



**PROJECT NAME (ASSESSING THE PERFORMANCE OF  
TRANSDUCER X AS A TEMPERATURE MEASURING DEVICE)**

**Student Number(s) - Names :**

**Supervisor(s) :**

**Report Date : DD,MM,YYYY**

## Abstract

In this project, our aim is to measure and display the resistance changes of transducer X against changes in temperature. In particular, we investigate whether this transducer exhibits a linear relationship between its resistance and temperature variations. From this investigation, it is concluded that transducer X can be used to measure temperatures between 0 to 25 °C with a root mean square error of 5.2 %.

## Özet

Bu projede, bizim amacımız ...

## 1. Introduction

There are several transducers that can be used to measure temperatures as detailed in [1 – 3]. The accuracy for most of them cannot go above 93 %. Besides in those transducers, the range of linearity is often limited to 10 to 20 °C. Earlier experiments demonstrated that our recently designed transducer X could offer improved measuring accuracy and extended temperature range [4]. This part of the project is carried out to test the assertions in [4] and furthermore find the numeric values of temperature measuring accuracy and temperature measuring range of transducer X.

## 2. Requirements

- There are x sensors to get “Y” information
  - Performance of the project is measured by applying “Z” technique in “T” conditions
  - System should provide “Q” output under these conditions
- You can increase the specifications according to your project.

## 3. Materials and Methods

The experimental setup is shown in Figure 1. To establish better conduct between the transducer X and the temperature of the environment to be measured, we immersed transducer X into cubic water tank having side dimensions of 20 cm. The water tank was heated and cooled from underneath. Into the same tank, we placed water proof thermometer which acted as calibrator and reference device. From the manufacturer’s data sheet [5], it is known that this waterproof thermometer has temperature range of -10 to 70 °C and a reading accuracy of 99.2 %. Measurements were taken every other two days and this was repeated twenty times. It is known that transducer X converts temperature changes into resistance changes [4]. To measure these changes, a voltmeter placed around the load resistor of the driving circuitry as shown in Figure 1.

## 4. Hardware or Software Design

Designed circuit is shown in Fig.x below. At this part, circuit includes xxx type of circuits. These circuits are chosen, because of xxx. (Hardware or software design technique must be analysed by explaining the calculations)

## 5. Test conditions

Tests have been carried out under “P”, “R”,”S” conditions to see the effect of these conditions. These conditions were chosen because of these reasons :

- 1
- 2 ....

## 6. Results

(Test Results with figures or graphs must be clearly presented in this part.)Under the test conditions mentioned above, it was obtained that..... Data collected from the experimental setup is displayed in Figure 2, where the horizontal axis,  $T$  represents the temperature readings, taken from the thermometer, while the vertical axis,  $V_L$  gives the voltage readings across the load resistor,  $R_L$  which in turn gives an indication of the resistance changes in transducer X. In Figure 2, the averaged  $V_L$  readings taken at 1  $^{\circ}$ C intervals are marked as stars, then a straight line (i.e. a first order polynomial function) is fitted to these readings. The fitted line is described by the equation

$$V_s T = A + BT \tag{1}$$

Here it is seen that the stars are best concentrated around fitted line in the temperature range 0 to 25  $^{\circ}$ C. Hence if transducer X, were to be used for measuring temperature in this range, the root mean square error would be

