

Voltage

Introduction

This practical work will help discover the differences between a series circuit and a parallel circuit and allows the observation of the influence of the number of lamps on the voltage in both circuits.

Materials

Description	Quantity	Reference
Tooxy device	1	480 000
Voltage sensor	1	482 201
Power supply Evolio F3-12V / 1A	1	281 001
E10 socket	3	283 044
Electrical supply lead red 50 cm	5	283 073
Electrical supply lead black 50 cm	5	283 078

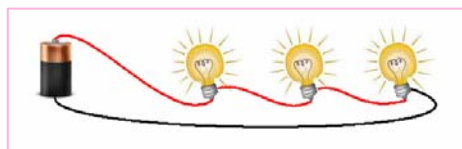
Experimentation



Voltmeter must be connected in parallel in the circuit

SERIES / PARALLEL CIRCUIT

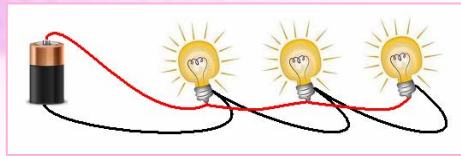
In a **series** circuit, lamps are mounted in the following manner:



In your opinion

- What impact will adding lamps in series in the circuit have on the brightness?
- How will the terminal voltage of each lamp change?
- What happens if a light bulb burns out?

In a **parallel circuit**, lamps are mounted in the following manner:



In your opinion

- What impact will adding lamps in parallel in the circuit have on the brightness?
- How will the terminal voltage of each lamp change?
- What happens if a light bulb burns out?

ADDING LAMPS IN A SERIES CIRCUIT

- Set up the wiring as shown in the photo to the right
- Measure the terminal voltage of the lamp
- Measure the terminal voltage of the power supply



	Power supply (U)	Lampe (U _L)
Voltage (V)		

- What do you notice about these two voltage readings?

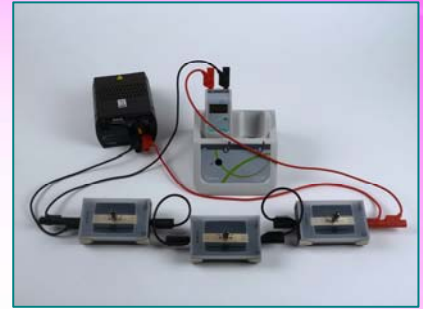
- Add a lamp to the series circuit
- Set up the wiring as shown in the photo to the right
- Measure the terminal voltage of lamp 1
- Measure the terminal voltage of lamp 2
- Measure the terminal voltage of both lamps



	Power supply (U)	Lamp 1 (U _{L1})	Lamp 2 (U _{L2})	Lamp 1 + 2 (U _L)
Voltage (V)				

- What relation exists between these four voltage readings?
- What has happened to the brightness of the lamp?

- Add a lamp to the series circuit
- Set up the wiring as shown in the photo to the right
- Measure the terminal voltage of lamp 1
- Measure the terminal voltage of lamp 2
- Measure the terminal voltage of lamp 3
- Measure the terminal voltage of all 3 lamps



	Power supply (U)	Lamp 1 (U_{L1})	Lamp 2 (U_{L2})	Lamp 3 (U_{L3})	Lamp 1 + 2 + 3 (U_L)
Voltage (V)					

- What relation exists between these five voltage readings?
- What has happened to the brightness of the lamp?
- What happens if you remove one bulb from its support?

ADDING LAMPS IN A PARALLEL CIRCUIT

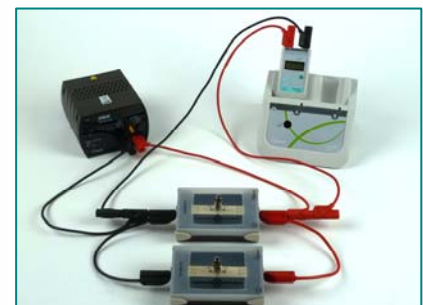
- Set up the wiring as shown in the photo to the right
- Measure the terminal voltage of the lamp
- Measure the terminal voltage of the power supply



	Power supply (U)	Lampe (U_L)
Voltage (V)		

- What do you notice about these two voltage readings?

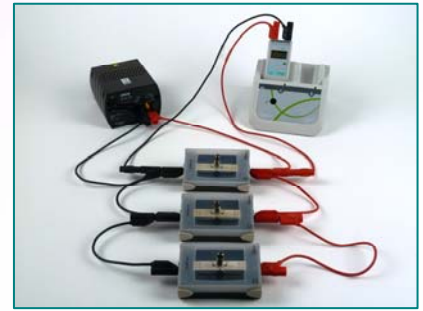
- Add a lamp to the series circuit
- Set up the wiring as shown in the photo to the right
- Measure the terminal voltage of lamp 1
- Measure the terminal voltage of lamp 2
- Measure the terminal voltage of both lamps



	Power supply (U)	Lamp 1 (U_{L1})	Lamp 2 (U_{L2})	Lamp 1 + 2 (U_L)
Voltage (V)				

- What relation exists between these four voltage readings?
- What has happened to the brightness of the lamp?

- Add a lamp to the parallel circuit
- Set up the wiring as shown in the photo to the right
- Measure the terminal voltage of lamp 1
- Measure the terminal voltage of lamp 2
- Measure the terminal voltage of lamp 3
- Measure the terminal voltage of all 3 lamps



	Power supply (U_{L2})	Lamp 1 (U_{L1})	Lamp 2 (U_{L2})	Lamp 3 (U_{L3})	Lamp 1 + 2 + 3 (U_L)
Voltage (V)					

- What relation exists between these five voltage readings?
- What has happened to the brightness of the lamp?
- What happens if you remove one bulb from its support?

Conclusion

In a series circuit:

How does the brightness of the bulb and the terminal voltage change?

How does the voltage change when lamps are added to this type of circuit?

In a parallel circuit:

How does the brightness of the bulb and the terminal voltage change?

How does the voltage change when lamps are added to this type of circuit?

What are the advantages/disadvantages of series/parallel circuits?

What applications could be envisaged for lamps in series / in parallel?

Complete:

In a *series* circuit, voltages....., $U = U_1 \dots U_2 \dots U_3$

In a *parallel* circuit, voltages....., $U = U_1 \dots U_2 \dots U_3$