Thermometers Comparison

Introduction:

As mentioned before, temperature is one of the most important phenomena that needed to be measured in real life applications; consequently there are more than 20 different types of thermometers these days. These thermometers have different specifications, such as measuring method, temperature range, linearity, stability, repeatability, accuracy and response time…etc.

Thermocouples, RTDs and Thermistors, are the most common thermometers in real life applications. Engineer chooses the suitable thermometer according to the specification of the application. In this experiment, you will be able to compare the behavior and the characteristics of these thermometers.

Experiment Procedure:

1. Refer to running procedure in Thermocouple Experiment.
2. Choose Experiment 4:" **Thermometers Comparison**".

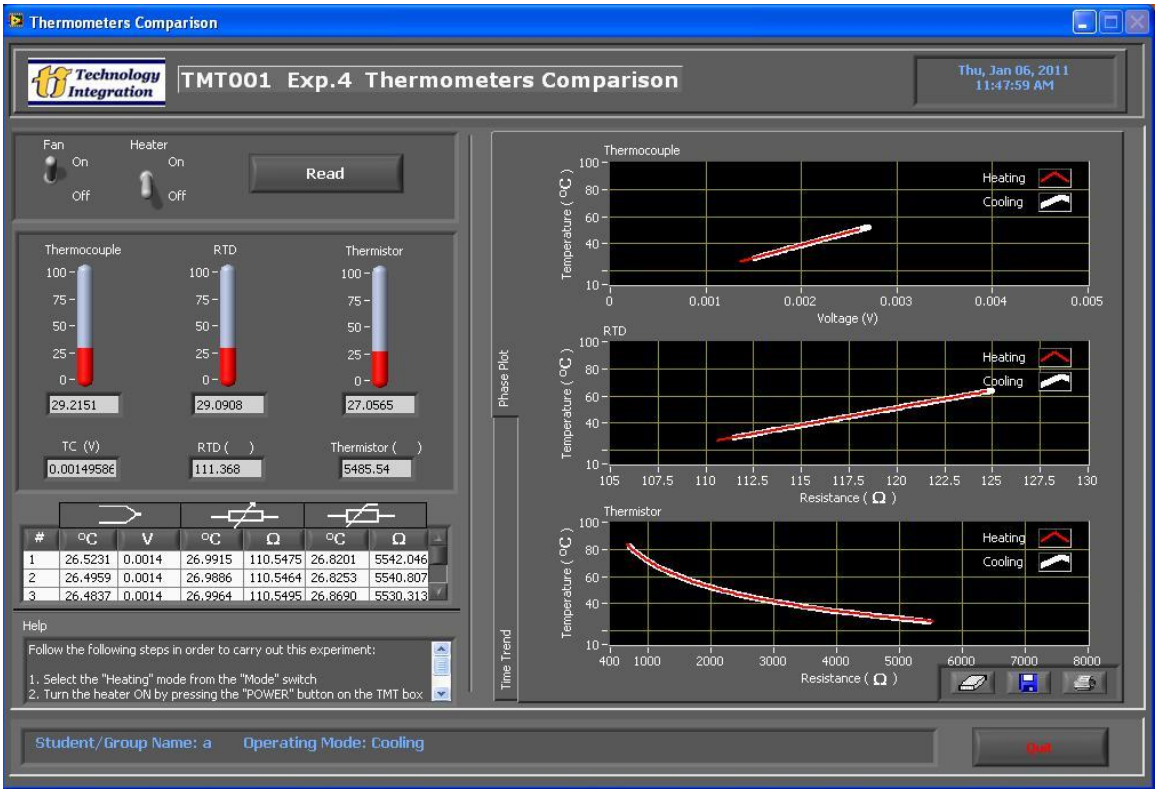

Figure (1): Thermometers Comparison Experiment.

3. Study the front panel carefully and observe the buttons on the screen.

4. Turn the **Heater** ON by pressing ON the **Heater Switch** on the screen (Heating Mode).

5. Start taking readings by pressing **[Read]** button over different temperature values.

6. The acquired readings appear on the Temperature-Resistance graph as red points.

7. Compare the read temperature values with the temperature of the glass thermometer.

8. Which thermometer has the closest readings compared to the glass thermometer readings:

   a) Thermocouple
   b) RTD
   c) Thermistor

9. Turn the **Heater** OFF by pressing OFF the **Heater Switch** on the screen.

10. Turn the **Fan** ON by pressing ON the **Fan Switch** on the screen (Cooling Mode).

11. Start taking readings by pressing [Read] button on different temperature values.

12. The acquired readings appear on the Temperature-Voltage (or Resistance) graph as white points.

13. Are the cooling curves of the thermometers the same as the heating curves? Why?

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14. Notice the Temperature-Voltage (or Resistance) curves and the Temperature-Time curves (on the Trends tab) and answer the following questions:

14. 1 Which one of the thermometers has the fastest response time?

    a) Thermocouple
    b) RTD
    c) Thermistor

14. 2 Which one of the thermometers has the slowest response time?

    a) Thermocouple
    b) RTD
    c) Thermistor

15. Depending on this and the previous experiments assign the suitable thermometer for the following applications and explain why:

15. 1 An application with a wide temperature range (**above 1000^{o}C**).

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15. 2 An application that needs a good response time (**temperature range is up to 500^{o}C**) .

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15. 3 An application that needs accurate readings and fast response time (**temperature range is up to 80^{o}C**).

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15. 4 An application that needs a repetitive sensor (**temperature range is up to 500^{o}C**).

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15. 5 An application that has electromagnetic fields (**temperature range is up to 500^{o}C**).

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15. 6 An application in which the wires length of the sensor does not affect the temperature readings (**temperature range is up to 500^{o}C**).

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15. 7 An application in which the wires length of the sensor does not affect the temperature readings (**temperature range is up to 50^{o}C**).

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