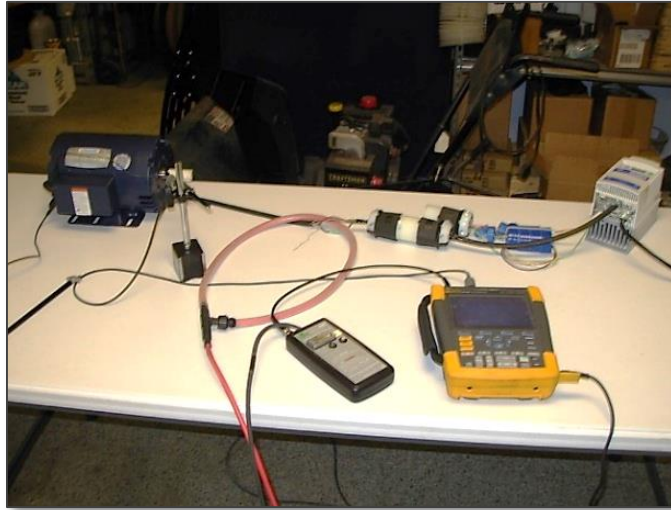


# Shaft Voltage and Current Test

March 15, 2015

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The following test measures shaft voltage and shaft current on a Leeson 2HP motor (catalog #115826.00 - DP Models) for use where water and dust exposure is moderate. This motor is ideally suited for use on pumps, compressors, blowers, fans, and other direct or belt-driven applications.), and Leeson SM2 SERIES drive, single phase input/three phase output. Output 115-230 Volts HP 1.5 A 6.0 LEESON SM2-Series Flux Vector – AC Inverter. This test was performed with and without the appropriate CoolBLUE common mode choke cores and NaLA<sup>®</sup> rings.

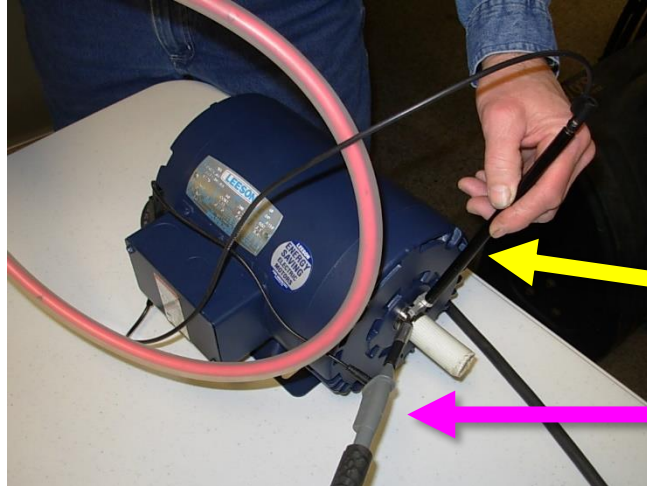
Test data was measured with a Fluke 190 series oscilloscope.

The following test data demonstrates the effects of the shaft grounding rings in respect to present shaft voltages, and shaft currents, on a motor.

# Shaft Voltage and Current Test

March 15, 2015

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*Photo 1*

**Photo 1** shows how the test results were achieved. A pick up brush, shown in pink, connected to the oscilloscope, was used to measure the shaft voltages.

The hand held grounding brush, shown in yellow, is used to pick up shaft voltages, which it redirects from the shaft to ground. This diverts voltage from flowing thru bearings.

The Rogowski Coil (red loop coil) is used to measure high frequency currents. The coil is looped around the hand held grounding brush to measure currents being directed from shaft to ground. Tests are performed with, and without, CoolBLUE common mode and NaLA<sup>®</sup> differential chokes installed.

Oscilloscope readings can be seen in **Figure 1** below.

**A** (red) represents the common mode currents.

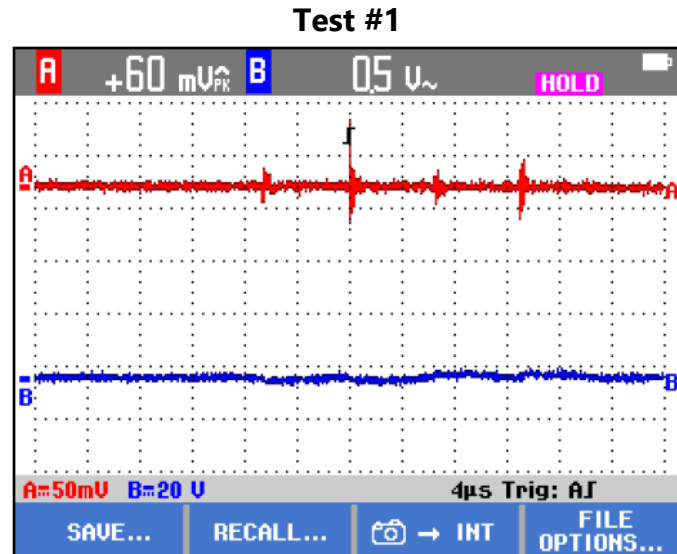
The oscilloscope is set to 50 millivolts.

