	.0468	1.190
1/16	.0625	1.587
5/64	.0781	1.984
3/32	.0937	2.381
7/64	.1093	2.778
1/8	.1250	3.175
9/64	.1406	3.571
5/32	.1562	3.968
11/64	.1718	4.365
3/16	.1875	4.762
13/64	.2031	5.159
7/32	.2187	5.556
15/64	.2343	5.953
1/4	.2500	6.350
17/64	.2656	6.746
9/32	.2812	7.143
19/64	.2968	7.540
5/16	.3125	7.937
21/64	.3281	8.334
11/32	.3437	8.731
23/64	.3593	9.128
3/8	.3750	9.525
25/64	.3906	9.921
13/32	.4062	10.318
27/64	.4218	10.715
7/16	.4375	11.112
29/64	.4531	11.509
15/32	.4687	11.906
31/64	.4843	12.303
1/2	.5000	12.700
33/64	.5156	13.096
17/32	.5312	13.493
35/64	.5468	13.890
9/16	.5625	14.287
37/64	.5781	14.684
19/32	.5937	15.081
39/64	.6093	15.478
5/8	.6250	15.875
41/64	.6406	16.271
21/32	.6562	16.668
43/64	.6718	17.065
11/16	.6875	17.462
45/64	.7031	17.859
23/32	.7187	18.256
47/64	.7343	18.653
3/4	.7500	19.050
49/64	.7656	19.446
25/32	.7812	19.843
51/64	.7968	20.240
13/16	.8125	20.637
53/64	.8281	21.034
27/32	.8437	21.431
55/64	.8593	21.828
7/8	.8750	22.225
57/64	.8906	22.621
29/32	.9062	23.018
59/64	.9218	23.415
15/16	.9375	23.812
61/64	.9531	24.209
31/32	.9687	24.606
63/64	.9843	25.003
1	1.0000	25.400

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