

# Smart Shaft Grounding

**SHAFT GROUNDING SOLUTIONS**

# INCREASE BEARING RELIABILITY WITH SMART TECHNOLOGY

## THE VFD CHALLENGE

Variable frequency drives (VFDs) are becoming increasingly popular across multiple industries due to their ability to reduce energy consumption and generate significant cost savings. However, these drive systems also contribute to unplanned downtime.

VFDs induce high frequency voltages on the shaft that seek a path to ground. When these voltages exceed the lubricant’s ability to provide insulation, they discharge through the motor’s bearings or the bearings of coupled equipment, resulting in a phenomenon commonly referred to as Electrical Discharge Machining (EDM).



*Stray shaft currents can cause fluting on the bearing race, resulting in premature bearing failure*

## THE HIGH COST OF ELECTRICAL DAMAGE

EDM causes fusion craters, pitting, frosting and fluting on bearings, leading to premature bearing failure in VFD-driven motors.

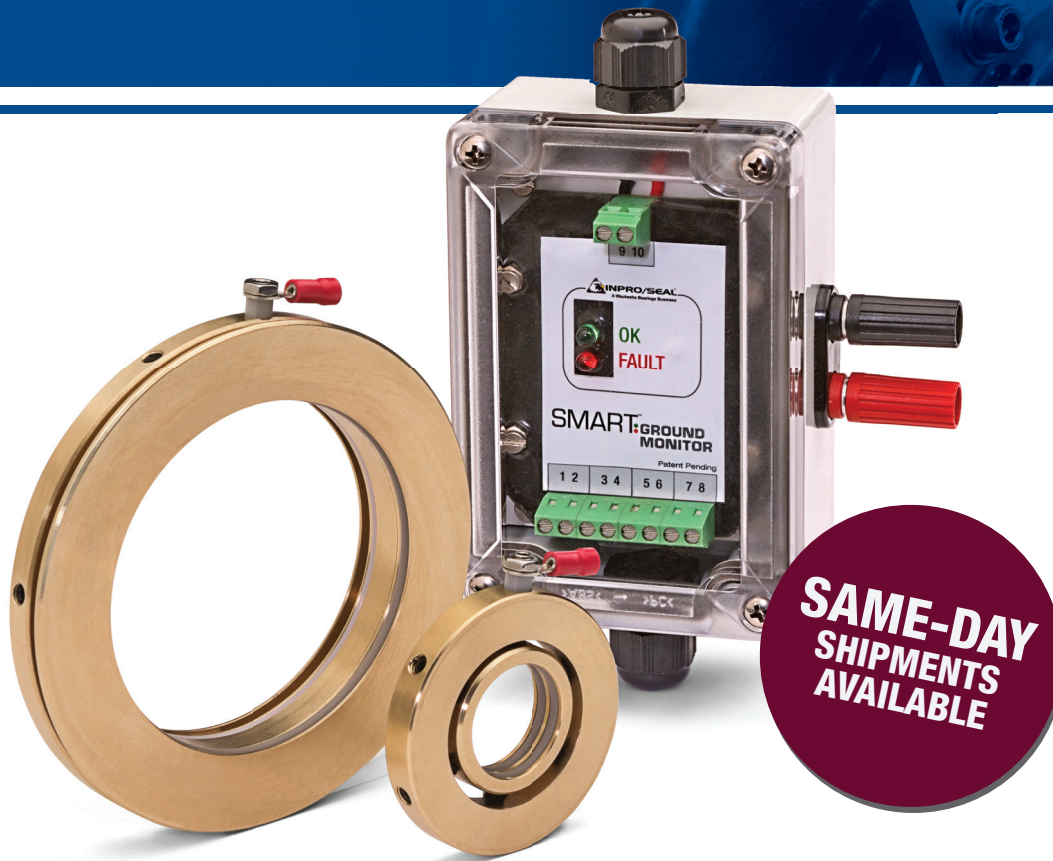
Even if a motor has insulated bearings, shaft currents can travel to the coupled equipment, such as pumps, pillow blocks and gearboxes, and damage those bearings. The results are often costly: reduced equipment reliability, increased maintenance costs, unscheduled downtime and in turn lost revenue.