The Rogowski coil has a constant conversion rate of 50mV per amp.

**B** (blue) represents the shaft voltage.

# Shaft Voltage and Current Test

March 15, 2015



Ragowski coil on grnd brush with no  
 cool blue or nala  
 3/11/15 06:14:55  
 test #1

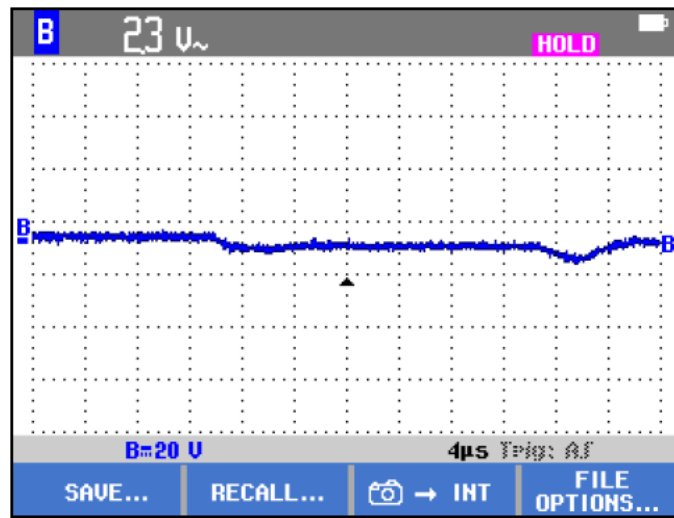
Test measurements were conducted with the Rogowski Coil around the hand held grounding brush, to measure common mode currents and shaft voltage, with no CoolBLUE cores or NaLA<sup>®</sup> rings installed.

**Test #3** is shaft voltage before any of the choke tests were performed. Shaft voltage was 2.3 vac.

# Shaft Voltage and Current Test

March 15, 2015

**Test #3**



shaft voltage measured with with  
shaft brush  
test #3  
03/11/15      06:18:52

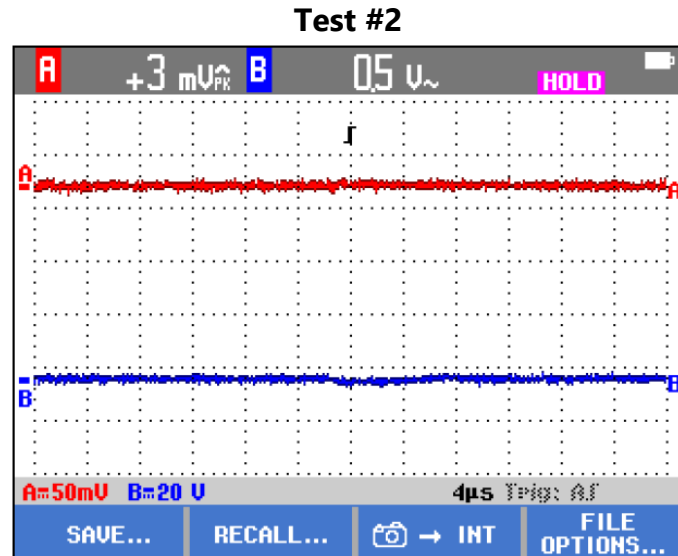
As seen in **Test #1**, with the hand held grounding brush in place on the shaft, the shaft voltage drops to .5 vac. This test illustrates what a grounding ring will do when properly installed, with a clean shaft, on an electric motor.

Also seen in **Test #1**, when the hand held grounding brush is placed on the shaft, the common mode currents do not reduce in reading. .060 mv divided by .05 = 1.2 amps of current that is flowing through the bearings. This test demonstrates that grounding rings do not remove common mode currents.

This type of current cause's damage to the windings, through voltage over shoot, and damage to bearings.

# Shaft Voltage and Current Test

March 15, 2015



Ragowski coil on gnd brush with cool  
blue and nala  
03/11/15                      06:17:32  
test #2

**Test #2** was conducted with a Rogowski Coil around the hand held grounding brush to measure common mode currents and shaft voltage, with CoolBLUE<sup>®</sup> cores and NaLA<sup>®</sup> rings installed.

As seen in **Test #2**, the CoolBLUE<sup>®</sup> cores and the NaLA<sup>®</sup> rings did not change the shaft voltage, but did reduce the amount of common mode currents being diverted to ground.  $.003 \text{ mv} \div .05 = .06$  amps of current flowing through the bearing. This was a reduction of + 90 % in common mode currents.

**Test #3** shows shaft voltage before performing any tests. We have found that installing CoolBLUE<sup>®</sup> cores and NaLA<sup>®</sup> rings has little effect on shaft voltage.

Results will vary. Common mode currents, when following proper guidelines from manufacturer, will be reduced by > 65%. We achieved more than 90% with this particular test.