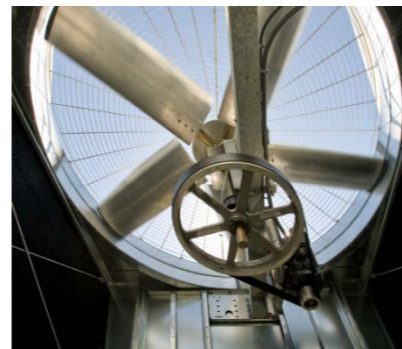
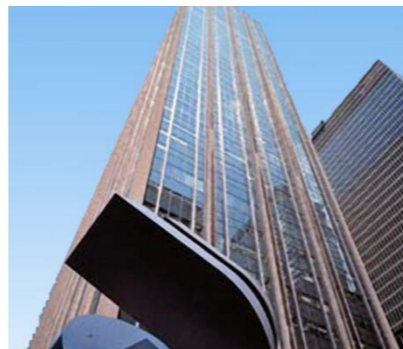


# Protecting VFD-Driven Motors with the



# Motors Waste Energy!

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- AC motors run at constant speed — regardless of load
- Old-fashioned throttling mechanisms reduce motor speed, but not energy consumption

# VFDs Save Energy!

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- Variable Frequency Drives (VFDs), or inverters, can dramatically reduce energy consumption
- VFDs can save 30% or more in energy costs

but...

# VFDs Cause Shaft Currents that Kill Motors!

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- VFD-induced shaft currents can destroy motor bearings:
- Causing premature motor failure
- Diminishing the reliability of an entire system
- Completely wiping out cost savings from the use of VFDs

# Consider these facts:

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- Motor bearings are designed to last 100,000 hours, yet ***VFD-driven motors often fail within 1 month***
- Of the VFD-driven fan motors installed in a 30-story building, ***all failed within 1 year (two within 6 months)***
- A major US pharmaceutical now specifies shaft grounding rings on all VFD-driven motors ***after experiencing 50% failure rate***
- VFD-induced motor failures are estimated to cause ***hundreds of thousands of hours of unplanned downtime annually***

# VFD-Induced Shaft Voltages...

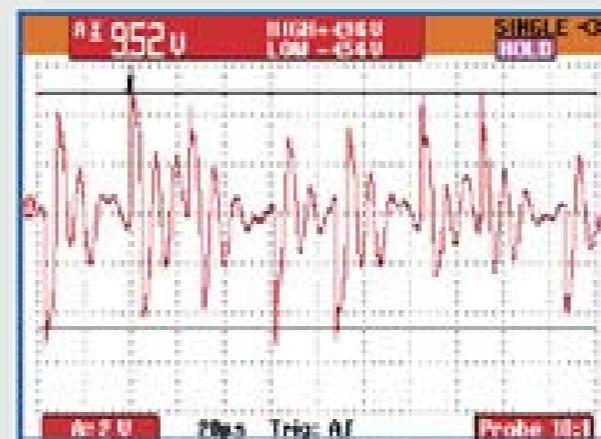


Typical shaft voltage wave forms

The following types of readings indicate potential bearing currents in your motor:



