Single-Plane Balancing with a Trial Weight

Correction weight and angle for single-plane balancing from the original vibration, the vibration with a trial weight, and the trial weight (influence coefficients).

Method: Influence-coefficient (vector) method for single-plane balancing (Thearle 1934)

Input parameters

Unit system: SI

Parameter	Value	Unit
Original vibration amplitude In any unit (mm/s, µm); keep the same unit for both readings.	8.0000	
Original phase	30.000	°
Amplitude with the trial weight	5.0000	
Phase with the trial weight	110.00	°
Trial weight	20.000	g
Angle of the trial weight	0	°

Calculated results

Parameter	Value	Unit
Effect of the trial weight (vector $A_1 - A_0$)	8.6665	
Correction weight	18.462	g
Angle of the correction weight	34.623	°

Notes for this case

• Remove the trial weight before fitting the correction (or keep it and fit the vector difference). Angles are measured the same way as the phase readings: if the phase is measured against rotation and the weight angle with rotation (or the reverse), the correction angle comes out mirrored.

Formula and method

$$T = A_1 - A_0, \quad W_c = -\frac{A_0}{T} W_t \quad \text{(complex numbers)}$$

Variables

A_0	Original vibration amplitude	-
ϕ_0	Original phase	rad
A_1	Amplitude with the trial weight	-
ϕ_1	Phase with the trial weight	rad
m_t	Trial weight	kg
θ_t	Angle of the trial weight	rad
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m_c	Correction weight	kg
θ_c	Angle of the correction weight	rad

Method and standards

Linear influence of unbalance on vibration.

Assumptions and limits

- Linear system, steady speed.
- Phase readings and weight angles must use the same reference and the same direction (both with or both against rotation, and the same phase lag or lead convention as the instrument); a mismatch mirrors the correction angle.
- The trial effect |T| should be a clear part of the original vibration; below 10 % of A_0 the page warns that the result is poorly

conditioned.

References

• Influence-coefficient (vector) method for single-plane balancing (Thearle 1934)

Report details

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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/single-plane-balancing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.