جامعة محمد بوضياف- المسيلة -
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كلية التكنولوجيا
Faculty of Technology
قسم الهندسة الكهربائية
Department of Electrical Engineering
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University year: 2025/2026	السنة الجامعية : 2026/2025
2nd year Electrical Engineering	السنة الثانية هندسة كهربائية
Applied Work in Electrical and Electronic Measurements	أعمال تطبيقية في القياسات الكهربائية والإلكترونية

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PW n°01 : Resistance measurement

Duration : $1^{h}30$.

Date of the experiment: ………. /……../………….. .

Report prepared by:

Last Name	**First Name**	**Group**	**S/Group**	**Final Note**
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Instructions :

- **Internal laboratory regulations must be observed.**
- **You must wear a lab coat.**
- **Attendance is compulsory and will be monitored. Any unjustified absence or failure to hand in a report will result in a mark of 0/20.**
- **Have your assemblies checked before connecting the voltage source.**
- **It is strictly forbidden to move equipment from one station to another. In the event of a breakdown or faulty equipment, contact the teacher.**
- **The report must be written by a maximum of four students.**
- **The report must be handed in at the beginning of the next session.**
- **The report must include the following sections:**
  - **TP cover page.**
  - **The date of the practical session.**
  - **Last Name and first name of the main writer.**
  - **Last Names and first names of the WP participants.**
  - **Preparation and work in manuscript.**

Person in charge of practical work: Pr ROUABHI.R

I. Aim of the manipulation

- ✓ Measure the unknown resistances using the following methods: Colour Code; Ohm Meter; Volt-Amperometric.
- ✓ Evaluate the absolute and relative accuracy of each method.

II. Equipment used

- ➢ Power Sources (DC).
- ➢ Resistors.
- ➢ Instruments (voltmeters, miliammeter, microammeter, multimeters).

III. Evaluation method

Continuous assessment: 100%.

IV. Theoretical reminder

A resistor is an electronic or electrical component whose primary characteristic is to resist the flow of electric current, measured in ohms. Electrical resistance is a fundamental part of electricity. The term "resistance" primarily refers to a physical property, but it has also come to refer to a specific type of component. Some people prefer to call it a "resistive device".

V. Method n°01: Direct measurements using Color Code Designation

To determine the ohmic value of a resistor, it is necessary to identify the colour bands present on the resistor (see Figure 1) and associate them with the universal colour code. The international standard IEC 60757, entitled "Colour Code Designation" (1983), defines a colour code to be applied to resistors to indicate their resistance values.

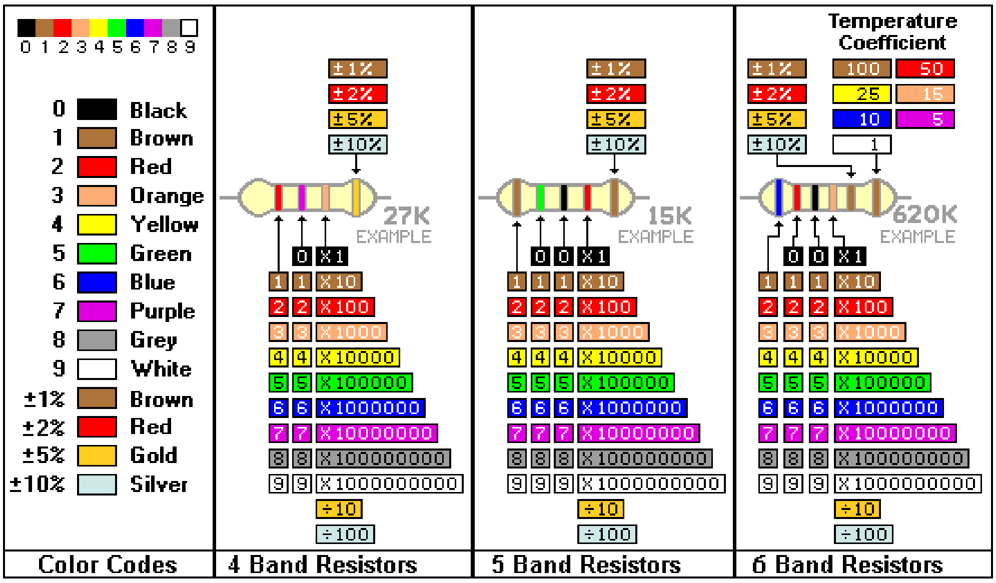


Figure 1: Resistor Color Code

R_1= ΔR_1= R_2= ΔR_2=

VI. Method n°02 : Direct measurements using the ohmmeter

Measure the values of resistors $\mathbf{R_1}$, and $\mathbf{R_2}$ using the multimeter in ohmmeter mode, then calculate the relative ∂R and absolute ΔR uncertainties using the following relationship:

$$\Delta R = R * precision + number\ of\ digits * resolution$$

Instructions for recording the accuracy of the measurements provided according to the range used are given in the uncertainty table below:

Range	*Precision +Number of digits*	*Resolution*	*Uncertainty*
200Ω	±(1%+3 digits) 0,1Ω	0,1Ω	4,5Ω
2kΩ	(0,8%+1digits)	1Ω	30Ω
20kΩ	±(0 ,8%+1 digits)	10Ω	300Ω
200kΩ	±(0,8%+1digits)	100Ω	3kΩ
2MΩ	±(0.8%+1 digits)	1kΩ	42kΩ
20MΩ	±(2%+2 digits)	10kΩ	620kΩ

Table 1

Measure the resistances, then calculate the measurement uncertainty and complete the following table

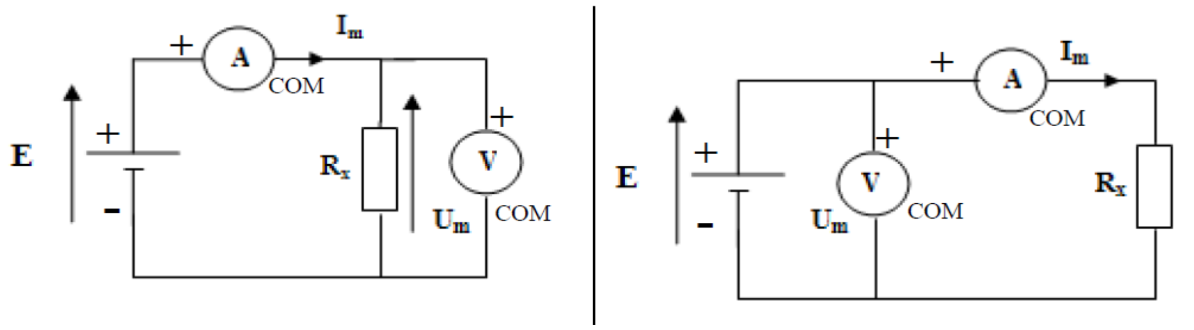
	Measurement of R_1=220Ω	Measurement of R_2=220KΩ
Range		
R		
ΔR		
$\partial R = \Delta R/R$		

Table 2

VII. Method n°03 : Indirect measurements using the Volt-Amperometric method

1) Selecting the appropriate circuit

This involves selecting the appropriate circuit, upstream or downstream, for measuring each of the resistors R_1 and R_2 resistors, specifying the measuring equipment. Then, once the measurements have been made, determine the value of each resistor and its uncertainty for the selected circuit.



Downstream assembly (short derivation) Upstream assembly (Long derivation)

Figure 2

The choice of the assembly is made according to the following rule:

If $R \leq \sqrt{R_A * R_V}$ (low value resistances), we prefer the short assembly;

If $R \geq \sqrt{R_A * R_V}$ (high value resistances), we prefer the long assembly;

2) Measurement Table

E=5V,

Miliammeter Class =…………..

Microammeter Class =…………..

Voltmeter Class =…………..

3) Remarks

- **Absolute uncertainty ΔX**: Calculation of the absolute uncertainty **ΔX** due to a measuring device

$$\Delta X = \frac{\boldsymbol{Class * Rang}}{\mathbf{100}}$$

- **Relative uncertainty:** $\partial X = \Delta X / X$ generally expressed as a percentage (%).

- **$\Delta R/R = \Delta I/I + \Delta V/V$**

- Measure the current and voltage for the two risistors R_1, R_2.
- Record the measured and calculated results in the table below:

	R_1=220Ω	**R_1=220Ω**	**R_2=220KΩ**	**R_2=220KΩ**
Assembly adopted	**Downstream**	**Upstream**	**Downstream**	**Upstream**
Range for I (C_A)				
Scale for I (E_A)				
Current reading (L_A)				
Im=(L_A *C_A/E_A)				
Range for V(C_V)				
Scale for V (E_V)				
Voltage reading (L_V)				
Um= (LV *C_V/E_V)				
Rm=Um/Im				
ΔRm				

Table 3

Interpretation of results

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VIII. Conclusion

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