High amplitude EDM discharge pattern

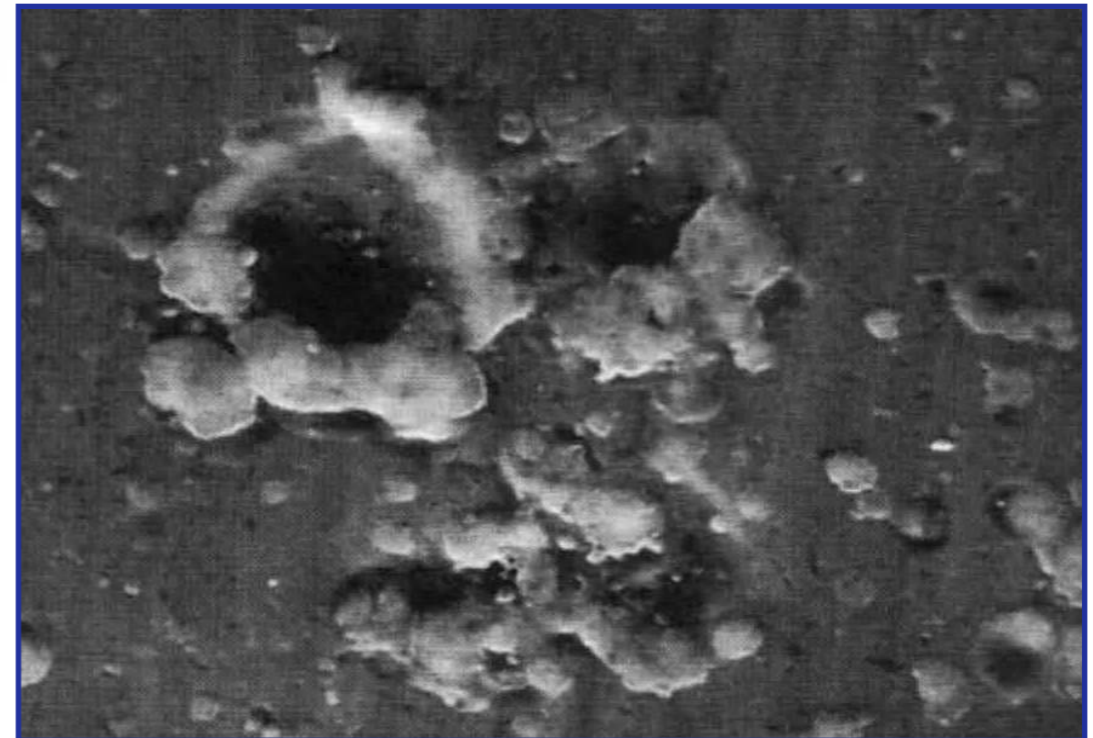
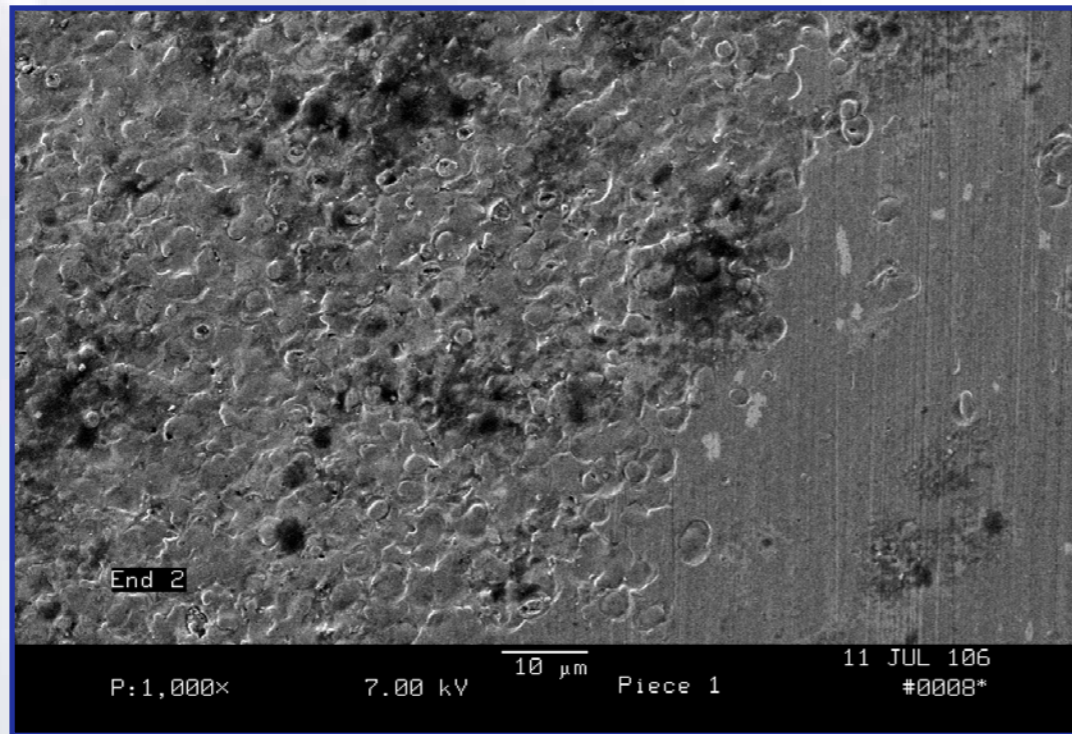


Low amplitude voltage discharge pattern



High Peak to Peak common mode voltage

# Produce EDM Bearing Damage



Pitting due to Electrical Discharge Machining (as seen under an electron microscope)

