

## Electricity with the Modular System

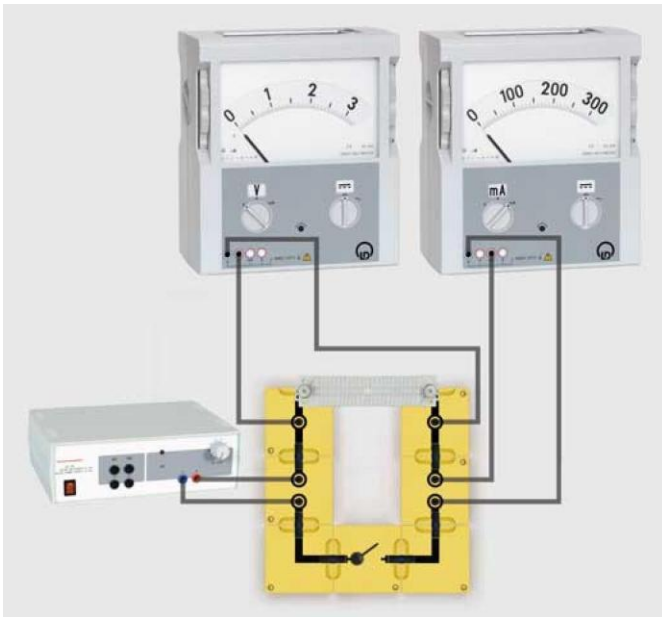
Basic Electric Circuits  
Electrical resistance

Relationship between re-  
sistance and cross-section  
of a wire

### Objective of the experiment

To investigate the relationship between resistance and cross-section of a wire.

### Setup



### Apparatus

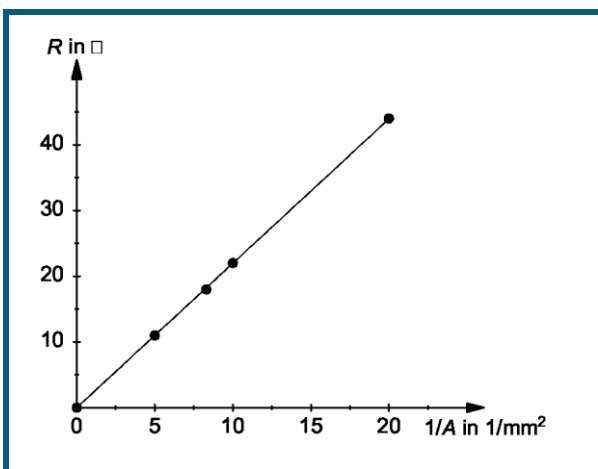
1	567 18	Wire wrapping plate
1	550 46	Chrome-nickel wire, $d = 0,25$ mm
2	539 060	Adapter plug, BST
1	539 025	Toggle switch, BST
2	539 002	Connector blocks BST, straight, 1 socket
2	539 003	Connector blocks BST, straight, 2 sockets
2	539 004	Connector blocks BST, 90° angle
6	539 000	Bridging plug, BST
2	531 906	Demo multimeter, passive
1	521 49	Power supply, 12 V DC, 230 V
6	500 644	Safety connection lead, 100 cm
1	500 411	Connection lead, 25 cm
1	from 501 861	Croc-clip
1	301 300	Demonstration experiment frame
1	301 301	Adhesive magnetic board

**Carrying out the experiment**

- Wind the chrome-nickel wire ( $d = 0.25$  mm) around the wire wrapping plate (25 turns) and clamp the ends of the wire used for contacting under the clamping screws.
- Insert the wire wrapping plate into the adapter plug. Close the switch and adjust the power supply to a voltage of 3 V across the wire wrapping plate.
- Read the current and voltage from the demo multimeter and enter them into the table.
- Repeat the measurement with chrome-nickel wires of the same length and diameters  $d$  of 0.35 mm, 0.40 mm and 0.50 mm.
- Calculate cross-section  $A$  of wires from diameters  $d$  ( $A = \pi r^2$ ).
- Calculate resistances of wires from voltages  $U$  and currents  $I$  ( $R = \frac{U}{I}$ ).

**Measuring example**

Diameter $d / \text{mm}$	0.25	0.35	0.40	0.50
Cross-section $A / \text{mm}^2$	0.05	0.10	0.12	0.20
$1 / A$ / $1 / \text{mm}^2$	20.0	10.0	8.3	5.0
Voltage $U / \text{V}$	3	3	3	3
Current $I / \text{A}$	0.068	0.135	0.165	0.270
Resistance $R / \Omega$	44	22	18	11

**Evaluation**

The resistance  $R$  of a wire increases in inverse proportion to its cross-section  $A$ :  $R \sim \frac{1}{A}$