

ROTOR DIFFERENTIAL EXPANSION & SHAFT POSITION

The eddy current probe, as well as providing ac vibratory information, also provides dc information of the probe to target gap. This makes it ideal for measuring rotor to casing differential expansion via a non-contact method.

The eddy current probe and the measurement of differential expansion are governed by a series of empirical relationships.

The linear measurement range of an eddy current probe is approximately one third of its coil diameter as shown earlier. The ideal flat target area for an eddy current probe to “observe” is twice the coil diameter. Therefore the ideal target size for an eddy current probe is six times the linear measurement range.



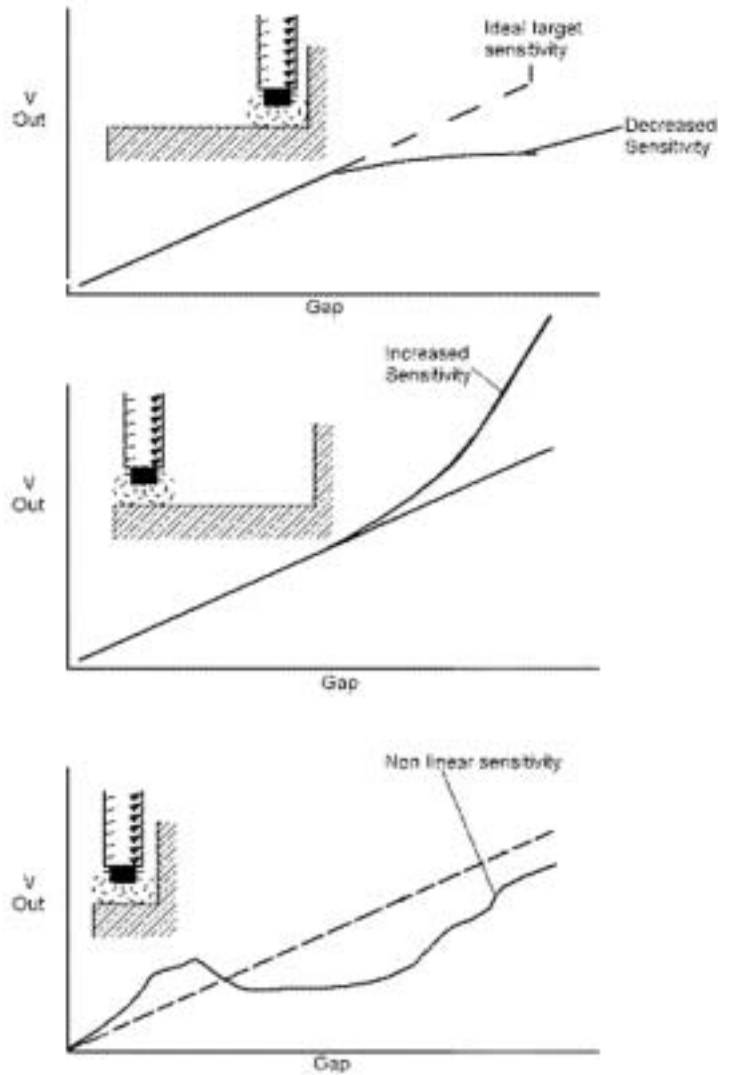
Probes monitoring differential expansion by observing a tapered collar

For differential measurement ranges of 25mm a target of 100mm is therefore required. This large target size is often impractical to fit. It is also often the case when retrofitting differential expansion systems that the existing collar is much smaller than that ideally required.

The illustrations opposite show the effect of a less than ideal target on the output of an eddy current probe.

To overcome this problem and obtain a linear output the probe electronics can either be calibrated in-situ or supplied pre-calibrated with a non-linear output. This non-linear output becomes linear when the probe is fitted in-situ. Eddy probe drivers are normally pre-calibrated to give a linear output when observing an ideal target.

The diagram opposite illustrates a disc type eddy current probe measuring movement against a flat collar, the limitations in terms of target area can clearly be seen.



One option to overcome this limitation is to reduce the size of the probe and therefore obtain a more linear output against the fixed target area, in combination with measuring both sides of the collar. However, this push – pull technique does require some simple arithmetic within the signal conditioning units to generate the correct expansion measurement.

