



# Electric Vehicles

## **MOTOR PROTECTION**

# INCREASE VEHICLE RELIABILITY & REDUCE MAINTENANCE COSTS

## THE RISE OF ELECTRIC VEHICLES

Around the world, government policy and consumer demand is driving significant investment and growth in electric vehicles as they produce zero tailpipe emissions and offer the added benefits of increased fuel efficiency and lower maintenance costs compared to conventional vehicles. However, to realize these cost-saving benefits, consumers, manufacturers and suppliers recognize the importance of vehicle reliability.

A key element of a reliable electric vehicle is proper shaft grounding.

## ELECTRIC VEHICLE SHAFT GROUNDING

Electric vehicle motors use inverters/controllers to convert DC power to AC power and change rotational speed allowing for a range of speeds and reverse operation. These changes in speed cause circulating currents that build an excessive charge on the shaft seeking a path to ground. Without proper grounding, these currents will eventually exceed the lubricant's ability to provide insulation, allowing them to discharge through the motor's bearings. This results in Electrical Discharge Machining (EDM).

EDM causes fusion craters, pitting, frosting and fluting on the bearings, leading to excessive vibration, noise, and premature failure, all of which reduce vehicle maintenance and increase service time and warranty claims.

Ceramic bearings are a common solution deployed by electric vehicle and motor manufacturers to mitigate EDM. However, they only reduce some of the current discharge and often pass the remaining harmful currents to coupled equipment.



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



## PROVEN SHAFT GROUNDING SOLUTIONS

Inpro/Seal offers several cost-effective solutions designed to protect against EDM, increasing motor and vehicle reliability.

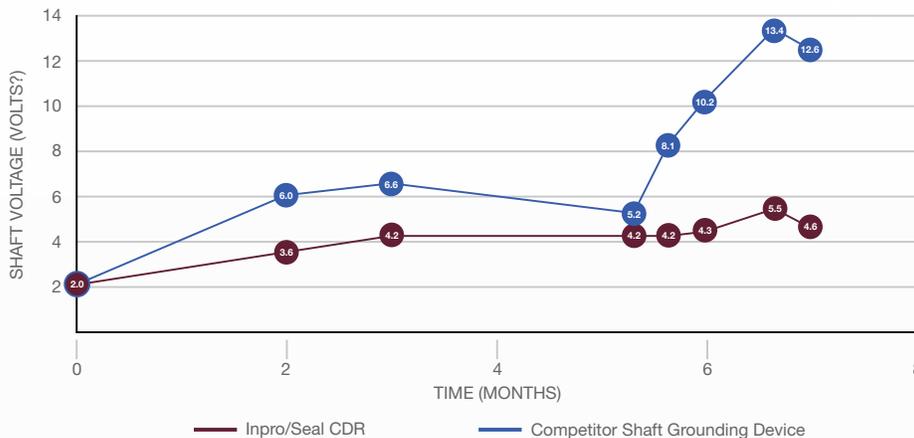
The Inpro/Seal CDR (Current Diverter Ring) utilizes proprietary conductive filaments to provide a low resistance to ground - effectively diverting harmful shaft currents safely away from the bearings. Its innovative design provides long-lasting protection for difficult-to-access electric motor bearings, offers a variety of mounting configurations and material options to fit the complexity of the vehicle design, and performs in wet or dry environments without impacting longevity.

The Inpro/Seal CDR's proven effectiveness coupled with its design flexibility makes it the perfect solution to prevent extreme bearing damage which causes vibration, noise and vehicle breakdown.



*The Inpro/Seal CDR and MGS provide proven shaft grounding solutions for electric vehicle reliability.*

7 MONTH SIDE-BY-SIDE SHAFT GROUNDING PERFORMANCE COMPARISON



For severe-duty environments, the robust design of the Inpro/Seal MGS (Motor Grounding Seal) combines shaft grounding capabilities with Bearing Isolator technology to eliminate EDM and provide permanent protection against lubrication leakage and bearing contamination. Its unique design utilizes internal conductive filaments and a conductive bronze rotor for premium current connectivity in harsh conditions.

Inpro/Seal Shaft Grounding Solutions increase reliability across a wide range of commonly used electric vehicle motor configurations, including:

- Permanent Magnet Synchronous Motors
- Induction Motors
- Switch Reluctance Motors

These solutions provide superior bearing protection on vehicles ranging from class 1 passenger electric vehicles to Class 8 Heavy Duty Commercial electric vehicles.



# 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 shaft grounding technology, right when you need it. We know that time is money. That's why we offer same-day shipments on most products, including new and custom designs. No matter the application or operating environment, we can deliver a solution designed to protect your equipment.

## EXPERIENCE YOU CAN TRUST

Inpro/Seal, the leader in permanent bearing protection, has been maximizing uptime on rotating equipment for over 40 years. A trusted source of shaft grounding solutions, we have provided proven bearing protection against harmful shaft currents in applications around the globe.

## 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.



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