

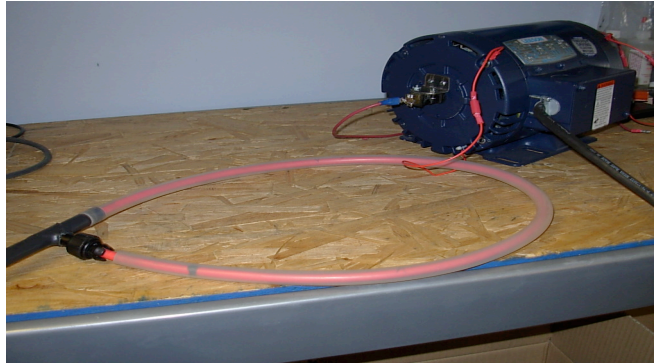
Bearing Parasitic's Due to VFD'S

This test was conducted to demonstrate how much voltage and current is passing through the bearings on the electric motor while being drive by a VFD. The motor we are testing has had both bearings insulated from the end bells on the motor. The end bells were bored over size and then a Delron bushing was pressed into each end bell. The Delron bushings were machined to spec for the bearings to be reinstalled into the bearing housings. The two bearings in the motor were equipped with a lead wire that was soldered onto the bearing shield. By soldering the two lead wires onto the bearings shields, we were able to measure the bearing voltage and current. See the photo below.



The two pink arrows show the two leads wires that were soldered to the bearings and that come out of the end bells and to ground on the case.

The orange arrow is the power cord from the VFD, common mode lead.
The yellow arrow is the shaft grounding brush.



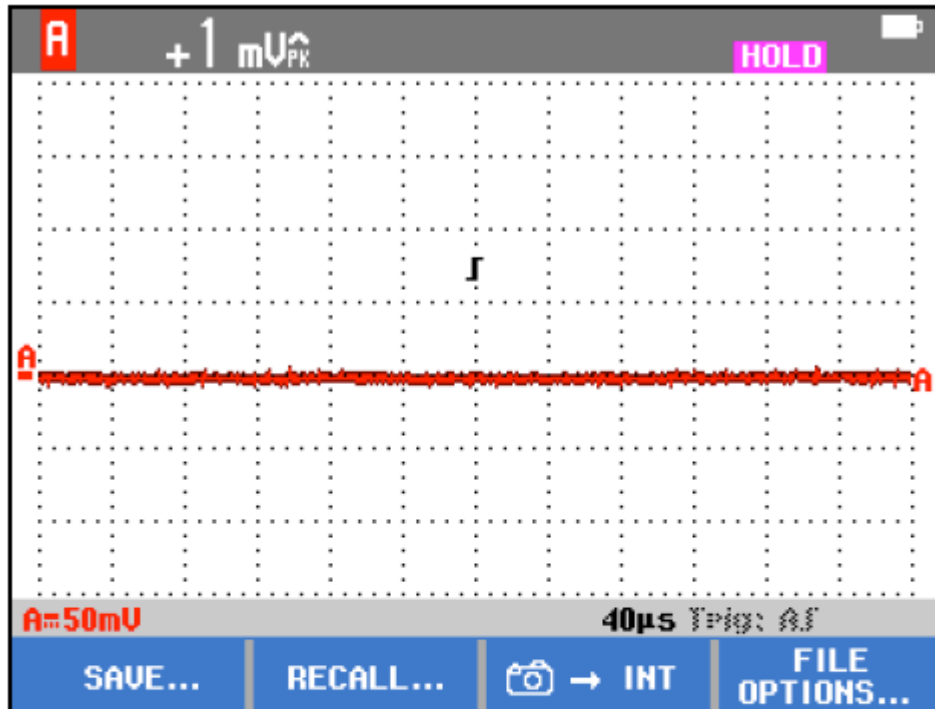
All of the tests conducted in this report were done with the Rogowski coil looped through the lead wire that is connected to the bearing and then is connected to ground which is the case of the motor. All readings were taken on the opposite drive bearing.



The above photos show that the end bells are both insulated with Delron sleeve inserts. The Delron sleeves keep the outer race of the bearings from conducting any voltage, current or parasitic's to ground through the end bells.



