

# The quantitative relationship between power, voltage and current

## Introduction

There is a relationship between power  $P$ , voltage  $V$  and current  $I$ . This relationship is best summarised as  $P=IV$ .

## Apparatus

Datadisc Au  
Voltage sensor ( $\pm 20V$ )  
Current sensor ( $\pm 100mA$ )  
Logbook XD, ML or SE



A serial lead or USB-serial lead





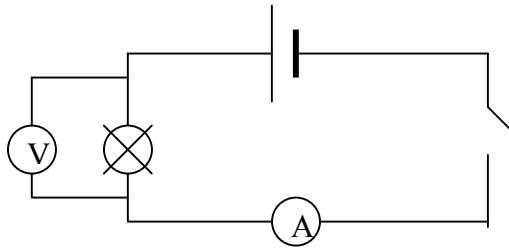
An electric circuit:  
A switch  
A DC power supply (5V, 350 mA)  
A filament bulb (6.5V, 0.3A)  
6 wires

## Duration

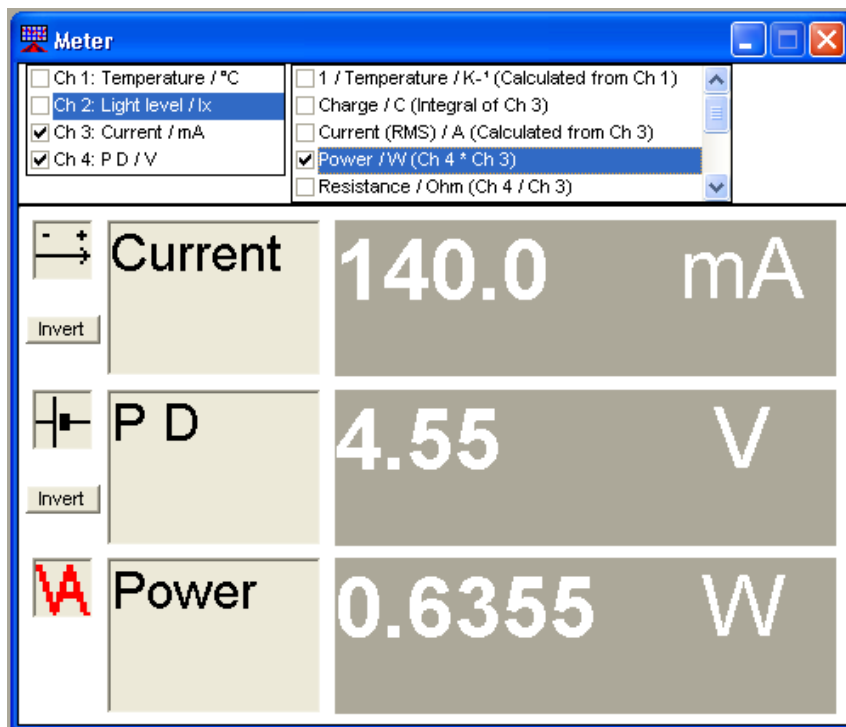
30 minutes


## Method

1. Plug the Logbook into the PC using a serial lead or USB-serial lead.
-  2. Plug the Current sensor into port 1 or 3 according to the Logbook you are using.
-  3. Plug the Voltage sensor into port 2 or 4.
4. Prepare your electric circuit including the two sensors:





5. Start Datadisc Au.
6. Select "Power":
  - a. Click on "Measure" and then click on "Meter". A menu will appear asking you to choose channels to meter.
  - b. Click on "OK". You will see the current and voltage readings. Add the power reading by ticking the right case at the top of the window. Remove the readings you don't need (Temperature, Light level) if you are using Logbook SE or ML.
  - c. Switch on the lamp to see if the current and the voltage are positive. If not, click on "Invert".



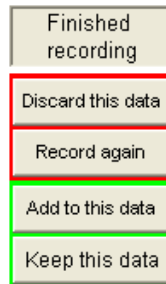
- d. Switch off the lamp.
-  e. Close the Meter window.
7. Click on "Measure".
8. Click on "Auto time". Then the Recording window will open.
9. Choose the channels you want to measure on the toolbar if you are using Logbook ML or SE.



