Bubbler (Dip-Tube) Level and Density Measurement

Liquid level above a bubbler dip-tube from the back pressure and liquid density, and the liquid density from two dip-tubes at different depths.

Method: Hydrostatics of purged dip tubes (definitions; Lipták, Instrument Engineers' Handbook, 4th ed. (CRC Press), vol. 1, level)

Input parameters

Unit system: SI

Parameter	Value	Unit
Back pressure, lower tube (gauge)	25.000	kPa
Back pressure, upper tube (gauge)	15.200	kPa
Vertical distance between tube ends	1.0000	m
Liquid density (for level from one tube)	1,000.0	kg/m³
Height of the lower tube end above tank bottom	0.10000	m

Calculated results

Parameter	Value	Unit
Liquid level above the lower tube	2.5493	m
Level above tank bottom	2.6493	m
Measured density (two tubes)	999.32	kg/m³
Level using the measured density	2.6510	m

Notes for this case

- Back pressure equals the liquid head at the tube end once the purge just bubbles. Keep purge flow small so line friction is negligible; vented tanks need gauge pressures.

Formula and method

$$h = \frac{p_1}{\rho g}, \quad \rho_m = \frac{p_1 - p_2}{g\,\Delta h}$$

Variables

p_1	Back pressure, lower tube (gauge)	Pa
p_2	Back pressure, upper tube (gauge)	Pa
Δh	Vertical distance between tube ends	m
ρ	Liquid density (for level from one tube)	kg/m³
z_1	Height of the lower tube end above tank bottom	m
h	Liquid level above the lower tube	m
L	Level above tank bottom	m
ρ_m	Measured density (two tubes)	kg/m³
$h_{\rho m}$	Level using the measured density	m

Method and standards

Hydrostatics.

Assumptions and limits

- Static liquid; negligible purge friction.
- Both tube ends must be submerged for the density; an uncovered upper tube (zero back pressure, or a level below it) is flagged.

References

- Hydrostatics of purged dip tubes (definitions; Lipták, Instrument Engineers' Handbook, 4th ed. (CRC Press), vol. 1, level)

Report details

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Release checks	2 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/instrumentation/pressure-level/bubbler-level-density

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.