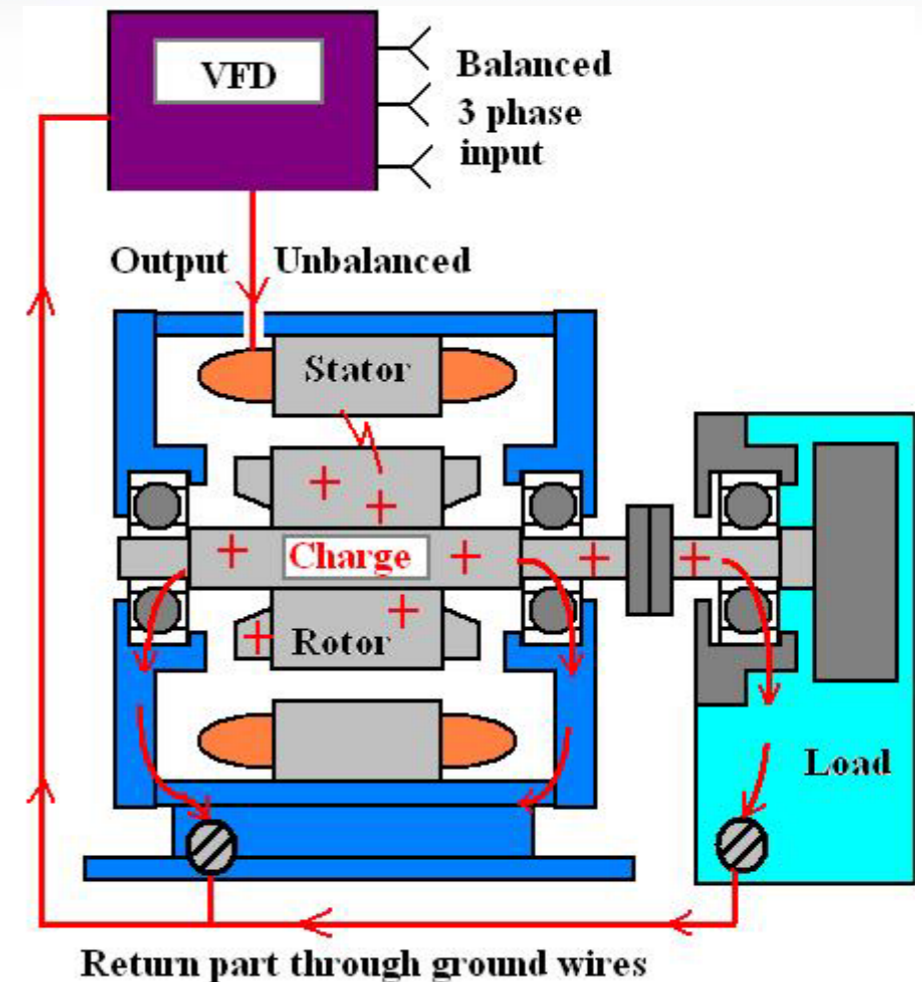
# and Fluted Bearings

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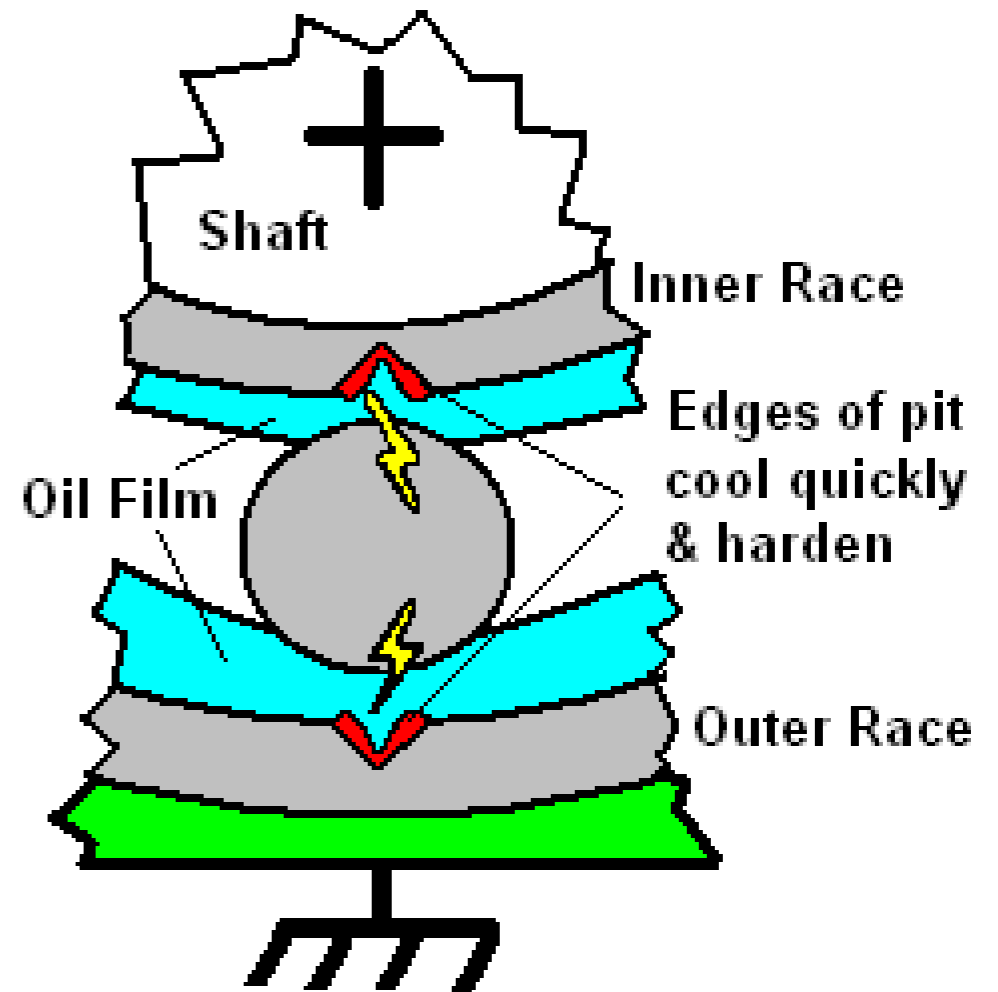
# Causing bearings to fail...