SHAFT GROUNDING TECHNOLOGIES						
	SMART SHAFT GROUNDING	GROUNDING RINGS	INSULATED BEARINGS	CARBON BRUSHES	CONDUCTIVE GREASE	VFD FILTERS
SHAFT CURRENT MITIGATION	✓	✓		✓	✓	
LOW INITIAL COST	✓	✓			✓	
STANDARD SIZES	✓	✓	✓	✓	✓	✓
MULTIPLE MOUNTING CONFIGURATIONS	✓	✓		✓		
NO RPM LIMITS	✓	✓			✓	✓
CUSTOM ENGINEERED	✓					
MAINTENANCE FREE	✓		✓			✓
PERMANENT PROTECTION FROM SHAFT OXIDATION	✓					
PERFORMANCE MONITORING						

## REDUCING ELECTRICAL DAMAGE

While specially designed bearings, grease, carbon brushes, filters and grounding rings have been introduced to mitigate shaft currents, each has significant limitations.

**Smart Shaft Grounding from Inpro/Seal®** addresses the limitations of these other technologies to effectively divert harmful shaft currents and increase bearing and equipment reliability.



## SMART SHAFT GROUNDING FROM INPRO/SEAL

Inpro/Seal® combines proven technology with innovative new features to offer the most robust shaft grounding product portfolio available.

Whether you stock standard sizes or require a custom engineered solution, Inpro/Seal offers the most reliable method for diverting stray shaft currents to ground. All Inpro/Seal Smart Shaft Grounding products can be shipped same-day, delivering the right technology, right when you need it. Inpro/Seal Smart Shaft Grounding products meet NEMA MG1 31.4.4.3 and CSI 23 05 13 specifications.

### Inpro/Seal Smart Shaft Grounding products include:

- **Smart CDR®** – a zero maintenance shaft grounding solution that outlasts and outperforms other designs
- **Smart MGS®** – premium shaft grounding combined with Bearing Isolator technology for severe-duty applications
- **Smart Ground Monitor™** – a condition monitoring system that provides instant feedback on shaft grounding performance

The clear choice in shaft grounding:

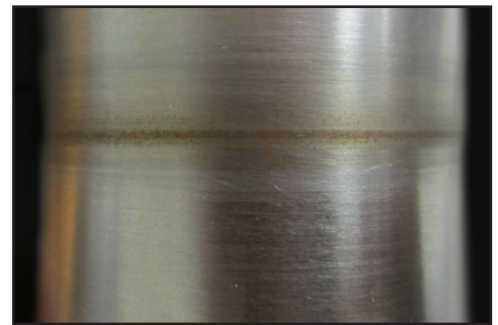
# SMART SHAFT GROUNDING, ONLY FROM INPRO/SEAL



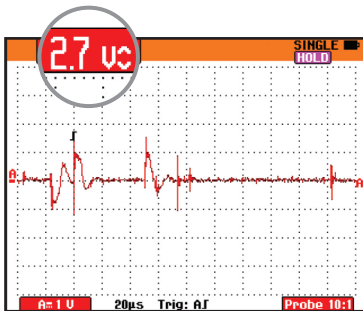
# Smart CDR

The Inpro/Seal® Smart CDR® (Current Diverter Ring®) utilizes an innovative sleeved design which outperforms and outlasts other grounding rings.

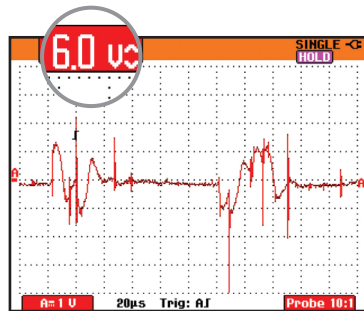
Proprietary conductive filaments provide a low impedance path to ground – diverting stray shaft currents safely away from the bearings. Smart CDR integrates a bearing-bronze sleeve, driven by conductive O-rings, to provide a consistent contact surface for the conductive filaments. The bronze surface significantly reduces wear and maintains effective conductivity in all environments. There is no direct contact between conductive filaments and the shaft, eliminating the formation of conduction inhibiting oxidation and the need for periodic application of silver coatings or other related shaft maintenance.



*Carbon fiber brushes can become ineffective due to conduction inhibiting oxidation from direct contact on the shaft.*



*Shaft voltage with the Inpro/Seal Smart CDR*



*Shaft voltage with a leading competitor*



*The Smart CDR can be installed with a variety of mounting configurations, including press-in, clip-on, epoxy, bolt-through, side-mount and flexbracket.*

To further ensure reliability, the Smart CDR is designed with a Smart Terminal for performance monitoring on the Inpro/Seal Smart Ground Monitor™.



