MATRIX | RENEWABLES

Advanced Photovoltaic Energy

MATRIX
CP7526
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Contents

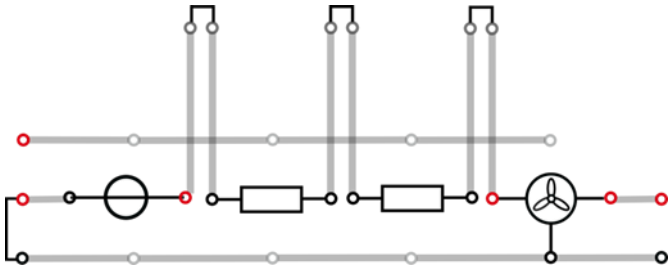
Electrical Basic Experiments

Setup of a simple circuit

Task

Set up a simple electrical circuit.

Setup



Required devices

- base unit
- 1 PowerModule (V=5V)
- 1 resistor module, triple
- 2 resistor plug elements (R=100Ω)
- 1 motor module

Execution

1.Set up the experiment according to the circuit diagram. Plug in every resistor module one resistor.
2.Open and close the electrical circuit by:
a) Plug in/plug off a cable.
b) Plug in/plug off a current bridge.
c) Plug in/plug off a resistor
3.Note your observations.

Observation

_____

_____

_____

_____

Evaluation

1. Formulate reasons for the behaviour of the motor.

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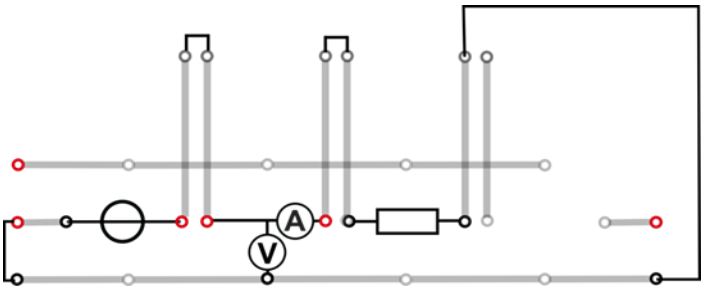
Electrical basic experiments

Ohm's Law

Task

Investigate Ohm's law with several resistors

Setup



Required devices

- base unit
- 1 power module
- 1 resistor module, triple
- 3 resistor plug elements (R=100Ω, R=33Ω, R=10Ω)
- 1 AV-Module

Execution

1. Set up the experiment according to the circuit diagram.
2. Measure voltage and current for various resistances:
   - R=100Ω
   - R=33Ω
   - R=10Ω
3. Note your measured data in the table and calculate each the ratio V/I.

Measurement

R (Ω)	100	33	10
V (V)			
I (mA)			
V/I (Ω)			

Evaluation

1. Deduce a connection between resistance R and ratio V/I. Which lawfulness can be derived?

Electrical basic experiments

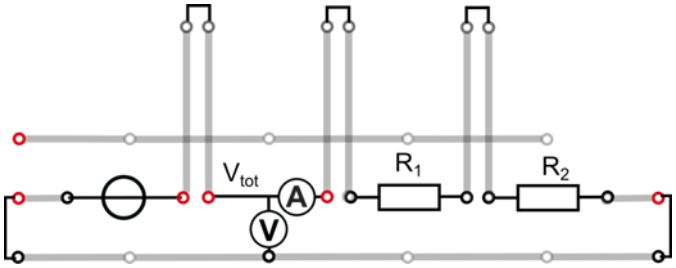
Series connection of ohmic resistances

Task

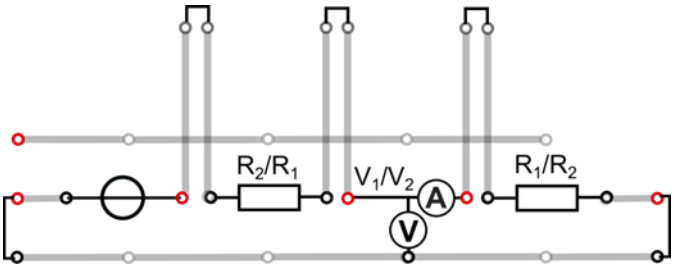
Examine the series connection of ohmic resistances.

Setup

Setup to measure the total voltage



Setup to measure the single voltage



Required devices

-base unit
- 1 PowerModule
- 1 resistor module, triple
- 4 resistor plug elements
  (2x R=100Ω, 2x R=10Ω)
- 1 AV-Module

Execution

1.Start with a series connection of 2x100Ω. Measure each voltage and current over both resistances (V_{tot} and the single voltage (V_1, V_2) for the following circuits:

- R_1=100Ω / R_2=100Ω
- R_1=100Ω / R_2=10Ω
- R_1=10Ω / R_2=10Ω

2.Set up the experiment according to the voltage measurement. To measure the single voltage over each module, it is necessary to change the position of the resistor modules intermediate.