- VFD pulses to the motor create capacitively coupled common mode voltage on motor shaft
- Voltage builds up until it exceeds dielectric insulation value of bearing's oil film
- Voltage looks for path to ground, discharges through bearings

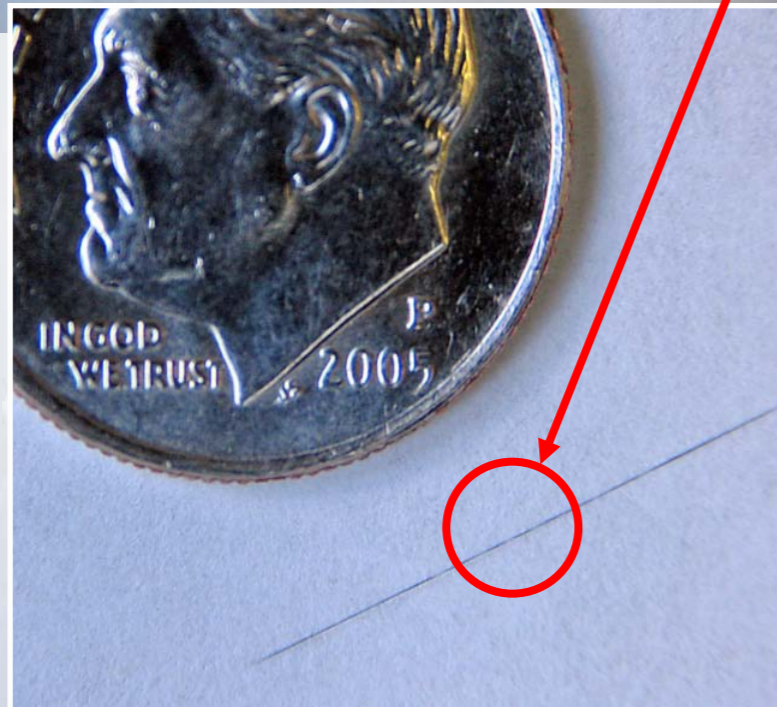


# and motors to fail

- Voltage arcs through bearing, and electrical discharge machining (EDM) produces thousands of pits
- Eventually, the rolling ball bearing causes fluting damage to race
- Bearings degrade, resulting in bearing and motor failure



# Unmatched Bearing Protection



- Completely encircles motor shaft
- Provides continuous grounding — regardless of RPM
- No maintenance required



# AEGIS™ SGR Effectiveness Test

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- **Shaft voltage readings**
- **Before and After**
- **Installation of  
AEGIS™ SGR  
on VFD-driven motor**