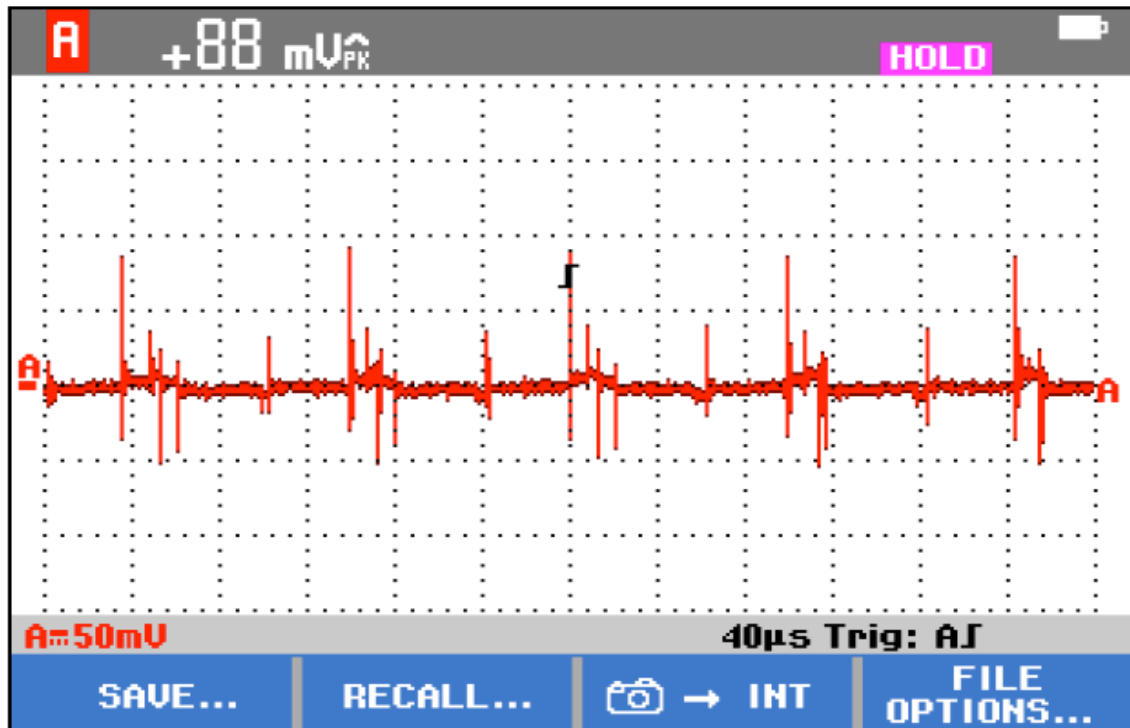
The above photo shows how the lead wire was attached to the bearings. The lead wire was soldered onto the bearing shield. The bearing shield only makes contact with the outer race so the path of voltage, current or bearing parasitic's is through the shaft to the inner race of the bearing, through the layer of grease, through the ball in the bearing, through another layer of grease, through the outer race to the lead wire, then to ground on the case of the motor.



test# 23 motor was running on
 230 v with no VFD or CoolBlue or
 NaLa cores.measurement taken on
 lead wire attached to opp. drive
 bearing.
 1-4-16

The above figure shows the motor running on 230 volt across line. There was no VFD in the circuit and there were no CoolBLUE® or NaLA® cores in the circuit. The reading was taken on the lead wire that is connected to the shield on the opposite drive bearing. The Rogowski coil was looped through the lead wire from the bearing to ground.

Note that there is not any High Frequency current readings or EMI noise. This is what the results should look like. However, VFD'S do not have the ability to deliver power this clean because of the way they operate.