3. Note your measured data in the table.

Measurement

	R_1=100Ω / R_2=100Ω	R_1=100Ω / R_2=10Ω	R_1=10Ω / R_2=10Ω
V_1 (V)			
V_2 (V)			
V_{tot} (V)			
I (mA)			
$R_{tot}=V_{tot}I$ (Ω)			

Evaluation

1.Calculate each the ratio $R_{tot}=V_{tot}/I$ and note your values in the table above.
2. Calculate each the sum of the single voltages ($V_1 + V_2$) and compare it the voltage over both resistances (V_{tot}).
3. What is the influence of the resistance on the current I and the voltages $V_1 + V_2$ and V_{tot}?
4. What is the connection between the total resistance R_{tot} and the single resistances?
5. Formulate a law for the calculation of the total resistance in a series connection of resistances.

2.

	$V_1 + V_2$	V_{tot}
R_1=100Ω / R_2=100Ω:		
R_1=100Ω / R_2=10Ω:		
R_1=100Ω / R_2=10Ω:		

3.

4. + 5.

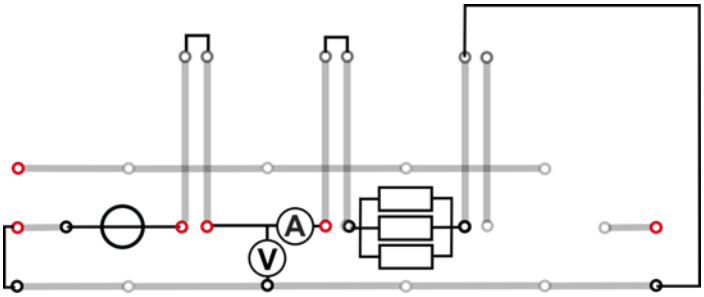
Electrical basic experiments

Parallel connection of ohmic resistances

Task

Examine the parallel connection of ohmic resistances.

Setup



Required devices

-Base unit
- 1 PowerModule
- 1 resistor module, triple
- 6 resistor plug elements
  (3x R=100Ω, 2x R=10Ω, 1x R33Ω)
- 1 AV-Module

Execution

1.Set up the experiment according to the circuit diagram. Start with 1 x 100 Ω resistance.
2.Measure each voltage and current for the following circuits:
- R_1=100Ω
- R_1=100Ω / R_2=100Ω
- R_1=100Ω / R_2=100Ω / R_3=100Ω
- R_1=10Ω / R_2=10Ω / R_3=33Ω

3. Note your measured data in the table.

Measurement

	R_1=100Ω	R_1=100Ω / R_2=100Ω	R_1=100Ω / R_2=100Ω / R_3=100Ω	R_1=10Ω / R_2=10Ω / R_3=33Ω
V (V)				
I (mA)				
R_{tot}=V/I (Ω)				

Evaluation

What is the influence of the resistance on the current I and the voltage V?
Formulate a law for the calculation of the total resistance in a parallel connection of resistances.

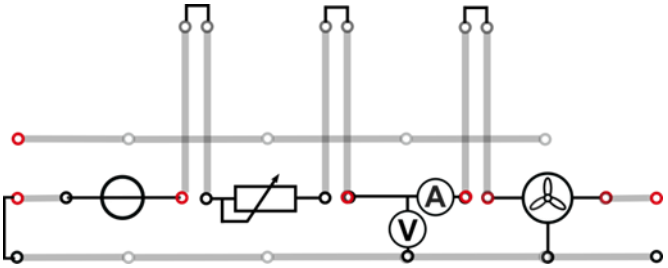
Electrical basic experiments

Start-up idling behaviour of a motor

Task

Examine the Start-up and the idling behaviour of a motor

Setup



Required devices

-base unit
-1 power module
-1 potentiometer module
-1 motor module
-1 AV module

Execution

1. Set up the experiment according to the circuit diagram.
2. Use the potentiometer to find the operation point where the motor starts. Measure current and voltage at this point and repeat the measurement twice.
3. Then find the operation point, where the motor is just turning before turning into resting position. Measure current and voltage at this point and repeat the measurement twice.

Measurement

1. Operation point: motor starts turning

	1. measurement	2. measurement	3. measurement
V (V)			
I (mA)			

2. Operation point: motor turns into resting position.

	1. measurement	2. measurement	3. measurement
V (V)			
I (mA)			

Evaluation

1.Determine the required start-up voltage and current.
2.Determine the lowest operation voltage and current.
3.Explain the difference between both.

1.
_____
_____

2.
_____
_____

3.
_____
_____
_____
_____

The full version of this curriculum is available upon purchase of the kit.

Please see contents for a full list of experiments from the full version.