Drum Level from DP Transmitter (Density Compensation)

True boiler drum level from a differential pressure transmitter with a cold reference leg, compensated for water and steam density at drum pressure (IAPWS-IF97).

Method: Hydrostatic balance of drum and reference legs; IAPWS R7-97 IF97

Input parameters

Unit system: SI

Parameter	Value	Unit
Drum pressure (absolute)	66.000	bar
Measured differential pressure (reference leg minus drum leg)	3.2000	kPa
Vertical distance between the taps	760.00	mm
Reference (cold) leg temperature	50.000	°C

Calculated results

Parameter	Value	Unit
True water level above the lower tap	562.27	mm
Level, share of the tap distance	73.983	%
Level an uncompensated (cold-water) setting would show	430.68	mm
Uncompensated reading minus true level	-131.59	mm

Formula and method

$$\Delta p = \rho_r g H - \rho_w g h - \rho_s g (H - h) \;\Rightarrow\; h = \frac{(\rho_r - \rho_s) g H - \Delta p}{g(\rho_w - \rho_s)} \qquad h_u = \frac{\rho_r g H - \Delta p}{\rho_r g}$$

Variables

p	drum pressure	Pa
Δp	measured differential pressure	Pa
H	tap distance	m
T_r	reference leg temperature	K
h	true level above lower tap	m
h/H	level share	–
h_u	uncompensated level	m
$\mathcal{E}$	uncompensated minus true	m
ρ_r	reference leg density (IF97)	kg/m³
ρ_w	saturated water density (IF97)	kg/m³
ρ_s	saturated steam density (IF97)	kg/m³
g	standard gravity	m/s²

Method and standards

Hydrostatic balance with densities from FireCAD's IAPWS-IF97; the transmitter's high side on the reference leg.

Assumptions and limits

- Reference leg full and at one temperature; equilibrium drum.

References

- Hydrostatic balance of drum and reference legs
- IAPWS R7-97 IF97

Report details

Report reference	FCC-NHSZ-N90K (the same inputs always give the same reference)
Generated	17 November 2026, 19:34 UTC
Calculator	Drum Level from DP Transmitter (Density Compensation)
Method last reviewed	11 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/instrumentation/pressure-level/drum-level-dp-compensation

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.