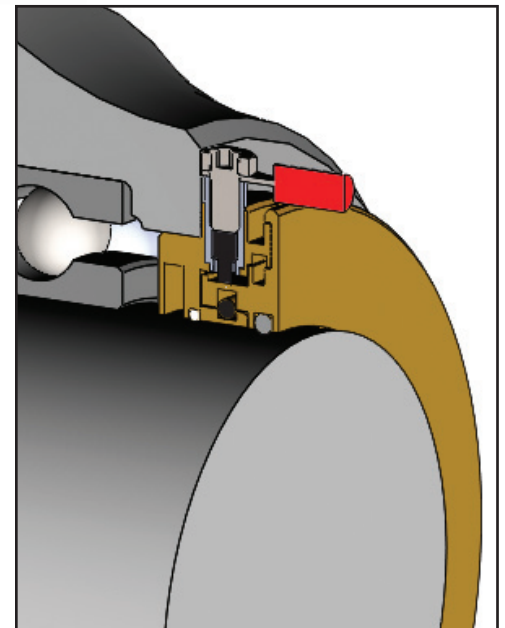
## Smart MGS

For severe-duty applications, the Inpro/Seal Smart MGS® (Motor Grounding Seal®) employs proven shaft-grounding technology with the patented VBXX® Bearing Isolator, providing complete bearing protection against stray shaft currents, contamination ingress and lubrication loss.

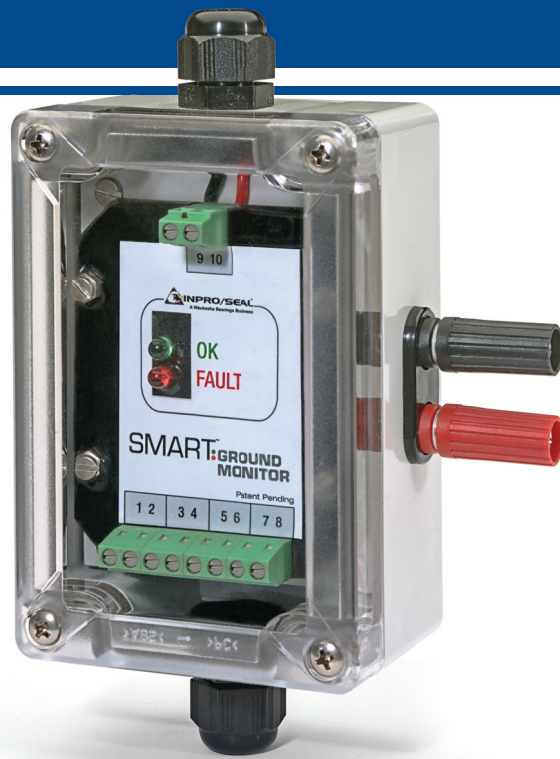
The innovative design of the Smart MGS couples internal conductive filaments and a zero maintenance conductive bronze rotor for premium current connectivity in harsh conditions. The innovative bronze rotor, unique to Inpro/Seal, supplies a consistent contact surface and protects against filament wear and the formation of conduction inhibiting oxidation on the shaft surface.

By isolating the filaments, the Smart MGS prevents contamination and lubrication from decreasing performance. The Smart MGS is a non-contacting two-part dynamic seal that uses the VBXX interface and VBX® O-ring for permanent bearing protection against contamination ingress. The seal's D-Groove and grease band combination protects against lubrication loss in either oil or grease lubricated applications.

Standard equipped with a Smart Terminal, the Smart MGS is designed to connect to the Inpro/Seal Smart Ground Monitor™ to verify performance.



*Isolated conductive filaments contacting the rotor are protected from contamination and shaft conditions, providing premium shaft grounding.*