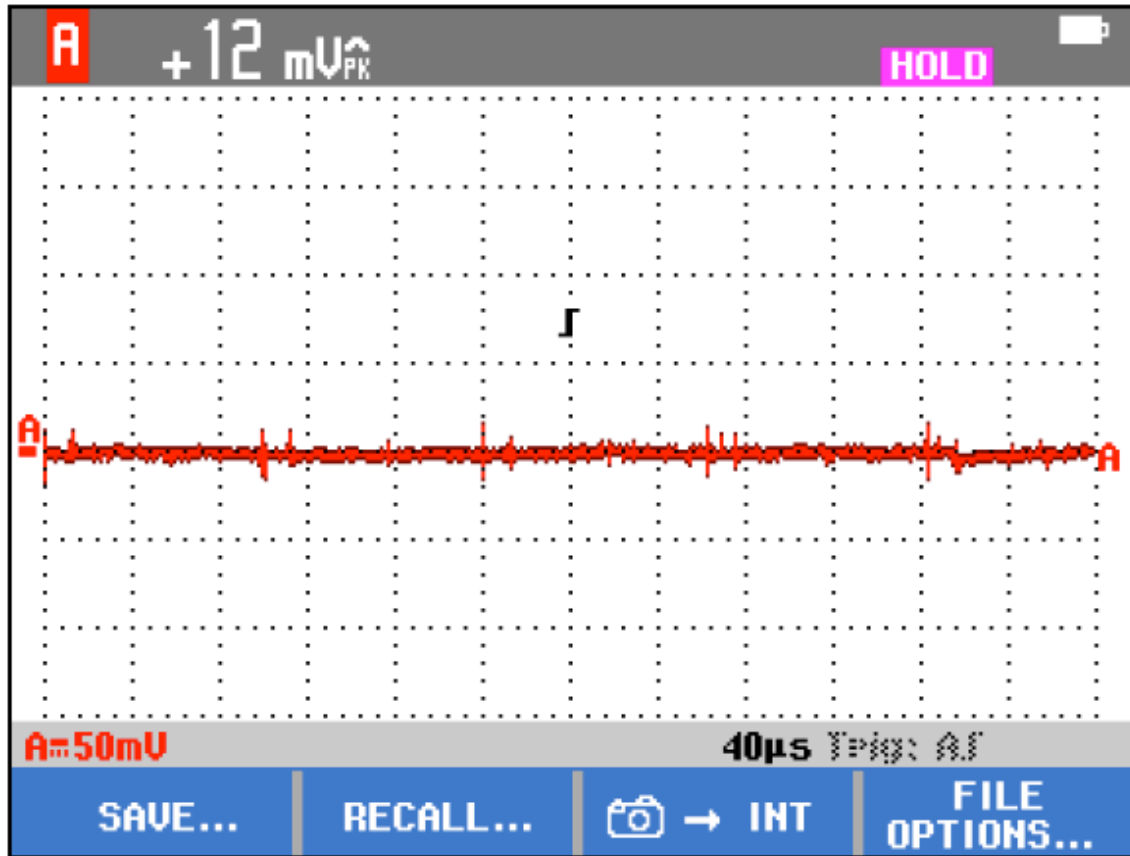


test# 25 motor was running on VFD
 with no CoolBlue or NaLa cores
 shaft grounding brush was applied
 to output shaft.
 1-4-16

The above figure shows the motor running on the VFD with no CoolBLUE® or NaLA® cores and with the shaft grounding brush applied to the output shaft. The reading was taken with the Rogowski coil looped through the lead wire that is attached to the bearing that then is attached to the case, to ground.

The reading was 0.088 v. The reading is then converted to amperage by dividing by 0.05. 0.088 v divided by 0.05 = 1.76 amps of current on the lead from the bearing to ground.

As you can see in the figure, we are still having lots of spikes in the reading. These spikes are also very damaging to the stator windings and to the ball bearings.



test# 26 motor was run on VFD with CoolBlue and NaLa cores. reading taken on lead from bearing, no shaft grounding brush
1-4-16

The above figure shows the motor running on the VFD and with CoolBLUE® and NaLA® cores installed on the common mode leads to the motor from the VFD. There was no shaft grounding brush being applied to the output shaft.

The reading was 0.012 v. This is calculated to: $0.012 \text{ divided by } 0.05 = 0.024 \text{ amps of current}$. The difference between test # 25 and test # 26 is a reduction to 86.3% of High Frequency current.