

Tension/Compression and Thermal Stress Verification

Sample document with complete example values. It shows the report the purchased export produces for YOUR input - it is not itself a report for any part.

Project: Sample project

Part/Position: no real part

Prepared by: Sample, not released

Overall assessment: OK - the available safety factor against the yield strength meets the required safety factor.

Loading and System

Operating mode	Tension/compression (mechanical)
Axial force F	10,000 N
Rod length L	1,000 mm
Modulus of elasticity E	210,000 N/mm ²
Yield strength R _p	235 N/mm ²
Required safety factor S _{req}	1.5

Cross-section

Cross-section	Direct input, A = 100 mm ²
Area A	100 mm ²

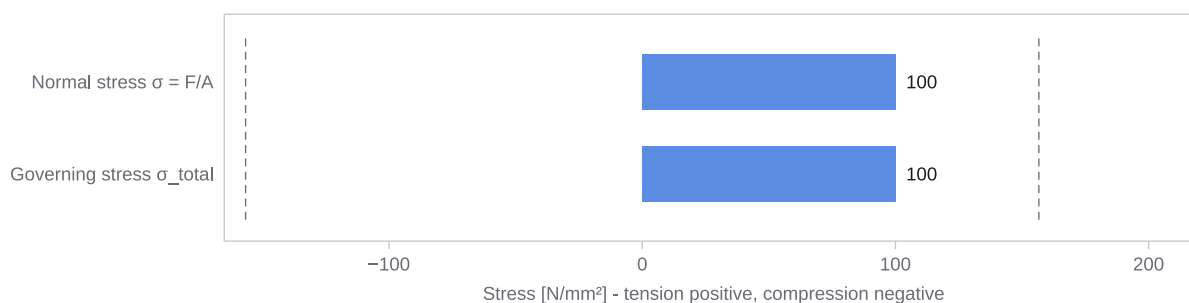
Results

Normal stress $\sigma = F/A$	100 N/mm ²
Governing stress σ_{total}	100 N/mm ²
Strain $\epsilon = \sigma/E$	0.4762 mm/m
Change in length ΔL	0.4762 mm
Allowable stress $\sigma_{allow} = R_p/S_{req}$	156.67 N/mm ²

Verification

Criterion	Value	Limit	Status
Safety factor $S = R_p/ \sigma_{total} $	2.35	1.5	● OK

Stress contributions (dashed: allowable stress)



Calculation basis

Uniaxial tension/compression rod with constant cross-section, linear-elastic per Hooke's law. The normal stress follows from $\sigma = F/A$, the strain from $\epsilon = \sigma/E$, and the change in length from $\Delta L = F \cdot L / (E \cdot A)$. A temperature change expands the free rod by $\Delta L_{th} = \alpha \cdot L \cdot \Delta T$; if the expansion is fully restrained, the thermal stress $\sigma_{th} = -E \cdot \alpha \cdot \Delta T$ results (heating produces compression). In the combined case, the force and thermal components are superimposed. The verification compares the governing stress with the yield strength R_p. A constant cross-section and a temperature that is uniform across it are assumed - a temperature gradient produces its own stresses, which are not covered here. Buckling under compression, notch effects, multiaxial stress states, fatigue and creep are not considered.

About this sample

All values on these pages come from a freely chosen example calculation and belong to no real part. The purchased export contains the same sections with your input, your header data (project, part, prepared by) and as searchable text. Pricing and scope: maschinenbaurechner.de/en/pricing

Note: The results are design and orientation aids. They do not replace independent verification, calculation and approval by a qualified person. The terms of use at maschinenbaurechner.de apply.