

# Experiments with Memory Wire

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The following experiments with NiTiNol (memory) wire are designed to explore some of the characteristics of this relatively new material. The type of wire used is Flex-150 supplied by [www.mikromodellbau.de](http://www.mikromodellbau.de) it has an impedance of 50 ohms/m with a maximum current rating of 400 mA. 15 cm lengths of wire were used for all of the experiments.

## Experiment 1

The wire is wound into a coil shape with a diameter of 1 cm (**Figure 1**). To reduce current flow through the wire a 15 ohm / 2 W resistor is placed in series with the memory wire and power is supplied from a 4 to 6 V battery. When the current is turned on the wire unwinds and returns to its original straight shape. The temperature rise in the wire required for this effect to take place is less than 100 °C.

## Experiment 2

A length of memory wire is tensioned with a spring (**Figure 2**). With a tension of around 30 N the wire is elongated by 4 to 5 % (be careful, over stretching will shorten its life). When the current is switched on the wire remembers its original length and contracts. Switching the current off causes the wire to cool down and be stretched out by the spring again. The contraction speed is relatively fast (100 to 200 ms) while the process of stretching out takes a little longer because heat in the wire requires time to dissipate (approx. 500 ms). Use a couple of 3 mm bolts together with two washers and nuts to clamp the wire ends.

## Experiment 3

This layout is similar to experiment 2 but does not rely on a spring to apply tension to the wire as it cools. The wire is held in tension by a bolt at either end while a contact is made at

the centre of the wire. When current is passed from one end of the wire through the centre contact it produces heating in that half of the wire which contracts, pulling the centre of the wire towards it. The current is now switched off and switched on through the other half of the wire which pulls the centre point of the wire back in the other direction. This arrangement enables the centre point to move in both directions with equal speed.

## Experiment 4

The wire is placed around a curved former with a small weight of around 1 gram attached to the end of the wire (see **Figure 3**). When current is passed through the wire it straightens and lifts the weight.

### Some further possible applications:

Remote control: two wires can be used to move a rudder or control surface.

Thermoelectric relay.

A low speed motor.

Special effects: A wire could be used to produce 'unexplained' or apparently ghostly movement of objects without any obvious source of motive force.