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Knowledge Base Article

Product Group: Sensors
Product: Eddy Probe Systems
Version: N/A

Abstract

SKF Eddy Probe Systems can be used as effective tachometer sensors when several considerations are kept in mind. This article explains the mounting requirements and other information for using Eddy Probe Systems as tachometer sensors.

Overview

Eddy Probes can be used to observe keyways, keys, gear teeth, or any similar displacement change in a rotating steel shaft.

The following comments are based on cutting a custom slot in an AISI 4140 steel shaft, but other configurations and materials can be used with success.

Tachometer sensor performance is directly related to the ratio of the Eddy Probe tip used to the shaft slot width available, as well as the shaft slot depth.

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Eddy Probe Mounting Requirements When Used for Radial Vibration or Axial Position Measurements

To maintain full range and linearity, the Eddy Probe System Technical Manual states:

"Probes must not be installed closer than the ratio of half the probe tip diameter to a shaft shoulder or other discontinuity. Otherwise, probe target calibration will be altered. This clearance must also be maintained with all stationary components so that the entire electric field is concentrated on the observed surface only. If necessary, surfaces should be chamfered." Refer to Figure 1 and Figure 2 below.

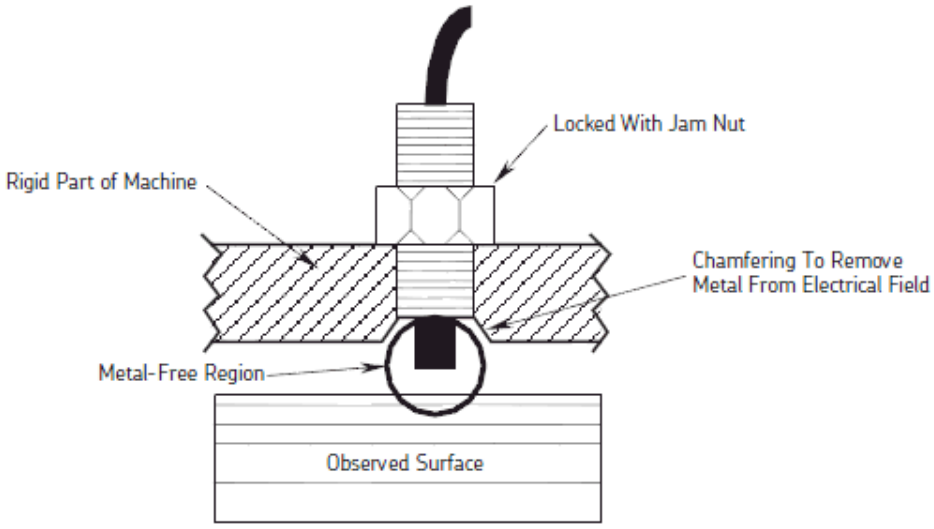
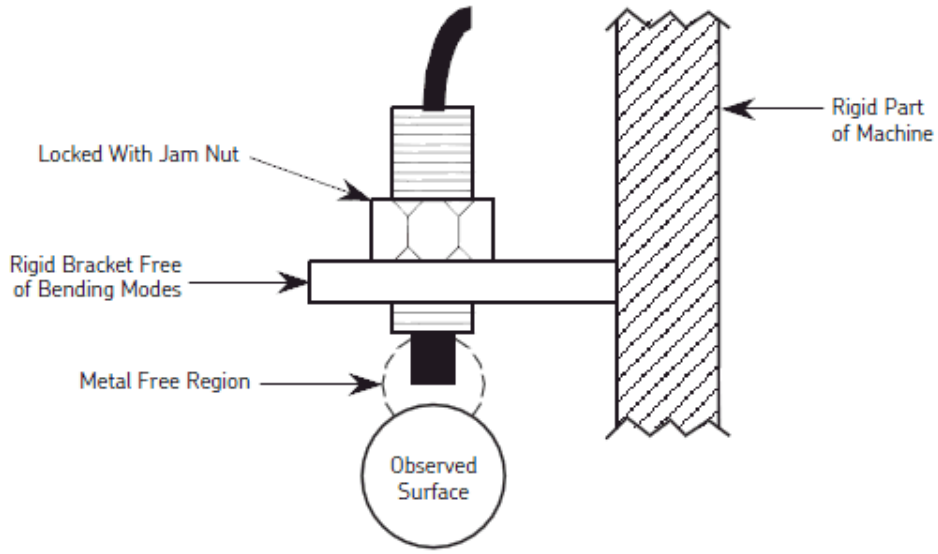


Figure 1. Probe mounting through casing



Tip diameter	Metal-free region
5 mm	0.10" (2.5 mm)
8 mm	0.16" (4.0 mm)
19 mm	0.38" (9.5 mm)

Figure 2. Probe mounting on bracket

The clearance area around the probe tip is necessary to avoid influence from metal alongside the probe tip, reducing range and changing the sensitivity of the system.

