KEITHLEY

A GREATER MEASURE OF CONFIDENCE

Product(s)

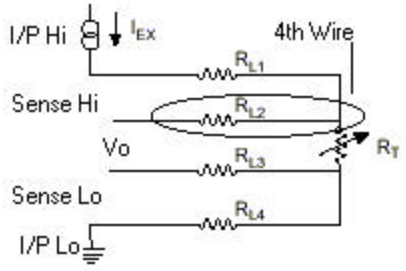
Integra Series DMM: 2700, 2750 and 2701

Question: Can I use Keithley Integra Models to measure Temperature using 3 wire RTD's?

Answer: Keithley recommends using 4 wire RTD sensors with Integra Models 2700/2750/2701, as these sensors offer maximum accuracy by eliminating lead resistance.

When temperature is measured from a resistive element such as an RTD or thermister, the measuring instrument (Integra Series) uses a 4-wire ohms measurement function. Temperature is computed from the characteristic equation for the type of RTD (T as a function of R).

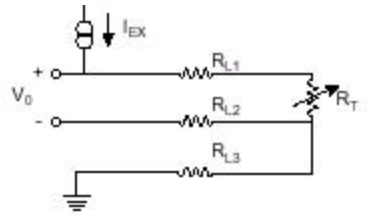
In a 4-wire ohms measurement, a known current applied on the excitation leads excites the RTD and the resulting voltage is measured on the two sense leads. Normally, the small resistance in the lead lines can be a source of error, but since the input resistance into the Integra is high, only a negligible amount of the excitation current will flow in the sense lines. There will be virtually no error due to the excitation current on the lead resistance of the sense lines. This allows a precise measurement of the resistance of the RTD (R = V/I).



4 Wire RTD Connections with Integra Series

Use of a 3-wire RTD requires a special math capability to compensate for lead resistance on the 3rd wire. So, effectively 2700/2750/2701 will not directly measure temperature using a 3-wire RTD sensor.

You can use the 2-wire resistance measurement mode with a 3-wire RTD to measure the resistance but this will be equivalent to the temperature being measured including the lead resistance (R_{L1}).



3 wire RTD Sensor
(connect using 2 wire mode with Integra Series)