Hydraulic Line Sizing: Velocity and Pressure Drop

Inside diameter of a hydraulic pressure, return or suction line from flow and recommended velocity, and the pressure drop in the chosen line.

Method: Darcy–Weisbach with laminar and Colebrook friction (FireCAD engine); recommended velocities from fluid power practice

Input parameters

Unit system: SI

Parameter	Value	Unit
Flow	60.000	L/min
Line type	Pressure line (4.5 m/s)	
Chosen inside diameter	19.000	mm
Line length (equivalent)	10.000	m
Oil kinematic viscosity	32.000	cSt
Oil density	870.00	kg/m³

Calculated results

Parameter	Value	Unit
Minimum diameter for the velocity	16.821	mm
Velocity in the chosen line	3.5270	m/s
Reynolds number	2,094.1	
Pressure drop	0.87039	bar

Notes for this case

• Velocities are common practice (pressure lines 2–6 m/s, returns 2–4, suctions 0.6–1.5). Viscosity rises steeply when cold: check start-up pressure drop on suction lines.

Formula and method

$$d_{min} = \sqrt{\frac{4Q}{\pi v_{max}}}, \quad \Delta p = f_D \frac{L}{d} \frac{\rho v^2}{2}$$

Variables

Q	Flow	m³/s
line	Line type	-
d	Chosen inside diameter	m
L	Line length (equivalent)	m
ν	Oil kinematic viscosity	m²/s
ρ	Oil density	kg/m³
d_{min}	Minimum diameter for the velocity	m
v	Velocity in the chosen line	m/s
Re	Reynolds number	-
Δp	Pressure drop	Pa

Method and standards

Pipe friction.

Assumptions and limits

- Drawn tube, roughness 1.5 µm; isothermal; laminar f = 64/Re below Re 2 300.

- A velocity above the line type's figure is flagged.

References

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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-line-sizing

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.