

Relief Valve Lab Cheat Sheet

Pressure relief valves: function, types and bench data

ENGINEERING
CHEAT SHEET

Key equations

Quantity	Equation	Notes
Hydraulic power	$hp = p Q / 1714$	Textbook; p in psi, Q in gpm
Zero-flow pressure	590 psi at 0.00 gpm	First reading in the lab table
Linear region slope	$(560 - 440) / (2.00 - 0.50) = 80$ psi/gpm	Computed from the table (mine)
Post's stated step	-20 psi per 0.25 gpm	Same 80 psi/gpm
Steep region slope	$(440 - 360) / (2.37 - 2.00) \approx 216$ psi/gpm	Computed from the table (mine)
Power at 2.00 gpm	$440 \times 2.00 / 1714 \approx 0.51$ hp	Illustration (mine)

Key takeaways

- Two functions: hold system operating pressure and prevent over-pressurization.
- Opens at a set pressure, relieves excess, then closes when normal conditions return. Common on home boilers.
- Direct-acting valves respond quickly; pilot-operated (two-stage) valves have better pressure-flow characteristics and suit high pressure, large flow.
- Instability factors named: chamber size, poppet mass, load variations, nonlinear displacement, discharge coefficient.
- Lab: open a needle valve in steps up to 10 readings; record flow (gpm) and pressure (psi) at each step.
- Result: pressure falls as flow rises, nearly linearly to 2.00 gpm, then more steeply to 2.37 gpm.
- Post wording conflict: results call the late drop 'exponential decay', observations call it a steeper inverse-linear segment.

Bench data from the post

Flow (gpm)	Pressure (psi)
0.00	590
0.50	560
0.75	540
1.00	520
1.25	500
1.50	480
1.75	460
2.00	440
2.25	390
2.37	360