Proximity Probe Gap, Shaft Vibration and Frequency

Probe gap from the DC gap voltage, peak-to-peak shaft displacement from the AC signal, the running-speed frequency and the margin within the linear range.

Method: Eddy-current displacement probe scaling

Input parameters

Unit system: SI

Parameter	Value	Unit
DC gap voltage (magnitude)	10.000	V
Probe sensitivity (V per mm)	7.8700	
AC signal peak to peak	0.40000	V
Shaft speed	3,000.0	rpm
End of linear range (gap)	2.2900	mm
Start of linear range (gap)	0.25000	mm

Calculated results

Parameter	Value	Unit
Probe gap	1.2706	mm
Shaft displacement peak to peak	50.826	µm
Running-speed frequency	50.000	Hz
Margin to the linear range limit	1.0194	mm
Vibration within range (1 = yes)	1.0000	

Notes for this case

• An eddy-current probe system gives a DC voltage proportional to gap (typically 7.87 V/mm, i.e. 200 mV/mil, with −24 V supply) and an AC part from shaft vibration. Gap = |V_gap|/S, displacement = V_pp/S. Set the gap near the middle of the linear range (about −10 V) so the vibration and thermal growth stay inside it. Sensitivity depends on target material; 4140 steel is the usual calibration target.

Formula and method

$$g = \frac{|V_{gap}|}{S}, \quad x_{pp} = \frac{V_{pp}}{S}, \quad f = \frac{n}{60}$$

Variables

V_{gap}	DC gap voltage (magnitude)	V
S	Probe sensitivity (V per mm)	-
V_{pp}	AC signal peak to peak	V
n	Shaft speed	rad/s
g_{max}	End of linear range (gap)	m
g_{min}	Start of linear range (gap)	m
g	Probe gap	m
x_{pp}	Shaft displacement peak to peak	m
$f_{1\times}$	Running-speed frequency	1/s
$\min(g - g_{min}, g_{max} - g)$	Margin to the linear range limit	m
$x_{pp}/2 \leq margin$	Vibration within range (1 = yes)	-

Method and standards

Proximity probe.

Assumptions and limits

- Linear probe response; calibrated target material.

References

Eddy-current displacement probe scaling

Report details

Report reference	FCC-1BNY-85QG (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/instrumentation/vibration-noise/proximity-probe-gap

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.