$$E_{rms} = \sum_{i=0}^{20} [V_{L_i} - V_s T]^2 \tag{2}$$

By inserting the values from (1) and from Figure 2 in (2), we find

$$E_{rms} = 0.052 \tag{3}$$

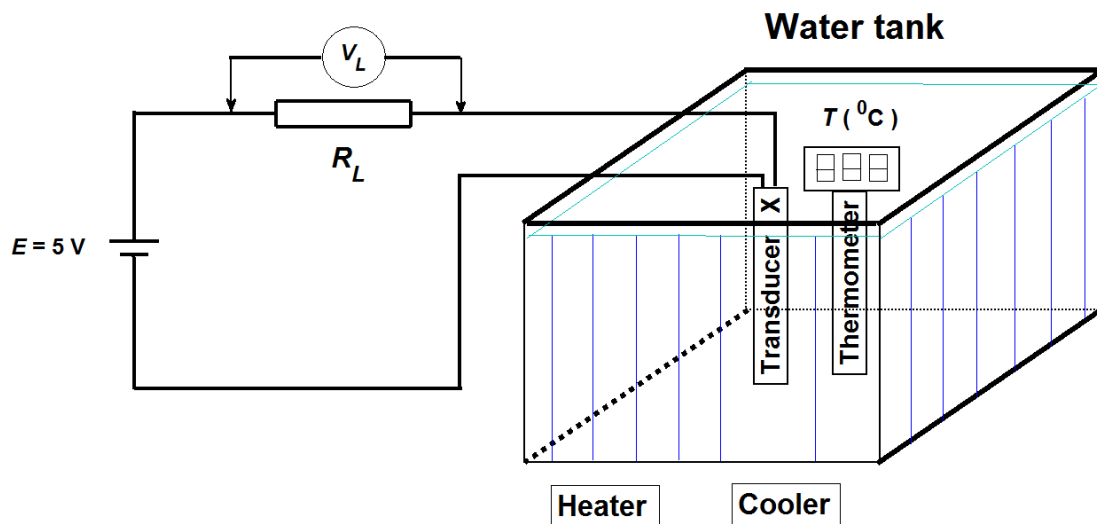


Figure 1 Schematic view of experimental setup.

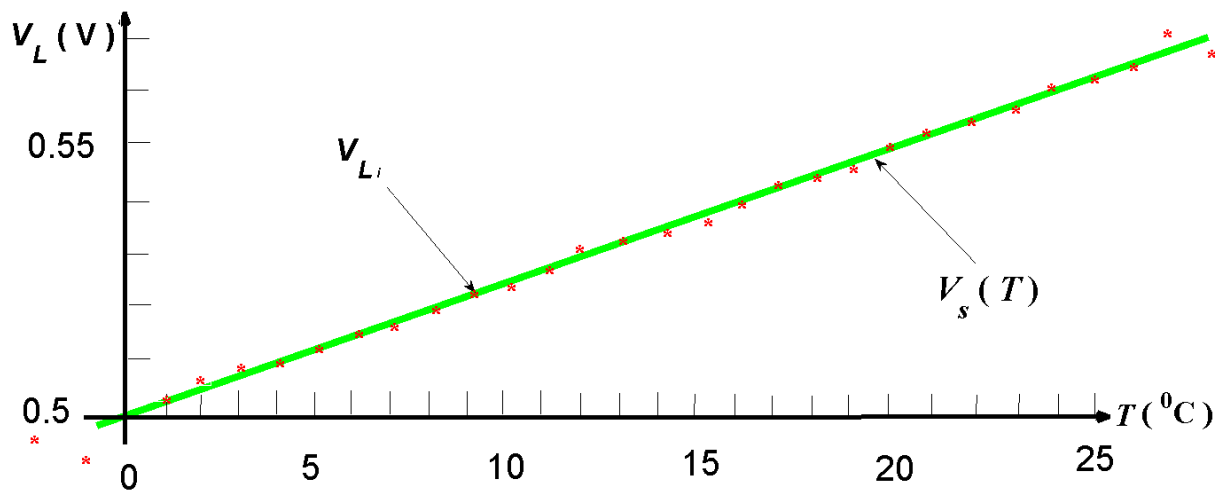


Figure 2 The variation of the voltage across the load resistor against temperature.

## 7. Discussions

From Figure 1, it seems that transducer X can be safely used as a temperature measuring device within temperature range of 0 to 25  $^{\circ}\text{C}$ . In this range root mean square error is 5.2%. To ensure the reliability of results, measurements were spread over twenty days with one day interval. Water tank was employed to establish better conduct with the reference thermometer and temperature of the environment. It is suggested as future study to repeat these measurements in air, to see if any differences arise.

## 8. Conclusion

We have assessed the suitability of transducer X for temperature measurements. It is found that this transducer can be used for this purpose within temperature range of 0 to 25 °C, where root mean square error of the measurements will be 5.2 %.

## **9. Acknowledgements**

We would like to thank our supervisor H. T. Eyyuboğlu, for his guidance and help throughout the project. We further like to thank technicians N. Aybak, O. Yurdakul for the preparation of experimental setup.

## **10. References**

[1]. Book Reference : Authors Initials (Names) Surnames, *Book Title*, Publisher, Place of Publication, Page Range, Year of Publication.

[2]. Article Reference : Authors Initials (Names) Surnames, Article Title, Journal Name, Volume Number, Serial Number, Page Range, Year.

[3]. Website Reference : Authors Initials (Names) Surnames, Document Title, Date of Last Access.

Text must be written in Times New Roman, 12. Headings must be in Times New Roman, 16 Bold. The report must be at least 15 pages and it should coherent.