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Historical Eddy Probe Mounting Requirements When Used as a Tachometer Sensor

The minimum slot width shown in this historic illustration of an Eddy Probe used as a tachometer sensor [Figure 3] is 1.5 times the tip diameter - less than the two times (2x) tip diameter required for linear operation.

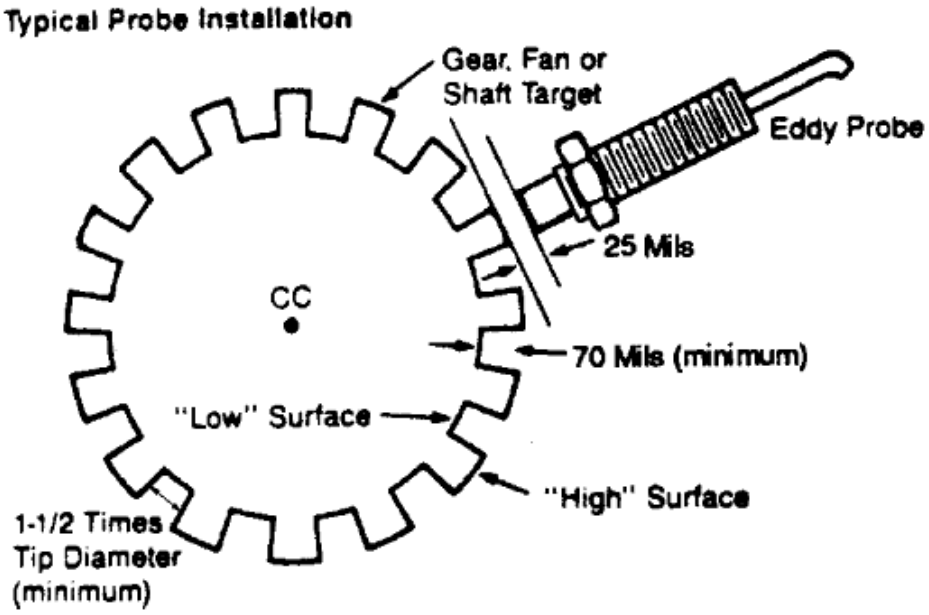

Figure 3. Minimum slot width in a typical probe installation

The effect of using this narrow clearance is that the probe will never be clear of influence of either the leading or trailing edge of the slot.

This will result in the Eddy Probe System never reaching its full output voltage when centered in the slot.

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Recommendations for Eddy Probe Mounting When Used as a Tachometer Sensor

If the slot is expanded to the two times (2x) tip diameter requirement for linear operation, the probe will reach its full output voltage, but only when it is centered in the slot.

This will result in a momentary maximum output voltage when the shaft is moved at a slow roll.

For a significantly improved tachometer waveform, the slot width can be set at five times (5x) the tip diameter, resulting in three times (3x) the tip diameters at the center of the slot that will allow maximum output voltage at a slow roll.

Empirical testing has shown that the field of the Eddy Probe tends to bridge the slot as speed is increased, resulting in a smaller peak to peak voltage than at a slow roll.

The five times (5x) tip diameter (or greater) slot width will minimize this effect.

Slot depth, shown in Figure 3 above as a minimum of 70 mils, should exceed the expected range of the Eddy Probe System being used to assure maximum peak to peak voltage output.

Of course, many installations do not offer the possibility of a custom slot for an Eddy Probe tachometer sensor.

If an existing key, keyway, gear, etc. is used the parameters above are likely to be compromised.

The result of these compromises is that the peak to peak voltage output of the Eddy Probe System is less than optimal.

As mentioned above, the peak to peak voltage will drop with increasing speed.

For self-adjusting tachometer inputs, this should be no problem.

For manually adjusted tachometer inputs, the trigger setpoint must be carefully set to provide consistent triggering at all speeds of interest.

If the trigger is set too near the signal zero crossover, the trigger will be unstable.

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If the trigger is set too near the signal peak at low speed, the trigger may be lost at higher speeds.

Once the peak to peak signal at high speed is known, the trigger can typically be set to 70% of the peak value to trigger reliably at all speeds.

For further assistance, please contact the Technical Support Group by phone at 1-800-523-7514 option 8, or by email at TSG-Americas@skf.com.