Slider-Crank Verification

Sample document with complete example values. It shows the report the purchased export produces for YOUR input - it is not itself a report for any part.

Project: Sample project | Part/Position: no real part | Prepared by: Sample, not released

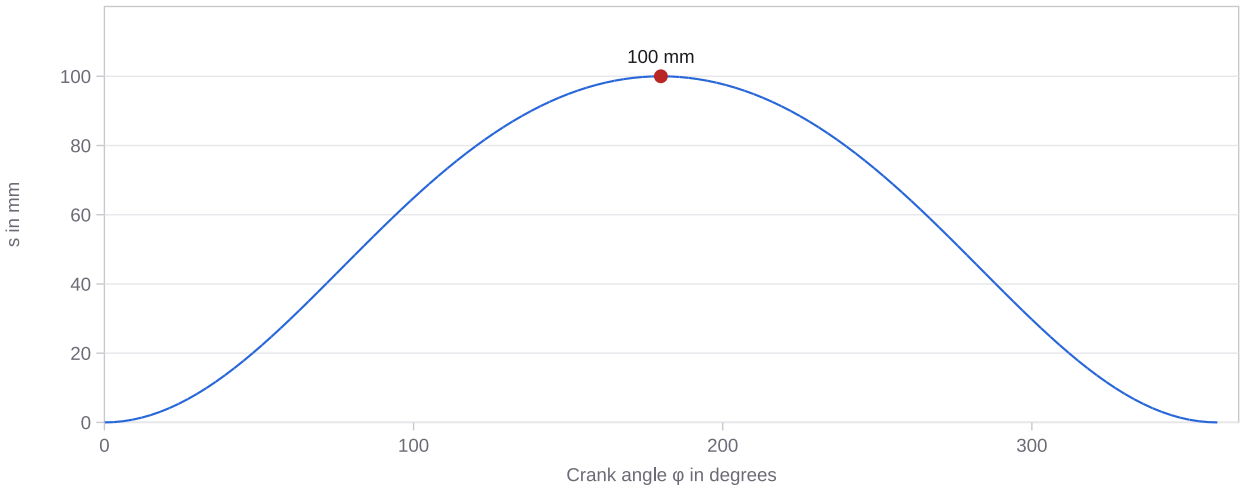
Input quantities

Crank radius r	50 mm
Connecting rod length l	200 mm
Rod ratio λ = r/l	0.25
Speed n	1,500 rpm
Angular frequency ω	157.08 rad/s
Piston force F	5,000 N
Oscillating mass m	1.2 kg

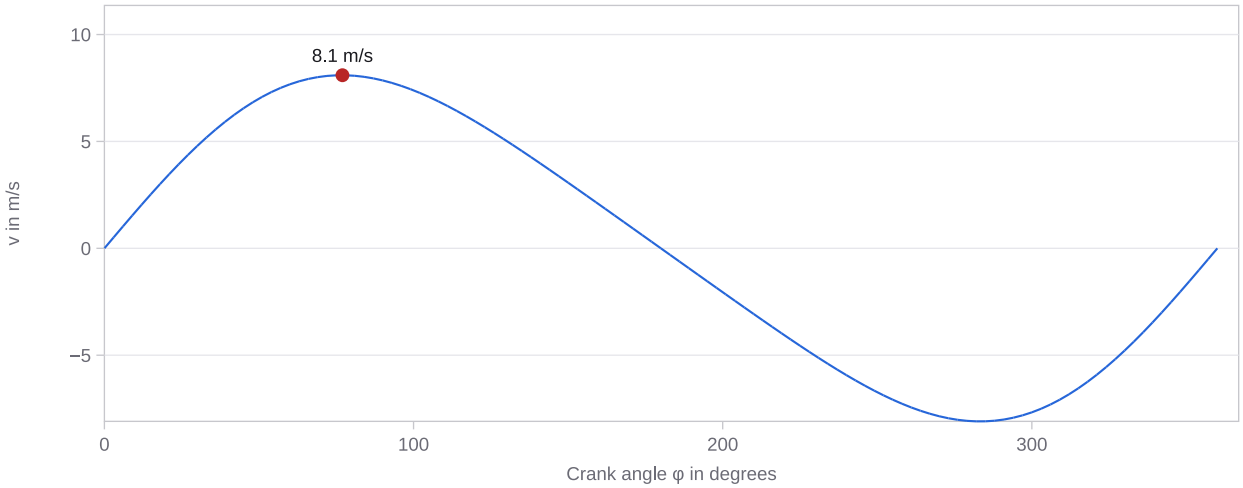
Peak values

Crank pin circumferential velocity v_U = ω·r	7.854 m/s
Max. piston displacement s_max	100 (at φ = 180 degrees) mm
Max. piston velocity v_max	8.096 (at φ = 77 degrees) m/s
Max. piston acceleration a_max	1,542.13 (at φ = 0 degrees) m/s²
Max. static torque M_stat	257.72 (at φ = 77 degrees) Nm
Max. dynamic torque M_dyn	46.69 (at φ = 37 degrees) Nm
Max. total torque M_total	271.44 (at φ = 61 degrees) Nm
Max. reduced mass moment of inertia J_red	0.0032 (at φ = 77 degrees) kg·m²

