SKF
Condition Monitoring Custom Products
"Vibration Monitoring and Machine Protection Systems"
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Condition Monitoring Custom Products

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CMCP810
Runout Measurement Kit

To successfully use the runout kit it is necessary to have a good working knowledge of the Fluke 192 Scopemeter. It is recommended that the user carefully review the oscilloscope manual before making runout measurements. Knowledge of how to set up channel and trigger parameters and how to save these setups and waveforms is required. Other functions such as Scope Record (pg. 3-31), and PC/Printer interface (pg. 6-61-63) are useful in this application and should be studied.

Installation:

1. Install and connect the –24 Vdc power supply, CMSS68 eddy probe, extension cable and driver near the testing location. The power supply requires a source of either 115 Vac or 230 Vac input.

2. Mount the probe at the desired measurement location along the shaft, and set the initial gap such that the driver output is approximately –10 Vdc.

3. If it is to be used, mount the optical pick-up at a second location along the shaft and connect it to its interface module. The interface module can be run on charged batteries or plugged into the power adaptor.

4. Place a piece of reflective tape approximately 1” long at the location to be viewed by the optical pick-up. When the pick-up passes over the tape, the interface module will output a TTL compatible pulse of approximately 5V. The pulse width will be determined by the width of the reflective tape. The polarity of the pulse can be set by switch on the interface module, but should generally be set to provide 0 to +5V pulse.

5. Connect channel A probe (red) of the Fluke 192 Oscilloscope to the output and common of the eddy probe driver. Connect the channel B (gray) scope probe to the output of the optical pick-up.

Making the Runout Measurement:

1. Turn on the oscilloscope. You should see two traces on the screen, marked A & B. The A trace is the run-out signal and the B trace is the once per revolution trigger event.

2. Depending on the speed at which the shaft is turning, you should see 2 or 3 trigger pulses on the B trace. If not, you will need to adjust the time base setting to a higher or lower value until you do. If you make a change, you will usually need to wait several seconds to see the results. A good starting point is to set it to 0.5 seconds per division, which will take the scope about 5 seconds to complete one sweep of the screen.

3. Trace A is your runout signal. The default sensitivity setting for this channel is 200 mV/mil, so you can directly read the peak-to-peak amplitude of runout.

4. At this point there are several options as to how to document the information.

   - Read the signal amplitude and write it down.
   - Let the scope indicate the Peak-to-Peak value for you.
   - Place the scope in Hold mode.
   - Save or Print the waveform or entire screen.
   - Transfer the data to the PC based software for viewing, storage and printing.

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Surface Irregularities:

Surface irregularities or imperfections will appear on an oscilloscope as sharp voltage spikes superimposed on the dynamic waveform.

Surface irregularities such as scratches, pitting, burrs, etc. will produce a runout condition as observed by the eddy probe sensor.

In general, surface irregularities are created due to improper handling of the rotor during the manufacturing or repair cycle. Care should be taken to protect the shaft surface to be used for dynamic motion measurements. In essence, these surface areas should be given the same protective measures used to protect a bearing journal surface. Crane lifts should be made with cables attached to shaft areas away from the probe measurement surfaces. Support fixtures for storage of rotors should not introduce surface scratches, dents, etc.

Occasionally, surface irregularities are introduced via a machine-cutting tool. If the tool is dull or the feed is too rapid, some tool chatter may occur which can introduce small ripples in the shaft surface.

Electrical Runout:

Eddy probes will operate in the presence of magnetic field, as long as the field is uniform or symmetrical and not localized to a particular location on the rotor. Electrical runout will be present if a particular area of the shaft surface is highly magnetic, and the remaining surface is nonmagnetic, or at a much lower value. This is due to the resultant change in sensitivity on the shaft surface to the applied field from the eddy probe sensors.

Residual Magnetism:

The observation of a residual magnetism runout condition on an oscilloscope can yield a sinusoidal motion indication. However, the sine wave will be distorted and to some extent tending toward a square wave.

Magnetic Particle inspection to check for cracks on castings, or welds is very often a culprit of generating residual magnetism problems. The magnetic field introduced to the rotor for this inspection should be neutralized after the inspection program is completed. This is done with the Magnaflux® machine and involves continuously reversing the polarity and passing a current through the rotor at continuously decreasing amperes. If done properly, this procedure should neutralize the magnetic properties of the rotor. In some cases a proper polarity reversal is not performed, and residual magnetism is produced.

A final check for residual magnetism embraces the use of a small handheld field strength indicator. Holding this meter at the shaft surface and hand turning the rotor will confirm the presence or absence of magnetic fields of less than 2 gauss with variations less than 1 gauss.

Residual Stress Concentrations:

Observation of residual stress concentrations on an oscilloscope will yield a sinusoidal waveform with high voltage, high frequency spikes superimposed on the waveform.

During manufacturing and repair of rotors, a variety of machining and surface treatment processes can introduce small amounts of localized stress concentrations. Although these stress areas do not adversely affect the mechanical properties of the rotor, they may give rise to an electrical runout from the proximity transducers. Since one of the variables affecting voltage output from the transducer is the resistivity of the observed shaft surface, any deviation of the resistance around the circumference of the shaft (due to varying stress levels) will produce a voltage change.