Permissible Residual Unbalance from a Balance Quality Grade

Permissible specific and residual unbalance of a rigid rotor from a balance quality grade, rotor mass and maximum speed, split between two planes.

Method: Balance quality grade relation e·ω = G

Input parameters

Unit system: SI

Parameter	Value	Unit
Balance quality grade (mm/s)	6.3000	
Rotor mass	800.00	kg
Maximum service speed	1,490.0	rpm
Correction radius	600.00	mm
Share at plane A (0.5 for a symmetric rotor)	50.000	%

Calculated results

Parameter	Value	Unit
Permissible specific unbalance	40.376	µm
Permissible residual unbalance (g·mm)	32,301	
Plane A allowance (g·mm)	16,150	
Equivalent mass at the correction radius, plane A	26.917	g

Notes for this case

• Balance grade G is the product of permissible eccentricity and angular speed, so e_per = G/ω and U_per = e_per·m (here in g·mm). Fans and pumps are commonly G 6.3, high-speed or sensitive machines G 2.5; choose G from the user's standard. The allowance is split between planes in proportion to the bearing loads.

Formula and method

$$e_{per} = \frac{G}{\omega}, \quad U_{per} = e_{per} m, \quad m_A = \frac{f_A U_{per}}{r}$$

Variables

G	Balance quality grade (mm/s)	-
m	Rotor mass	kg
n	Maximum service speed	rad/s
r	Correction radius	m
f_A	Share at plane A (0.5 for a symmetric rotor)	-
e_{per}	Permissible specific unbalance	m
U_{per}	Permissible residual unbalance (g·mm)	-
U_A	Plane A allowance (g·mm)	-
m_A	Equivalent mass at the correction radius, plane A	kg

Method and standards

Balance tolerance.

Assumptions and limits

- Rigid rotor; allowance split by the user's plane share.

References

Balance quality grade relation e·ω = G

Report details

Report reference	FCC-7J8R-PF8G (the same inputs always give the same reference)
Generated	23 November 2026, 18:18 UTC
Calculator	Permissible Residual Unbalance from a Balance Quality Grade
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/mechanical/fans/permissible-residual-unbalance

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.