



Protecting VFD-Driven Motors from Bearing Damage

August 2011

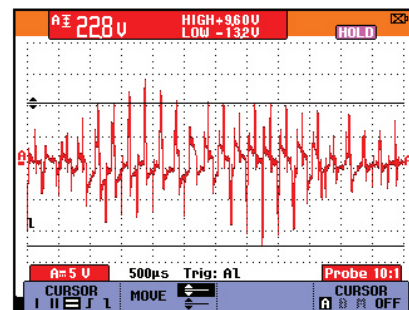
Electro Static Technology

New Kit Measures Motor Shaft Voltage to Assess Vulnerability of VFD-Controlled Motors

Variable Frequency Drives (VFDs) Can Damage Motor Bearings, Shorten Motor Life

Whether they drive the fans and pumps of commercial HVAC systems or the conveyors of industrial production lines, motors controlled by variable frequency drives (VFDs) are vulnerable to electrical bearing damage. For years, the true cause of VFD-induced bearing failure was often misdiagnosed. Eventually, repair shops and testing consultants proved that the high peak voltages, fast voltage rise times, non-sinusoidal shaft currents, and parasitic capacitance associated with typical pulse-width-modulated VFDs lead to the cumulative erosion of bearings.

Without mitigation, VFD-induced voltages can repeatedly build up on the motor shaft to a certain threshold, then discharge in short bursts along the path of least resistance, which all too often runs through the motor's bearings. The discharge rate tends to increase with carrier frequency, but continued discharges result in the pitting of the ball bearings and race walls through electrical discharge machining (EDM). Concentrated pitting at regular intervals along the race wall can cause washboard-like ridges called fluting, a source of vibration and noise. By the time such damage can be heard, bearing failure is often imminent.



Actual voltages induced on the shaft of a motor by a VFD. Without some form of shaft grounding, these voltages will discharge through bearings, damaging them and shortening the motor's life.



VFD-induced shaft current discharges can cause pitting (frosting) of ball bearings and fluting (the washboard pattern shown above) of bearing race.



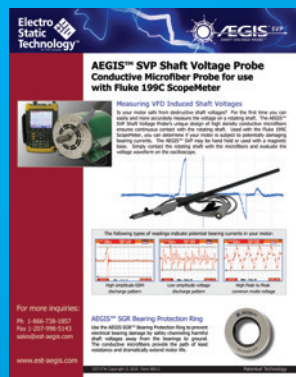
[Download AEGIS™ Technical White Paper](#)

Now, You Can Find Out Which of Your Motors Are At Risk of Bearing Failure

Since all VFD-driven motors are vulnerable to electrical bearing damage, today many companies now take a pro-active approach to protecting them, specifying new motors that are already equipped with bearing protection rings. But for retrofits the new [AEGIS™ Shaft Voltage Test Kit](#) makes it easier than ever to measure and document damaging VFD-induced voltages while there is still time to head off bearing damage and equipment downtime.



New AEGIS™ Shaft Voltage Test Kit includes a special conductive microfiber SVP probe for highly accurate measurement of motor shaft voltage levels.



[Download SVP Shaft Voltage Probe Datasheet](#)

Because the kit can test every VFD-controlled motor in a whole plant, office building or mechanical room, etc., it is ideal for maintenance personnel and testing contractors — anyone who needs to determine and convince others that a motor is or is not subject to stray shaft voltages great enough to harm bearings. The result of a collaboration between Electro Static Technology (EST) and Fluke Corporation, the kit includes a special probe tip for highly accurate sensing. Designed by EST, this tip is the first of its kind, containing high-density conductive microfibers that ensure continuous contact with a rotating motor shaft. EST manufactures the tip and extension rod, while Fluke makes the probe itself and the Fluke 190 Series Scope Meter, a portable 10:1 oscilloscope that displays the voltage waveform.



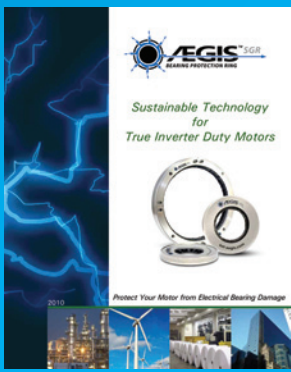
Ideal for maintenance personnel and testing contract tours, the kit can be used to test every VFD-controlled motor in an entire plant, office building, or mechanical room.

Protect VFD-Driven Motors with AEGIS™ Shaft Grounding Rings

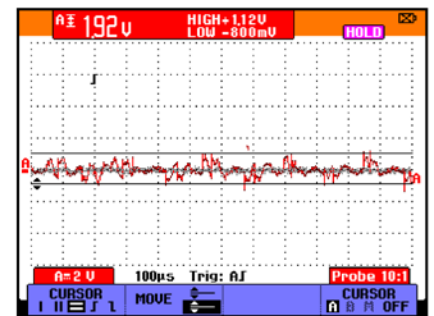
VFDs hold the promise of sizable energy savings, but without effective, long-term bearing protection such as the maintenance-free AEGIS™ SGR Bearing Protection Ring (manufactured by EST), those savings could be wiped out by high maintenance costs. By diverting bearing currents safely to ground, the AEGIS™ SGR extends motor life and thus ensures the reliable, long-term operation of the VFD-driven motor system, locking in energy savings to make the system sustainable and truly “green.” The AEGIS™ Shaft Voltage Test Kit makes it easier than ever to prove the need to any “doubters” who make decisions on mitigating measures the need for these AEGIS™ Shaft Grounding Rings.



AEGIS™ Shaft Grounding Rings provide long-term protection of motors against VFD-induced shaft voltages, extending motor life and improving system reliability



[Download AEGIS™ Catalog](#)



AEGIS™ Shaft Grounding Rings channel harmful shaft voltages away from motor bearings safely to ground, protecting the bearings and extending motor life.