# Shrink Fit Heating Temperature

Temperature to heat a hub (or cool a shaft) so it slides on for a shrink fit, from the interference, assembly clearance, diameter and expansion coefficient.

**Method:** Linear thermal expansion Δd = α d ΔT

## Input parameters

Unit system: SI

| Parameter | Value | Unit |
|---|---|---|
| Diametral interference | 40.000 | µm |
| Assembly clearance wanted | 25.000 | µm |
| Fit diameter | 50.000 | mm |
| Expansion coefficient | 12.000 | µm/(m·K) |
| Ambient temperature | 30.000 | °C |

## Calculated results

| Parameter | Value | Unit |
|---|---|---|
| Temperature rise needed | 108.33 | K |
| Heating temperature of the hub | 138.33 | °C |
| Or: cooling temperature of the shaft | -78.333 | °C |

**Notes for this case**

- Linear expansion with a constant coefficient. Heat evenly; bearings, tempered and hardened parts have temperature limits: check the hub temperature against the maker's limit.

## Formula and method

$$\Delta T = \frac{\delta + c}{\alpha\, d}, \quad T_h = T_a + \Delta T, \quad T_c = T_a - \Delta T$$

### Variables

| | | |
|---|---|---|
| $\delta$ | Diametral interference | m |
| $c$ | Assembly clearance wanted | m |
| $d$ | Fit diameter | m |
| $\alpha$ | Expansion coefficient | 1/K |
| $T_a$ | Ambient temperature | K |
| $\Delta T$ | Temperature rise needed | K |
| $T_h$ | Heating temperature of the hub | K |
| $T_c$ | Or: cooling temperature of the shaft | K |

### Method and standards

Linear thermal expansion.

### Assumptions and limits

- Constant α. At cryogenic temperatures α falls, so a cooling result below about −78 °C (dry ice) is optimistic; the page warns, and below liquid nitrogen (about −196 °C) no cooling temperature is shown.
- The hub temperature is not checked against a limit: keep it below the maker's limit for bearings, tempered and hardened parts.

### References

- Linear thermal expansion Δd = α d ΔT

## Report details

| | |
|---|---|
| Report reference | FCC-9WTY-B81H (the same inputs always give the same reference) |
| Generated | 17 November 2026, 19:45 UTC |
| Calculator | Shrink Fit Heating Temperature |
| Method last reviewed | 12 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/mechanical/machine-design/shrink-fit-temperature

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.