

AEGIS™ Bearing Protection Ring Specification Reference



Reference: NEMA MG1 31.4.4.3
CSI 23 05 13

Subject: MG 1 pertains to Definite-Purpose Inverter-Fed Polyphase Motor bearings, section 31.4.4.3 pertains to Shaft Voltages and Bearing Insulation.

CSI 23 05 13 is the Construction Specifications Institute specification for Common Motor Requirements for HVAC Equipment

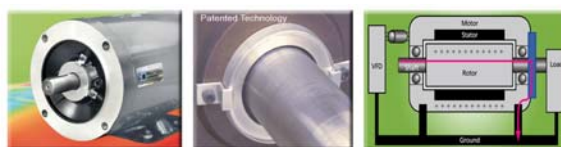
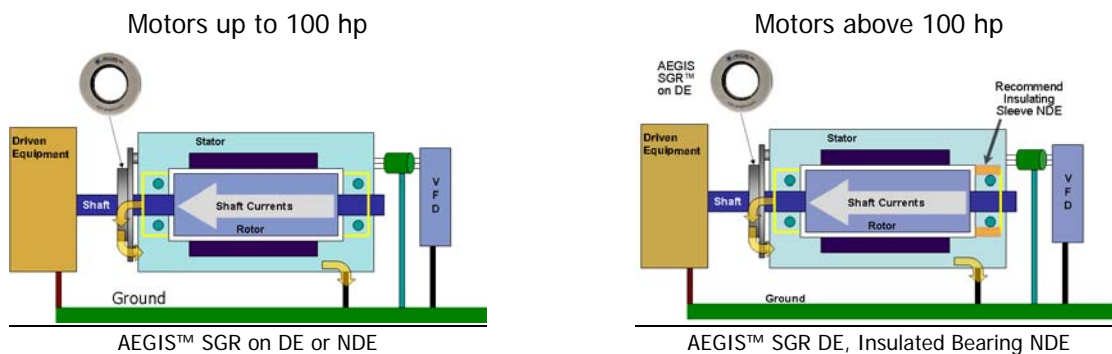
NEMA MG1 31.4.4.3

General Information: The NEMA MG1 specification addresses inverter driven motors and describes the effects of shaft voltages and destructive bearing currents induced by pulse width modulation (PWM) variable frequency drives (VFDs). In NEMA MG1 31.4.4.3 the induced bearing currents are described as "...destructive currents through motor bearings, manifesting themselves through pitting of the bearings, scoring of the shaft, and eventual bearing failure."

Inverter-Fed Polyphase Motors: When motors are controlled by PWM variable frequency drives (VFDs) the pulse switching causes high dv/dt (high frequency voltage changes) which results in a capacitive induced shaft voltage. These voltages may cause bearing failures and substantially decrease bearing life by electrically discharging through the motor bearings to ground causing pitting and fluting failure. NEMA MG1 states that the capacitive induced voltage "...results in peak pulses as high as 10-40 volts from shaft to ground." Guidance for mitigating bearing damage is also provided by insulating both bearings or "...Alternately, shaft grounding brushes may be used to divert the current around the bearing. It should be noted that insulating the motor bearings will not prevent the damage of other shaft connected equipment."

AEGIS™ SGR protects both the motor bearings and attached equipment with the patented shaft grounding ring technology that is proven in hundreds of thousands of applications and consists of a highly reliable circumferential ring of conductive micro fibers placed in a protective frame to divert currents away from the bearings to ground.

Best Practices Recommendation



AEGIS™ SGR Prevents Electrical Bearing Damage

Recommendation to meet: NEMA MG1 31.4.4.3 and CSI 23 05 13

**NEMA Frame Motors,
Best Practices**

Common motor
requirements for HVAC
equipment

1. **AEGIS™ on Motors Up to 100 HP:** Install AEGIS™ Shaft Grounding Ring (SGR) on either DE or NDE of motor to divert current away from the bearings and protect bearings in attached equipment.
2. **AEGIS™ on Over 100 HP:** Insulate one bearing, usually the NDE, and install AEGIS™ SGR on opposite end, usually the DE.
3. **AEGIS™ on Motors with Insulated or Ceramic Bearings:** Install minimum one AEGIS™ SGR to discharge voltages and protect bearings in attached equipment.

Construction Specification Institute: For all VFD controlled motors

Specification Reference

CSI 23 05 13
PART 2 PRODUCTS
2.1.13

CSI 23 05 13
PART 2 PRODUCTS
2.1.13.e

CSI 23 05 13
PART 3 EXECUTION
3.2 A. 9

Specification Details

Motors for use with Variable Frequency Controllers (Drives)

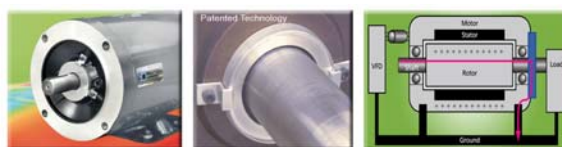
- Motor manufacturers which install AEGIS™ Shaft Grounding Ring on NEMA Premium® and inverter duty motors.
 - Marathon (Mod Central)
 - Baldor (Mod Express)
- AEGIS™ SGR may also be installed by equipment supplier or contractor as field installation kit.
- To meet NEMA MG1 Specification: Specify AEGIS Shaft Grounding Ring Kit on inverter duty and/or NEMA Premium® Efficient motors with class F, G or H insulation.

Provide Shaft Grounding Kit for Field Installation

- All motors controlled by Variable Frequency Controllers shall be equipped with AEGIS Shaft Grounding Ring kit to be installed by motor or equipment manufacturer or installed in the field by contractor.

Motors: Wire Shaft ground kit on motors for use with Variable Frequency Drives

- Ensure AEGIS Shaft Grounding Kit is installed on motor accordance with manufacturer's recommendation.
- AEGIS Shaft Grounding Ring (SGR) is bolted directly to the motor end bracket or installed with conductive epoxy to ensure ground connection from the AEGIS SGR to motor frame.



AEGIS™ SGR Prevents Electrical Bearing Damage