Hydraulic Pump Flow and Power

Flow of a positive-displacement hydraulic pump from displacement, speed and volumetric efficiency, and the hydraulic and shaft power and torque at a pressure.

Method: Positive-displacement pump relations Q = V_g n η_v; P = Q Δp / η

Input parameters

Unit system: SI

Parameter	Value	Unit
Displacement per revolution	40.000	mL
Speed	1,450.0	rpm
Pressure rise	200.00	bar
Volumetric efficiency	95.000	%
Overall efficiency	88.000	%

Calculated results

Parameter	Value	Unit
Actual flow	55.100	L/min
Hydraulic power Q Δp	18.367	kW
Shaft power	20.871	kW
Shaft torque	137.45	N·m

Formula and method

$$Q = V_g\, n\, \eta_v, \quad P_h = Q\, \Delta p, \quad P_s = \frac{P_h}{\eta_t}, \quad T = \frac{P_s}{2\pi n}$$

Variables

V_g	Displacement per revolution	m³
n	Speed	1/s
Δp	Pressure rise	Pa
η_v	Volumetric efficiency	-
η_t	Overall efficiency	-
Q	Actual flow	m³/s
P_h	Hydraulic power Q Δp	W
P_s	Shaft power	W
T	Shaft torque	N·m

Method and standards

Displacement and energy balance.

Assumptions and limits

- Steady operation; overall efficiency not above the volumetric efficiency.

References

• Positive-displacement pump relations Q = V_g n η_v; P = Q Δp / η

Report details

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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-pump-power

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Reopens the calculator with the inputs of this report.