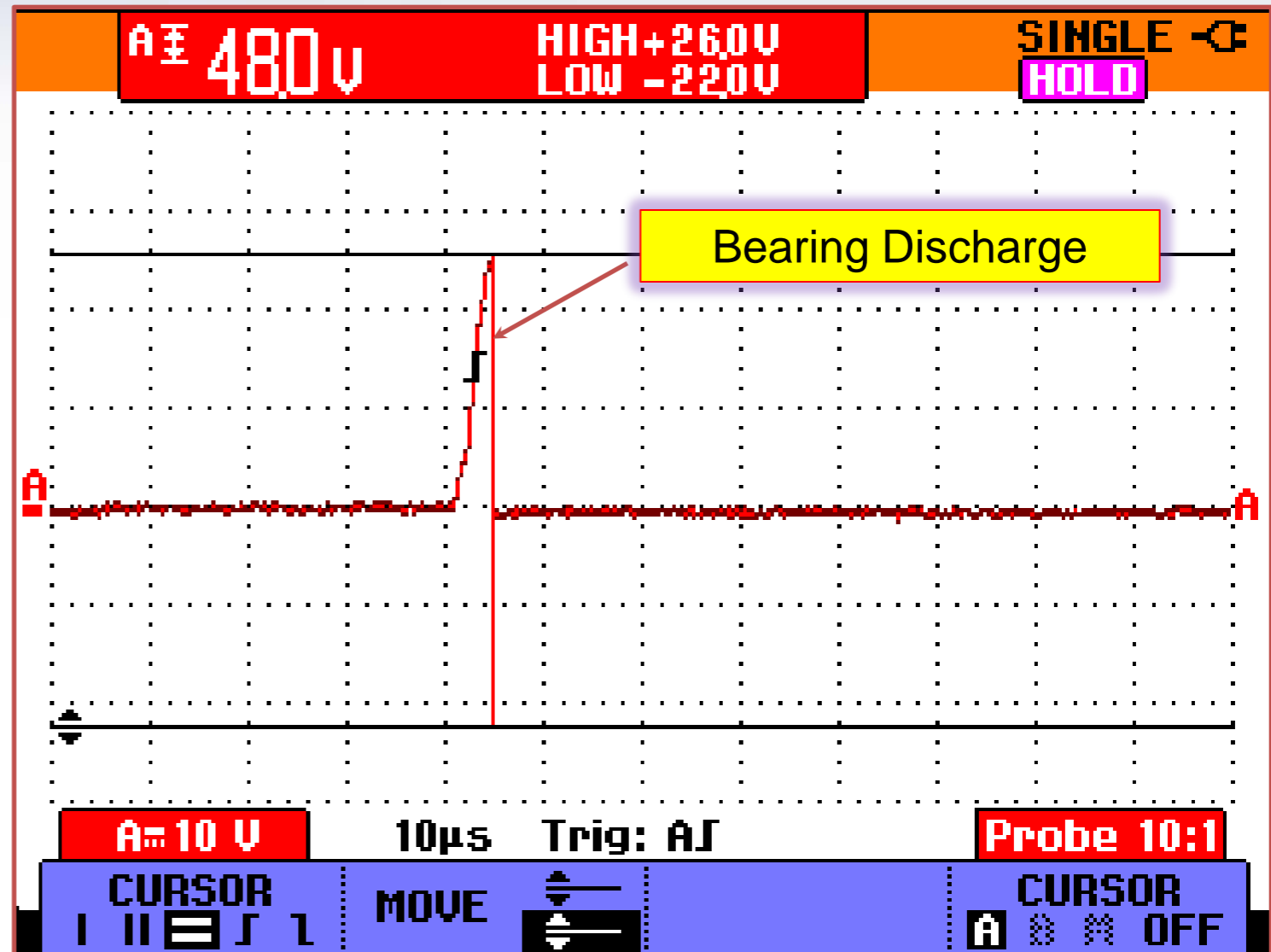
# Before AEGIS™ Installation

Shaft Voltage  
Reading:

