Hydraulic Cylinder Force, Speed and Flow

Push and pull force of a hydraulic cylinder from bore, rod and pressure, the extend and retract speeds for a pump flow, and the flow for a speed.

Method: F = p A; v = Q/A (fluid power basics); ISO 6020/6022 give standard bore and rod sizes; which are not checked here

Input parameters

Unit system: SI

Parameter	Value	Unit
Bore	100.00	mm
Rod diameter	56.000	mm
Working pressure	160.00	bar
Pump flow	60.000	L/min
Mechanical (seal) efficiency	95.000	%

Calculated results

Parameter	Value	Unit
Push (extend) force	119.38	kN
Pull (retract) force	81.943	kN
Extend speed	7.6394	m/min
Retract speed	11.130	m/min
Area ratio A/(A − a)	1.4569	

Notes for this case

- Pressure is the differential across the piston (supply minus back pressure).

Formula and method

$$F_e = p\,\frac{\pi D^2}{4}\,\eta_m, \quad F_r = p\,\frac{\pi (D^2 - d^2)}{4}\,\eta_m, \quad v = \frac{Q}{A}$$

Variables

D	Bore	m
d	Rod diameter	m
p	Working pressure	Pa
Q	Pump flow	m^3/s
η_m	Mechanical (seal) efficiency	-
F_e	Push (extend) force	N
F_r	Pull (retract) force	N
v_e	Extend speed	m/s
v_r	Retract speed	m/s
φ	Area ratio A/(A − a)	-

Method and standards

Pressure times area; continuity.

Assumptions and limits

- Steady motion.

References

- F = p A; v = Q/A (fluid power basics); ISO 6020/6022 give standard bore and rod sizes
- which are not checked here

Report details

Report reference	FCC-V41N-1405 (the same inputs always give the same reference)
Generated	17 November 2026, 19:49 UTC
Calculator	Hydraulic Cylinder Force, Speed and Flow
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 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/hydraulics-pneumatics/hydraulic-cylinder-force-speed

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.