

Thermal behaviour of bodies

Solid bodies

Forces acting when solid bodies are cooled

Object of the experiment

1. Demonstrating the force exerted by a cooling metal rod on a bolt

Setup**Observation**

When the rod cools down, the bolt breaks into two pieces.

Evaluation

While the metal rod cools down, it shrinks.

As the bolt is firmly braced with the metal rod, a force acts that is strong enough to break the bolt.

Apparatus

1 Tyndall's bar breaker	381 16
1 Butane gas burner	666 711
1 Butane cartridge, 190 g, set of 3	666 712ET3
1 Stand rod, 47 cm, 12 mm diam.	300 42
1 Leybold multiclamp	301 01
1 Stand base, V-shape, large.....	300 01
or	
1 Bench clamp	301 06

Carrying out the experiment

- Before warming, fix the bolt by fastening the butterfly screw firmly, but not violently.
- Warm the metal rod with big, non-luminous flame for approx. 10 minutes.
- Compensate the longitudinal expansion of the metal rod by further fastening the butterfly screw so that the bolt remains fixed.
- When the butterfly screw cannot be turned any more, remove the burner.
- Loosen the screw at the Leybold multiclamp, and turn the bar breaker so that the bolt is directed downwards (safety measure). Fasten the screw again.
- Observe the bolt for approx. 3 to 10 minutes.