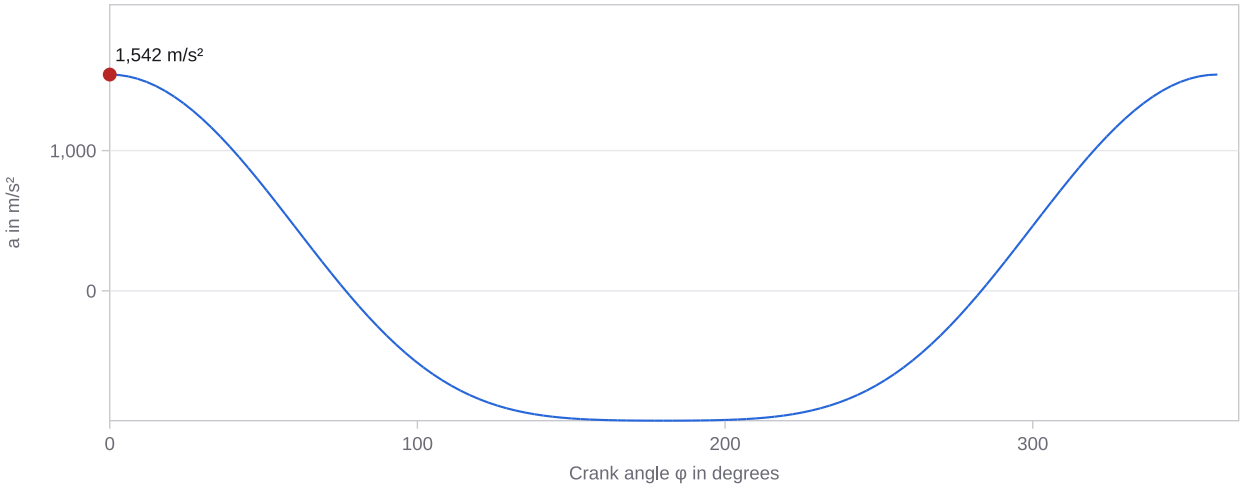
Piston displacement s(φ)



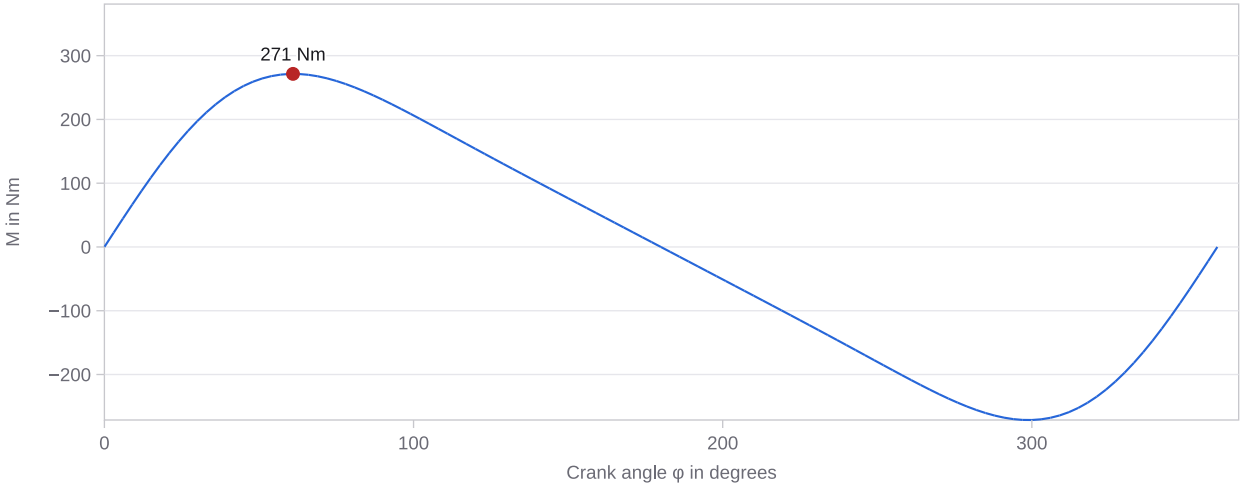
Piston velocity v(φ)



Piston acceleration a(φ)



Total torque M(φ)



Calculation basis

Slider-crank mechanism with exact kinematics via the connecting rod angle β (sin β = λ·sin φ, λ = r/l), not the λ-harmonic approximation. Piston displacement s = r·(1−cos φ) + l·(1−cos β); velocity v = ω·r·sin(φ+β)/cos β; acceleration a = (ω·r)²/r·[cos(φ+β)/cos β + λ·cos²φ/cos³β]. The tangential-force torque follows from the piston force F (static) and the inertia force m·a (dynamic): M = F_T·r with F_T = (F or m·a)·sin(φ+β)/cos β. The reduced mass moment of inertia is J_red = m·(v/ω)². The evaluation covers one full revolution φ = 0 … 360° in 1° steps; the reported values are the absolute peak values.

About this sample

All values on these pages come from a freely chosen example calculation and belong to no real part. The purchased export contains the same sections with your input, your header data (project, part, prepared by) and as searchable text. Pricing and scope: maschinenbaurechner.de/en/pricing