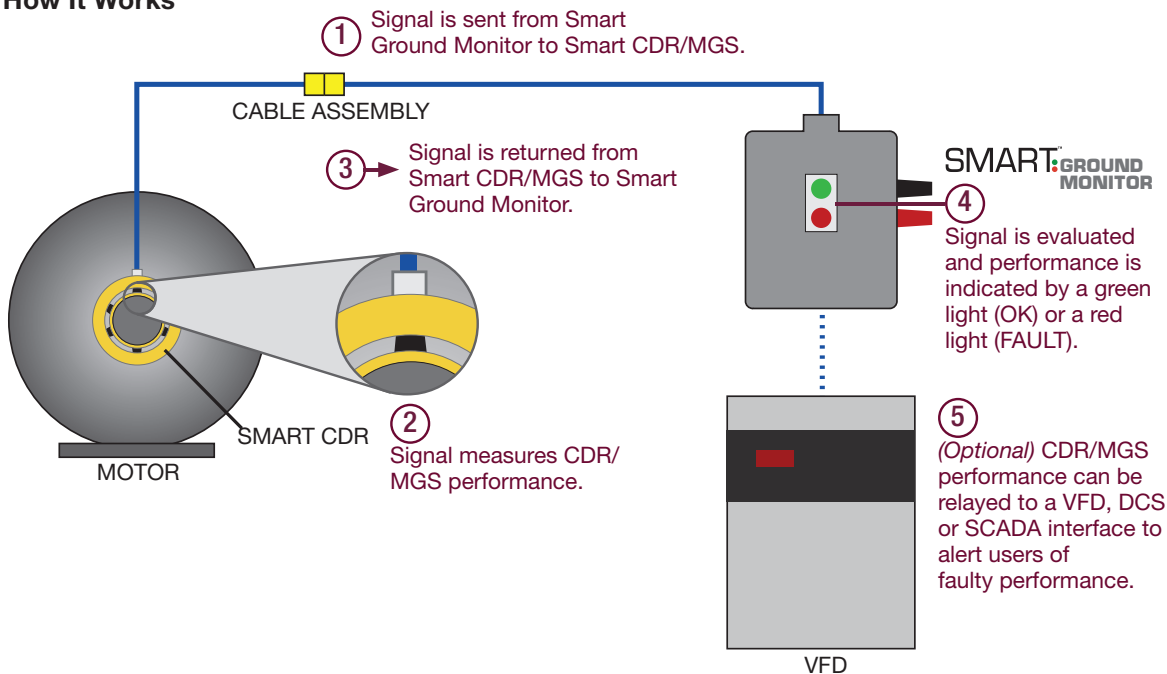


# Smart Ground Monitor

The Inpro/Seal® Smart Ground Monitor™ works in conjunction with the Smart CDR® and Smart MGS® to provide instant feedback on shaft grounding performance. Confirmation of successful shaft current diversion ensures maximum protection against the harmful effects of EDM.

The Smart Ground Monitor utilizes a simple interface to alert users in real time of non-optimal contact between conductive filaments and the shaft. If contact has been interrupted, routine maintenance can return shaft grounding to peak performance before damage occurs.

## How It Works





## Engineering Specifications

To ensure equipment is protected by Inpro/Seal Smart Shaft Grounding™ technology, include the following statements in specifications:

*“All motors driven by variable frequency drives (VFDs) shall include bearing protection in the form of a device to divert shaft currents to ground. The device shall be maintenance free and constructed of highly conductive bronze with an integral sleeve. Recommended device: Inpro/Seal Smart CDR.”*

*“All VFD-driven motors operating in harsh environments shall employ complete bearing protection through the use of (1) a non-contacting or non-contacting-while-rotating seal to obtain an IP55 degree of protection and (2) an integrated device to divert shaft currents to ground with isolated conductive filaments. Recommended device: Inpro/Seal Smart MGS.”*

# THE INPRO/SEAL ADVANTAGE

## GUARANTEED PERFORMANCE

Inpro/Seal® is committed to delivering innovative technology and superior customer support...standard with every solution.

Inpro/Seal Shaft Grounding products are backed by a performance guarantee. See our website for complete details.



## UNMATCHED CUSTOMER SERVICE

Inpro/Seal's responsive global sales network is committed to making sure you have the right technology for your VFD-driven motor and coupled equipment, right when you need it. We know that time is money. That's why we offer same-day shipments on most products, even new designs. No matter the application or operating environment, we can deliver a solution designed to meet your specific needs.

## EXPERIENCE YOU CAN TRUST

Inpro/Seal, the leader in permanent bearing protection and process seals, has been maximizing uptime on rotating equipment for more than 40 years. Known as the trusted source of Bearing Isolator technology, we are also pioneers in shaft grounding technology. Inpro/Seal Smart Shaft Grounding is the latest innovation for increased equipment reliability.

## READY TO GET STARTED?

Visit [www.inpro-seal.com](http://www.inpro-seal.com) to contact your local Inpro/Seal representative or submit an inquiry.



**INPRO/SEAL®**



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