Strain Hardening Exponent n and Strength Coefficient K

Hollomon strain-hardening exponent n and strength coefficient K from two points on the true stress–true strain curve, with the uniform strain and predicted UTS.

Method: Hollomon power law and Considère criterion

Input parameters

Unit system: SI

Parameter	Value	Unit
True strain, point 1	2.0000	%
True stress, point 1	380.00	MPa
True strain, point 2	15.000	%
True stress, point 2	540.00	MPa
True strain to evaluate	10.000	%

Calculated results

Parameter	Value	Unit
Strain-hardening exponent	0.17440	
Strength coefficient	751.77	MPa
Flow stress at the strain	503.13	MPa
True uniform strain (= n)	17.440	%
Engineering tensile strength	465.66	MPa

Notes for this case

• Hollomon σ = Kε^n is a straight line on log–log axes, so two points fix n = ln(σ₂/σ₁)/ln(ε₂/ε₁) and K = σ₁/ε₁^n. Necking starts (Considère) at true strain ε_u = n, where the engineering stress peaks at σ_UTS = K·n^n·e^{-n}. Take both points in the uniform plastic range, away from yield-point elongation; a least-squares fit to many points is better.

Formula and method

$$n = \frac{\ln(\sigma_2/\sigma_1)}{\ln(\varepsilon_2/\varepsilon_1)}, \quad K = \frac{\sigma_1}{\varepsilon_1^n}, \quad \sigma_{UTS} = K n^n e^{-n}$$

Variables

ε_1	True strain, point 1	-
σ_1	True stress, point 1	Pa
ε_2	True strain, point 2	-
σ_2	True stress, point 2	Pa
ε	True strain to evaluate	-
n	Strain-hardening exponent	-
K	Strength coefficient	Pa
$\sigma(\varepsilon)$	Flow stress at the strain	Pa
ε_u	True uniform strain (= n)	-
σ_{UTS}	Engineering tensile strength	Pa

Method and standards

Hardening exponent.

Assumptions and limits

- Hollomon law valid between the points; uniform deformation.

References

Hollomon power law and Considère criterion

Report details

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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/hollomon-n-k-fit

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.