Flow Split Between Two Parallel Pipes

Flow in each of two parallel pipe branches with the same pressure drop, from their lengths, diameters and roughness, by Colebrook friction factors.

Method: Darcy–Weisbach with Colebrook friction factor; equal pressure drop in parallel branches

Input parameters

Unit system: SI

Parameter	Value	Unit
Total flow	100.00	m³/h
Length of branch 1	200.00	m
Diameter of branch 1	102.30	mm
Length of branch 2	300.00	m
Diameter of branch 2	77.900	mm
Pipe roughness	0.045000	mm
Fluid density	998.00	kg/m³
Dynamic viscosity	0.001000	Pa·s

Calculated results

Parameter	Value	Unit
Flow in branch 1	71.790	m³/h
Flow in branch 2	28.210	m³/h
Common pressure drop	104.19	kPa
Share in branch 1	71.790	%

Notes for this case

- Straight pipe friction only; add fittings as equivalent length to each branch. Laminar flow uses 64/Re.

Formula and method

$$\Delta p = f_1 \frac{L_1}{d_1}\frac{\rho v_1^2}{2} = f_2 \frac{L_2}{d_2}\frac{\rho v_2^2}{2}, \quad Q_1 + Q_2 = Q$$

Variables

Q	Total flow	m³/s
L_1	Length of branch 1	m
d_1	Diameter of branch 1	m
L_2	Length of branch 2	m
d_2	Diameter of branch 2	m
ε	Pipe roughness	m
ρ	Fluid density	kg/m³
μ	Dynamic viscosity	Pa·s
Q_1	Flow in branch 1	m³/s
Q_2	Flow in branch 2	m³/s
Δp	Common pressure drop	Pa
Q_1/Q	Share in branch 1	-

Method and standards

Bisection on the split until the drops match.

Assumptions and limits

- Incompressible, steady flow.
- The friction factor jumps from 64/Re to Colebrook at Re 2300; a branch between Re 2000 and 4000 gets a warning that the split is uncertain.

References

- Darcy–Weisbach with Colebrook friction factor; equal pressure drop in parallel branches

Report details

Report reference	FCC-DR89-XWJT (the same inputs always give the same reference)
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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/fluid-mechanics/parallel-pipes-flow-split

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.