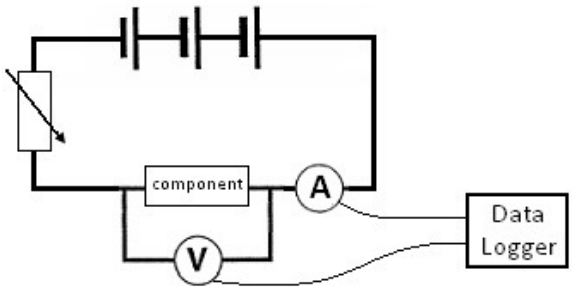
Ohm's Law and IV graphs

Ohm's Law

We know that a voltage (or potential difference) causes a current to flow and that the size of the current depends on the size of the p.d.

For something to obey Ohm's law, the current flowing is proportional to the p.d. pushing it. $V=IR$ so this means the resistance is constant. On a graph of current against p.d. this appears as a straight line.

Measuring current and potential difference



To find how the current through a component varies with the potential difference across it we must take readings.

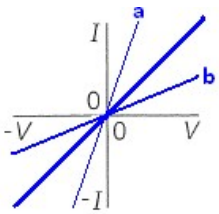
To measure the potential difference, we use a voltmeter connected in parallel across the component, and to measure the current we use an ammeter connected in series.

If we connect the component to a battery, we would now have one reading for the p.d. and one for the current. But what we require is a *range* of readings. One way around this would be to use a range of batteries to give different p.d.s. A better way is to add a variable resistor to the circuit, this allows us to use one battery and get a range of readings for current and p.d. To obtain values for current in the negative direction we can reverse either the battery or the component.

I-V Graphs

Resistor

This shows that when p.d. is zero, so is the current. When we increase the p.d. in one direction the current increases in that direction. If we apply a p.d. in the reverse direction, a current flows in the reverse direction. The straight line shows that current is proportional to p.d. and it obeys Ohm's law. Graph **a** has a lower resistance than graph **b** because for the same p.d. , less current flows through **b**.

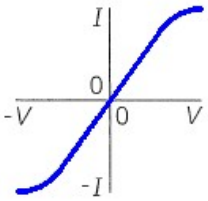


Ohmic Resistor

Filament Lamp

At low values the current is proportional to p.d. and so, obeys Ohm's law.

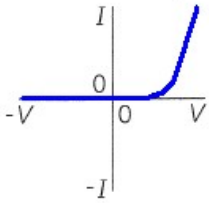
As the potential difference and current increase so does the temperature. This increases the resistance and the graph curves, since resistance changes it no longer obeys Ohm's law.



Filament Lamp

Diode

This shows us that in one direction increasing the p.d. increases the current but in the reverse direction the p.d. does not make a current flow. We say that it is forward biased. Since resistance changes it does not obey Ohm's law.



Semiconducting Diode

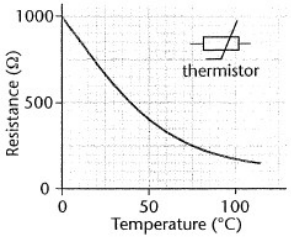
Types of variable resistors

Variable Resistor

A variable resistor is a resistor whose value can be changed.

Thermistor

The resistance of a thermistor varied with temperature. At low temperatures the resistance is high, at high temperatures the resistance is low.



Light Dependant Resistor (L.D.R)

The resistance of a thermistor varied with light intensity. In dim light the resistance is high and in bright light the resistance is low.