10. To make the recording:

- a.  Click on the green recording icon on the toolbar: this starts the recording.
- b. Start the experiment: switch on the lamp.
- c. Wait for the current and the voltage to stabilize.
- d.  Stop recording by clicking on the red hand after about one minute. You can see the time on the X-axis.
- e. Switch off the lamp.
- f. The graph should show three constant values.


11. Click on “Keep this data”.

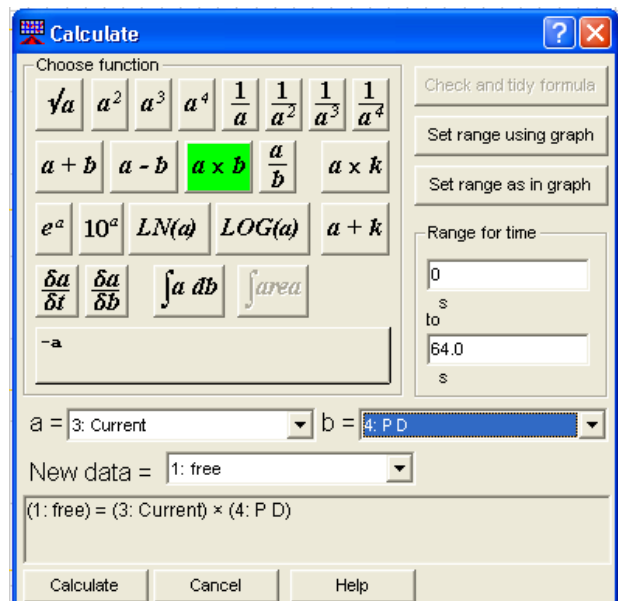


### How to save your recording

1. Click on “File”.
2. Click on “Save as...”.
3. Choose the directory you want to save in and type the name of your file.
4. Click on “Save”.

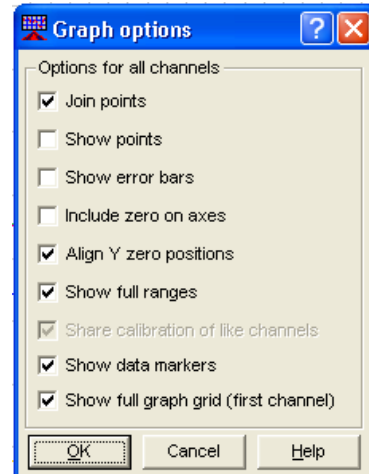
### How to find the relationship between the power, voltage and current

1. Click on “Data”.
2. Click on “Calculate”.
3. Click on “Function”. The Calculate window will open.
4. Click on .
5. Choose “a=Current” and “b=P D”.
6. Click on “Calculate”.



## How to amend the graph

1. Click on “Graph”.
2. Click on “Plot options...”.
3. Tick “Align Y zero positions” and “Show full ranges”.
4. Click on “OK”.



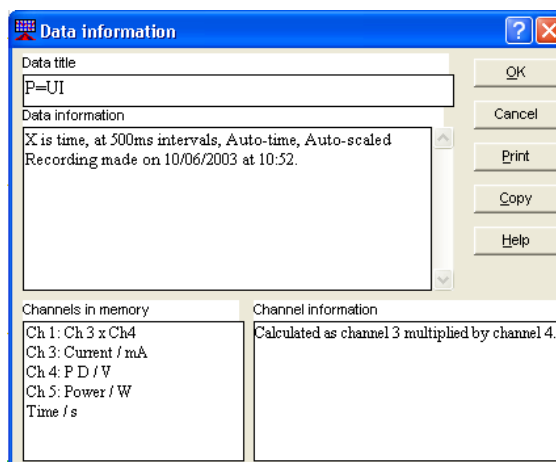
5. You can see that the calculated function is the same as the power recording. The calculated function is in mW and the power in W, which explains the difference you can see. So, what is the relationship between power, current and voltage?

## How to change the colour of a graph

1. Double click on the graph you want to modify. A “graph symbols and lines” dialogue will open.
2. Choose all the options you want.
3. Click on “OK”.

## How to store information about your recording

1. Click on “Data”.
2. Click on “Data information”.
3. Type all the information you want in “Data title” and “Data information”.



4. Click on “OK”.

## How to save your file and exit

1. Click on "File".
2. Click on "Save".
3. Click on "File".
4. Click on "Exit".

