Two-Plane Rotor Balancing by Influence Coefficients

Correction masses and angles in two planes from the original vibration at two bearings and the responses to a trial mass in each plane, by influence coefficients.

Method: Influence-coefficient method for two-plane field balancing

Input parameters

Unit system: SI

Parameter	Value	Unit
Original vibration at bearing A (amplitude)	8.0000	
Its phase	35.000	°
Original vibration at bearing B	6.0000	
Its phase	120.00	°
Trial mass in plane 1	20.000	g
Trial mass angle in plane 1	0	°
Vibration at A with trial 1	5.5000	
Its phase	85.000	°
Vibration at B with trial 1	5.2000	
Its phase	140.00	°
Trial mass in plane 2 (trial 1 removed)	20.000	g
Trial mass angle in plane 2	0	°
Vibration at A with trial 2	7.0000	
Its phase	50.000	°
Vibration at B with trial 2	3.0000	
Its phase	160.00	°

Calculated results

Parameter	Value	Unit
Correction mass in plane 1	20.167	g
Correction angle in plane 1	51.251	°
Correction mass in plane 2	18.717	g
Correction angle in plane 2	31.137	°

Notes for this case

• Each trial mass changes the vibration at both bearings; the change divided by the trial mass is a complex influence coefficient. The two corrections must cancel the original vibration at both bearings: [α][M] = −[V₀], two complex equations solved for the two complex correction masses. Measure amplitude and phase with the same reference mark and the same angle convention as the trial masses (angles here are measured the same way for both), and check with a final run.

Formula and method

$$\begin{bmatrix} \alpha_{A1} & \alpha_{A2} \\ \alpha_{B1} & \alpha_{B2} \end{bmatrix} \begin{bmatrix} M_1 \\ M_2 \end{bmatrix} = - \begin{bmatrix} A_0 \\ B_0 \end{bmatrix}, \quad \alpha_{A1} = \frac{A_1 - A_0}{W_1}$$

Variables

A_0	Original vibration at bearing A (amplitude)	-
ϕ_{A0}	Its phase	rad

B_0	Original vibration at bearing B	-
ϕ_{B0}	Its phase	rad
W_1	Trial mass in plane 1	kg
θ_1	Trial mass angle in plane 1	rad
A_1	Vibration at A with trial 1	-
ϕ_{A1}	Its phase	rad
B_1	Vibration at B with trial 1	-
ϕ_{B1}	Its phase	rad
W_2	Trial mass in plane 2 (trial 1 removed)	kg
θ_2	Trial mass angle in plane 2	rad
A_2	Vibration at A with trial 2	-
ϕ_{A2}	Its phase	rad
B_2	Vibration at B with trial 2	-
ϕ_{B2}	Its phase	rad
M_1	Correction mass in plane 1	kg
θ_{c1}	Correction angle in plane 1	rad
M_2	Correction mass in plane 2	kg
θ_{c2}	Correction angle in plane 2	rad

Method and standards

Two-plane balancing.

Assumptions and limits

- Linear system; constant speed; rigid rotor in the balancing range.

References

Influence-coefficient method for two-plane field balancing

Report details

Report reference	FCC-Y9DS-YJSF (the same inputs always give the same reference)
Generated	23 November 2026, 18:08 UTC
Calculator	Two-Plane Rotor Balancing by Influence Coefficients
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
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/two-plane-balancing

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Reopens the calculator with the inputs of this report.