Compression Ratio and Clearance Volume

Compression ratio from swept and clearance volumes, or the clearance volume needed for a target compression ratio.

Method: r = (V_s + V_c)/V_c

Input parameters

Unit system: SI

Parameter	Value	Unit
Swept volume per cylinder	1.0390	L
Clearance volume	0.069300	L
Target compression ratio	17.000	

Calculated results

Parameter	Value	Unit
Compression ratio (V_s + V_c)/V_c	15.993	
Clearance for the target	0.064937	L

Formula and method

$$r = \frac{V_s + V_c}{V_c}, \quad V_c = \frac{V_s}{r - 1}$$

Variables

V_s	Swept volume per cylinder	m³
V_c	Clearance volume	m³
r_t	Target compression ratio	-
r	Compression ratio (V_s + V_c)/V_c	-
$V_{c,t}$	Clearance for the target	m³

Method and standards

Geometry.

Assumptions and limits

- One cylinder.
- Static (geometric) ratio. The effective ratio is lower when the inlet valve closes late (Miller and Atkinson timing), and is not computed.

References

- r = (V_s + V_c)/V_c

Report details

Report reference	FCC-Z3C2-MBMT (the same inputs always give the same reference)
Generated	17 November 2026, 19:44 UTC
Calculator	Compression Ratio and Clearance Volume
Method last reviewed	12 November 2026
Software release	FireCAD Calc, release of 17 November 2026
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/automotive/engine/compression-ratio

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.