Powder Metallurgy Compact: Green Density and Porosity

Green density, relative density and porosity of a pressed powder compact from its mass and dimensions and the full (theoretical) density.

Method: Density = mass/volume of a cylinder; porosity = 1 − ρ/ρ_t

Input parameters

Unit system: SI

Parameter	Value	Unit
Compact mass	21.500	g
Compact diameter	15.000	mm
Compact height	18.500	mm
Full (theoretical) density	7,870.0	kg/m³

Calculated results

Parameter	Value	Unit
Green density	6,576.5	kg/m³
Relative density	83.564	%
Porosity	16.436	%

Notes for this case

- Sintering raises the density further and shrinks the part.

Formula and method

$$\rho_g = \frac{m}{\pi D^2 H/4}, \quad \varepsilon = 1 - \frac{\rho_g}{\rho_t}$$

Variables

m	Compact mass	kg
D	Compact diameter	m
H	Compact height	m
ρ_t	Full (theoretical) density	kg/m³
ρ_g	Green density	kg/m³
ρ_g/ρ_t	Relative density	-
ε	Porosity	-

Method and standards

Definitions.

Assumptions and limits

- Solid cylinder.

References

- Density = mass/volume of a cylinder; porosity = 1 − ρ/ρ_t

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/materials/properties/powder-compact-density

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.