Watt and Porter Governor: Height and Speed

Height of a Watt governor at a speed, and the speed range of a Porter governor between two heights from ball and sleeve masses.

Method: Rattan; Theory of Machines; ...

Input parameters

Unit system: SI

Parameter	Value	Unit
Governor type	Porter (equal arms)	
Speed (Watt height)	75.000	rpm
Mass of each ball	5.0000	kg
Central (sleeve) load	25.000	kg
Lower height	0.15000	m
Upper height	0.18000	m

Calculated results

Parameter	Value	Unit
Speed at h_1	189.13	rpm
Speed at h_2	172.65	rpm
Speed range	16.479	rpm

Notes for this case

- Frictionless, equal arm lengths, links meeting on the axis. Porter: $N^2 = (m + M)/m \times g/(4\pi^2 h)$.

Formula and method

$$h_W = \frac{g}{\omega^2}, \quad N^2 = \frac{m+M}{m}\frac{g}{4\pi^2 h} \ \text{(Porter)}$$

Variables

type	Governor type	-
N	Speed (Watt height)	1/s
m	Mass of each ball	kg
M	Central (sleeve) load	kg
h_1	Lower height	m
h_2	Upper height	m
h_W	Watt governor height at N	m
N_1	Speed at h_1	1/s
N_2	Speed at h_2	1/s
$N_1 - N_2$	Speed range	1/s

Method and standards

Governor equilibrium.

Assumptions and limits

- Frictionless; equal arms; h_1 below h_2.
- The Watt height at N is shown for the Watt type only.

References

- Rattan
- Theory of Machines

- 4th ed. (McGraw-Hill, 2014); Bhandari
- Design of Machine Elements
- 4th ed. (McGraw-Hill, 2017) (Watt and Porter governors)

Report details

Report reference	FCC-4ZPF-5RJB (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Watt and Porter Governor: Height and Speed
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 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/statics-dynamics/governor-watt-porter

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.