

## Electromagnetism and induction

### Transformers

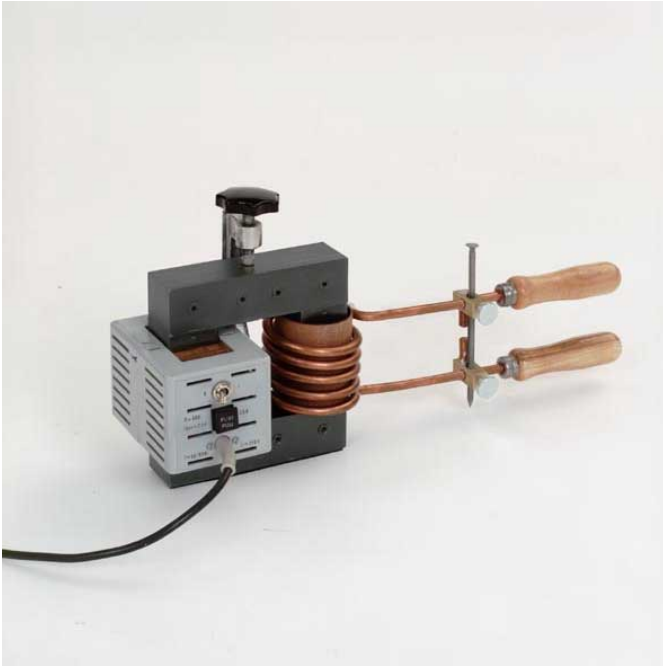
#### Model of a high-current transformer

##### Melting a nail

### Object of the experiment

1. Demonstrating the heating effect of a high-current transformer

### Setup



Experiments involving the coil with 5 turns are accompanied by a large evolution of heat:

- Therefore set up the high-current transformer on a heat-resistant table or put a wire gauze (667104) under the spot welding pliers.
- Limit the duration of the experiment to about 30 s.

### Apparatus

1 coil with 500 turns, main.....	562 21
1 coil with 5 turns .....	562 19
1 U-core with yoke .....	562 11
1 clamping device .....	562 12
1 wire gauze, 50 x 50 cm .....	667 104

Additionally required:

1 iron nail approx. 3.1 x 80 mm

### Carrying out the experiment

- Insert the iron nail in the clamping device the spot welding pliers being slightly pressed together. Fasten the two clamping screws.
- Switch the coil with 500 turns on, and observe the nail until it has melted.

Remark:

The parts of the melted nail can be rejoined by pressing together the spot welding pliers (switch the coil with 500 turns off in good time).

### Observation

After the coil with 500 turn has been switched on, the nail starts to glow and then melts.

### Evaluation

In the high-current transformer set up for this experiment, the ratio of the numbers of turns of the primary and secondary coil is  $\frac{100}{1}$ .

Due to the current transformation ratio of the high-current transformer ( $\frac{N_1}{N_2} = \frac{I_2}{I_1}$ ), the secondary current is 100 times the primary current.

The large secondary current leads to a strong warming of the clamped iron nail.

Remark:

If the current in the primary circuit is to be measured, an experimental setup like that in D 3.5.6.4.c is recommendable.