48 V peak

Equipment:  
Motor: Baldor 15 HP  
VFD: ABB

Test Settings:  
10 V/div; 10  $\mu$ sec/div



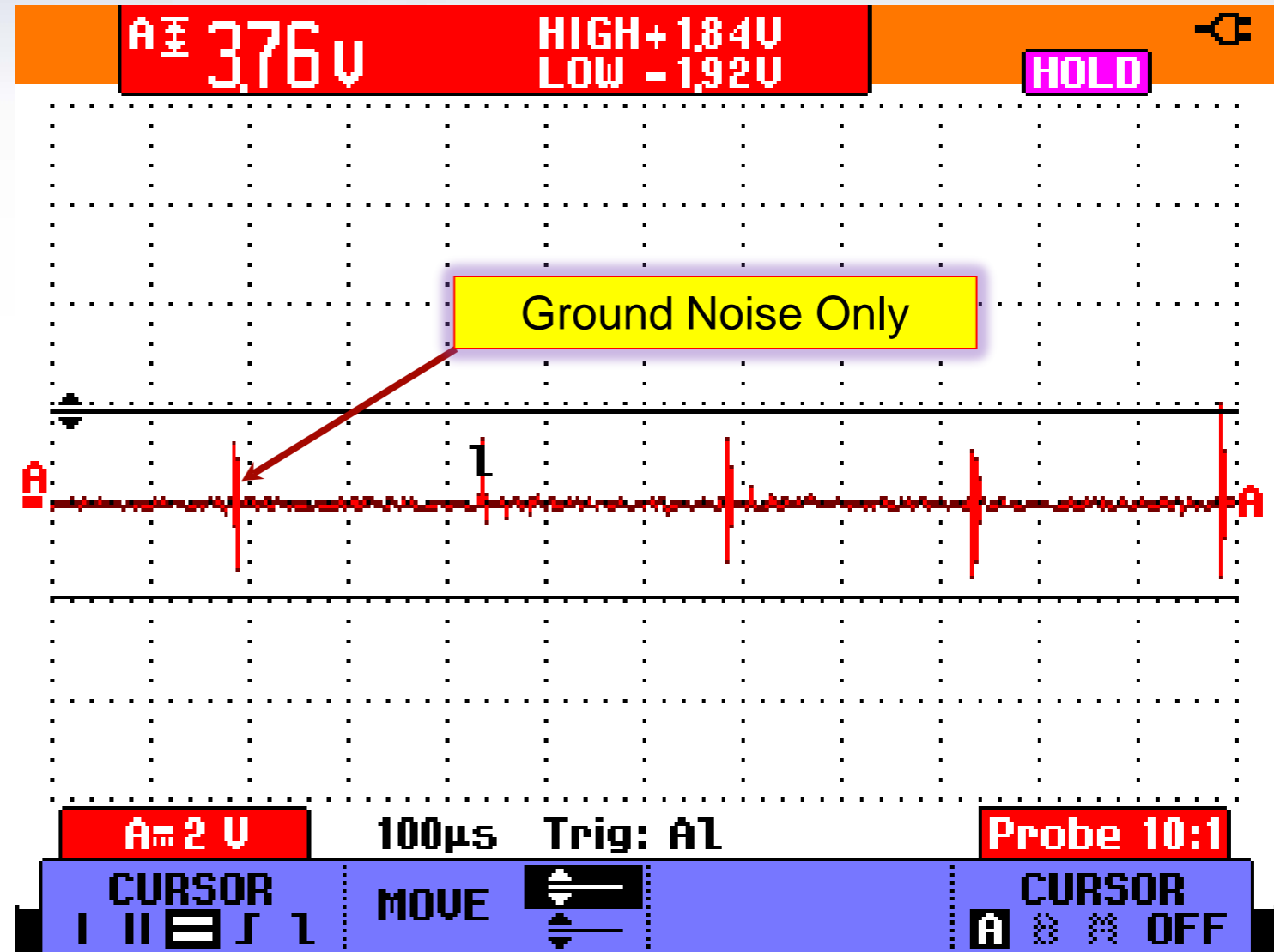
# After AEGIS™ Installation

Shaft Voltage Reading:

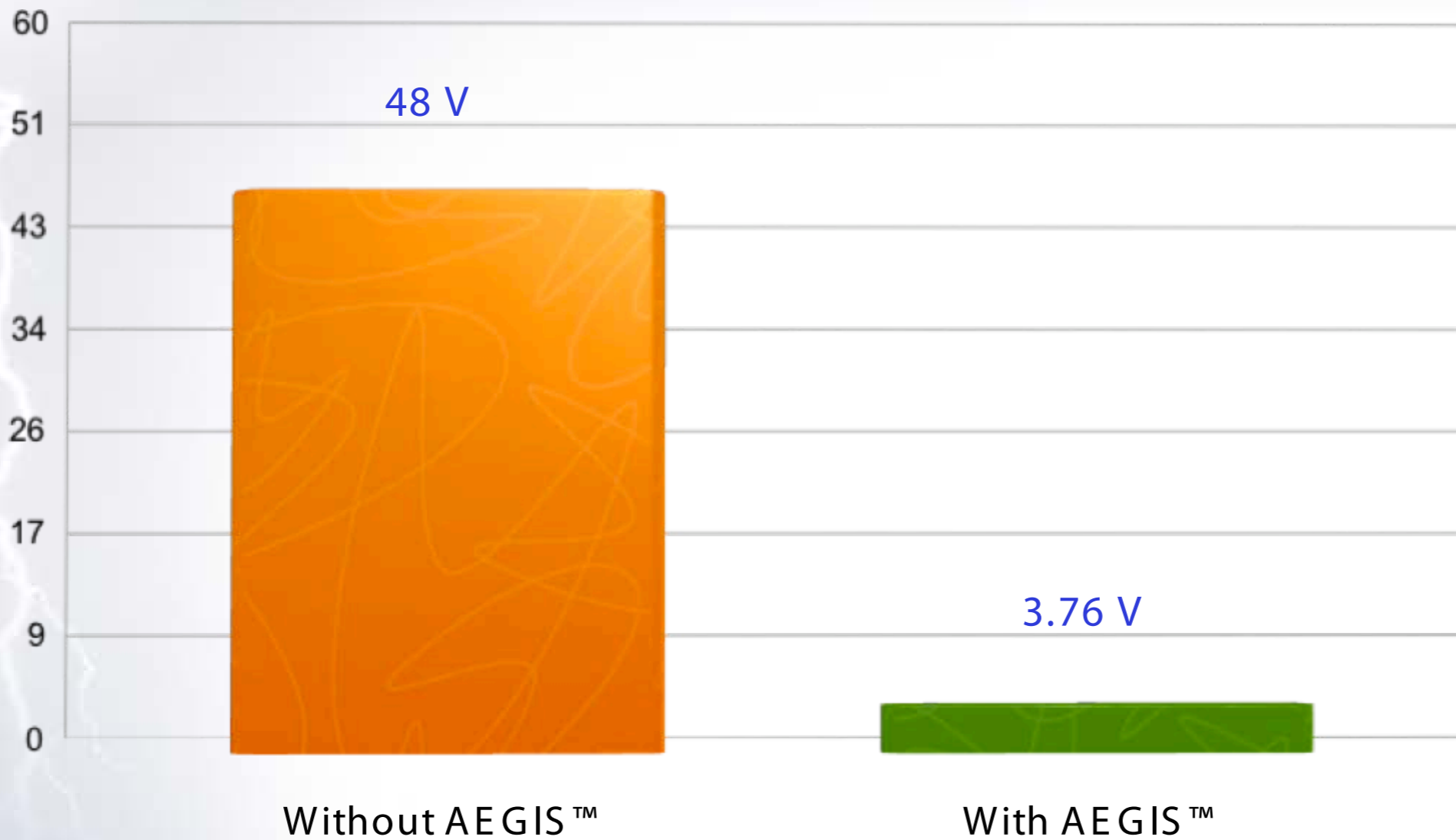
3.76 V peak!

