

SMART SPRINGS

WARNING: Smart springs are made from a nickel/titanium alloy and have been heat-treated to provide memory behaviour. Please read the following notes, and under no circumstances overheat a spring. This can destroy the memory and may ignite adjacent materials. Also, take care not to touch heated springs.

About smart springs

The contraction-type spring 'remembers' that it should be closed, and is supplied in this condition. At room temperature, the spring can be pulled out to about 50mm in length. If an electric current, not exceeding 3A is passed through the spring, it heats up to its transition temperature and contracts – with a useful pulling force. When cool, it can be extended again.

Electrical heating

Larger batteries offer the safest method of heating. For example, a 6v lantern battery connected across the two ends of the extended spring will supply sufficient current to close it. But please note: the resistance of the spring is quite low, as therefore the battery will discharge quickly if left connected.

Design notes

The spring cannot be soldered and has to be joined mechanically to any leads. A terminal connecting block offers a simple joining method when the two extremities of the spring are straightened.

A bias spring or mass can be used to open the smart spring at room temperature. This should be sufficient to just open the spring. When current is applied, the contraction force of about 10 Newtons will overcome the bias and do any additional work required. Please note that after a contraction cycle, the rate of relaxation will be slower than contraction but can be speeded up by cooling (e.g., moving surrounding air with a fan).

Possible applications

- *Demonstrations of shape memory alloy.*
- *Sensing over-temperature conditions.* E.g., a stretched spring will contract if heated sufficiently in an accidental fire. It can be linked to a mechanical system for closing a lid or door.
- *Actuation.* Using electrical heating, the spring can become a linear actuator requiring no other moving parts. Uses include: robotics, pumps, window opening, locks.