

Practical No.25: Measure temperature of liquid using RTD (PT-100) transducer

I Practical Significance:

RTD (Resistance Temperature Detector) is most linear passive temperature transducer. PT-100 is most common low cost RTD. It is made up of platinum and it have 100 Ohm resistance at zero degree temperature. Since RTD have higher accuracy and repeatability, they are slowly replacing thermocouple in industrial application below 600° C. This practical will help you to measure temperature using RTD for given liquid.

II Industry/Employer Expected Outcome(s):

In the industry environment industrial electronics expected to handle various transducers for measurement of process parameters such as temperature, pressure, level, flow, displacement etc. It is necessary to measure temperature of different ranges in various industries. Employee should able to select, test and use appropriate temperature sensor.

III Course Level Learning Outcome(s):

Use various types of sensors and transducers.

IV Laboratory Learning Outcome(s):

Use of RTD (PT-100) for measurement of temperature.

V Relevant Affective Domain related outcome(s):

1. Follow safe practices.
2. Demonstrate working as a leader/a team member.
3. Maintain tools and equipment.

VI Relevant Theoretical Background (With diagrams if required):

Resistance Temperature Detector (RTD): The resistance of certain metals changes with temperature change. With the increase of temperature electrical resistance of certain metal increase in direct proportion to the rise of temperature. RTD is a sensor to measure temperature. Many RTD elements consist of a length of fine wire wrapped around a ceramic or glass core but other constructions are also used. RTD wire is made of pure materials of platinum, Nickel or copper. The material has accurate resistance/temperature relationship which is to provide an indication of temperature.

X Procedure:

1. Connect RTD in bridge circuit as shown in setup.
2. Place mercury thermometer in given liquid.
3. Place RTD's metal part in the same liquid.
4. Measure resistance of RTD and output voltage for each 10° rise in temperature keeping heater on.
5. Repeat the procedure for 10 times.
6. Plot the Graph.

XI Required Resources/apparatus/equipment with specifications:

S. No	Instruments/Components	Suggested broad specification	Quantity
1	RTD Setup	any setup with standard RTD	1
2	DC Power supply	0-30V, 0-2A	1
3	Multimeter	Digital	1
4			

XII Actual procedure followed:

1. Connect RTD in bridge circuit shown in fig.
2. place mercury thermometer in given liquid.
3. place RTD's metal part in same liquid.
4. Measure resistance of RTD & output voltage for each 10° rise in temperature keeping heater on.
5. Repeat the procedure for 10 times.
6. plot the Graph.

XIII Observations and Calculations:

SR. NO.	Temperature in Degree	Output Voltage	Resistance in ohm
1	33		113.8
2	35		114.6
3	37		114.7
4	38		114.7
5	39		114.9

XIV Results:

we have studied in this practical to measure the temperature of liquid using RTD (PT-100) transducer.

XV Interpretation of Results:

we have studied in this practical to measure temperature of liquid using RTD (PT-100) transducer.

XVI Conclusions & Recommendations:

RTD is most linear passive temperature transducer. PT-100 is most common low cost RTD.

XVII Practical Related Questions:

1. List standard type of RTD available in market.
2. State method of measurement of resistance of RTD.
3. State Practical reason to cover RTD with metal case.
4. State the Meaning of PT-100.
5. State resistance of RTD at Room temperature

[Space for Answers]

1. The most common RTDs are made platinum, nickel or Nickel alloys.

2) AC RTD is a passive device it does not produce any output on its own external electric device are used to measure the sensation of the by passing a small electrical current the sensor the generator voltage.

3) to protect the RTD from damage caused by mechanical loads or from corrosion when the temperature with corrosive liquid most or gaseous e.g. sweat blood etc are heat sensitive resistor wire frame or film is covered by procedure can usually made off.

4) Pt refers to that the sensor is made from platinum (Pt-100) refers to that at Pt the sensor has a resistance of 100 ohms (Ω) resistor resistance of 100 ohms (Ω) resistor beaman is a type of temperature 1.45 axis

5) this PRT has a standard resistive value of 100 Ω at 0°C. A constant current flowing through an RTD can obtain an output voltage because RTDs are passive resistive device like thermistor.

XVIII References/ suggestions for further reading ; includes websites:

1. Laboratory Manual for Introductory Electronics Practicals, Maheshwari, L.K.; Anand, M.M.S., New Age International Pvt. Ltd. New Delhi: ISBN: 9780852265543
2. APPLICATION NOTES-PRACTICAL TEMPERATURE MEASUREMENTS from OMEGA
3. <https://youtube/WmIgusHZyPc?t=42>