Equipment:  
Motor: Baldor 15 HP  
VFD: ABB

Test Settings:  
2 V/div; 100  $\mu$ sec/div

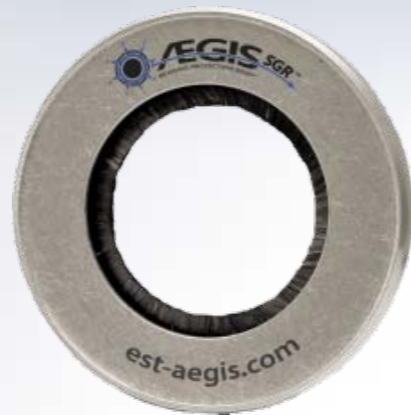


# AEGIS™ Safely Channels Damaging Shaft Currents to Ground

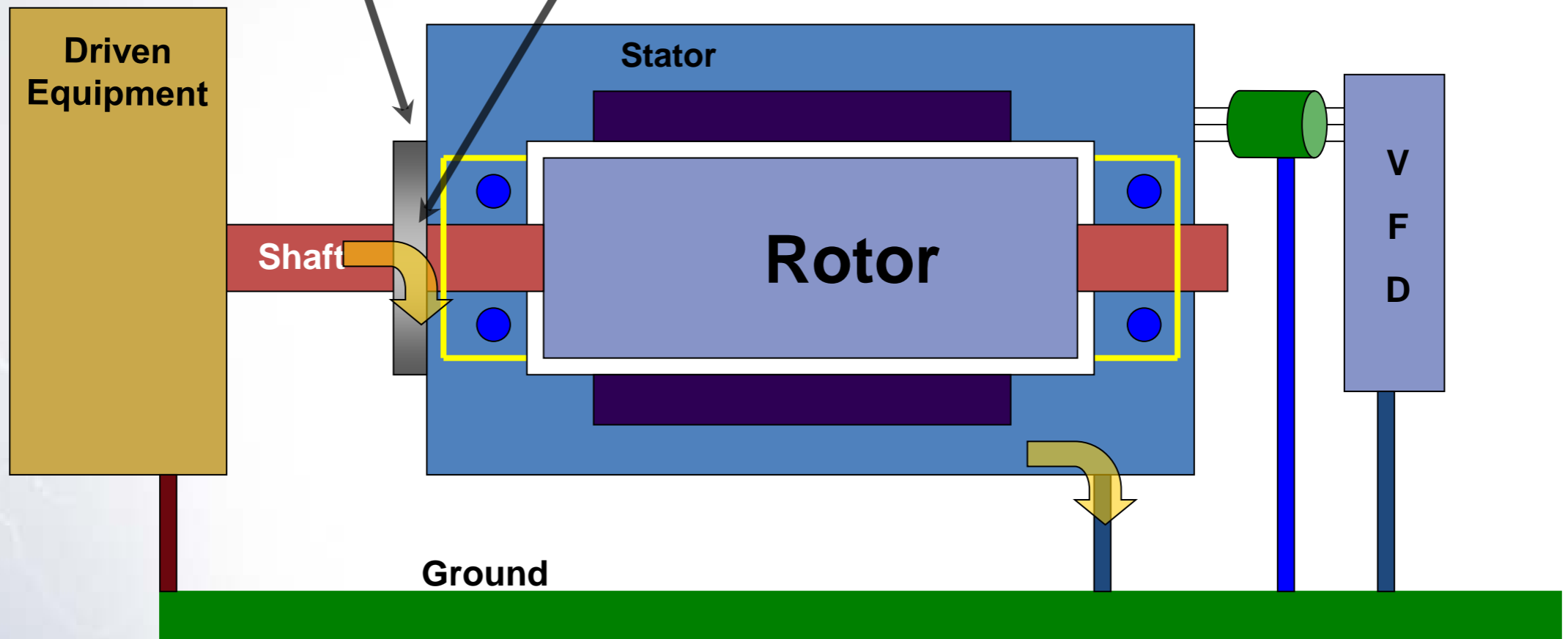


# Best Practices Motors up to 100 HP

**AEGIS™ Shaft  
Grounding Ring  
on DE**

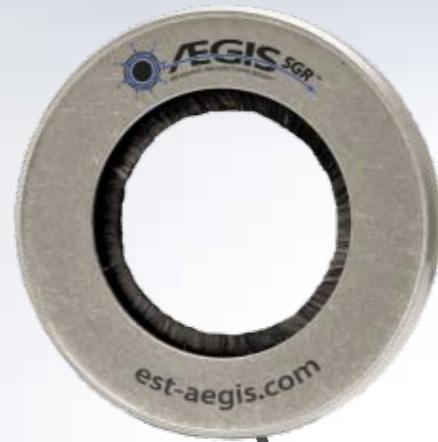


**Recommend  
AEGIS™ Colloidal  
Silver Shaft  
Coating PN CS015**



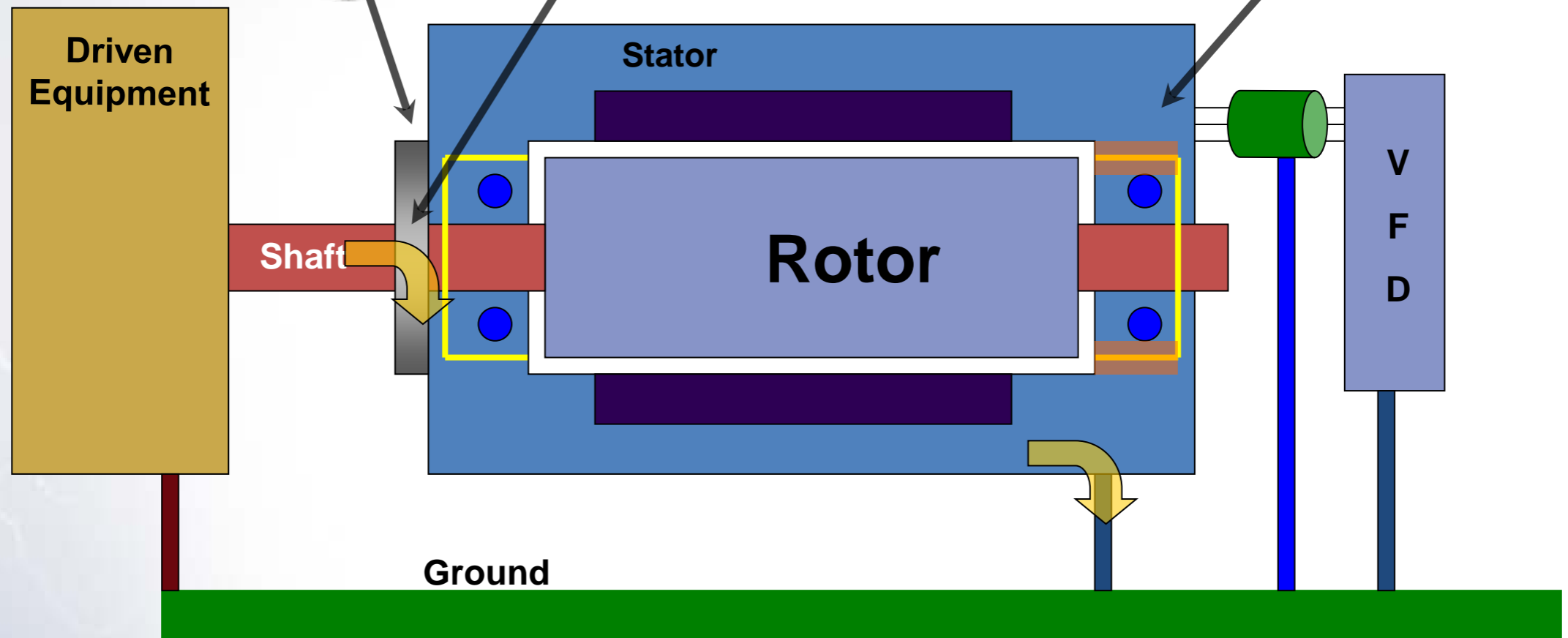
# Best Practices Motors over 100 HP

**AEGIS™ Shaft  
Grounding Ring  
on DE**



**Recommend  
AEGIS™  
Colloidal Silver  
Shaft Coating  
PN CS015**

**Insulated bearing  
or Insulation on  
NDE**



# AEGIS™ SGR Prevents Bearing Damage

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VFDs save money, but

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***...without effective,  
long-term bearing protection...***

these savings can vanish!



makes  
VFD-driven systems  
and the energy savings  
they generate

sustainable!



# AEGIS™ Award Winning Technology

