FUTEK has integrated the PT-1000 Resistance Temperature Detector (RTD) into its latest products to allow for real time environment monitoring and to detect adjustments in temperature. You will currently find the PT-1000 RTD in the LSB205 JR S-Beam Load Cell 2.0 line, LSB205 OEM in-line load cells, and the PMP400 pressure sensors.

What is the PT-1000 RTD?

A PT-1000 Resistance Temperature Detector (RTD), is a temperature sensor made from a fine platinum wire which has a nominal resistance of 1000 Ohm at 0°C. As the temperature changes, the wire expands and contracts (similar to a strain gauge while under physical strain) with the resistance changing linearly.

The PT-1000 RTD provides exceptional performance in a 2-wire configuration with its high, 1000 Ohm resistance limiting the influence of interconnecting signal wires lengths on the systems overall resistance, thereby reducing the measurement error.

How do you interface with it?

While it is possible to utilize an ohmmeter to correlate the resistance change to temperature, doing so comes with caveats. Any device for measuring RTD resistance must minimize the voltage and current injected into the RTD, otherwise heating from electrical resistance will skew the readings. Instead a specialized integrated circuit (IC) with the correct reference resistor for a PT-1000 RTD should be used to maximize the accuracy of RTD measurements.

How do you calibrate it?

Once you have a sensor with an RTD and a device to measure the RTD's resistance, you need to calibrate the RTD. To do that, you need a temperature-controlled chamber and a calibrated temperature probe with the capability of measuring the RTD resistance. Next you need to select a few temperature testing points. It's recommended you select 0˚C/32˚F as one temperature point, as that is the baseline temperature/resistance correlation for the RTD. The second temperature needs to be the highest temperature you expect the sensor to reach. For example, let's say 37.8˚C/100˚F.

After that, the next thing to do is place the sensor into the chamber, place the reference temperature sensor as close as possible to the RTD, and perform the following steps:

1. Connect the sensor to a power supply with necessary excitation voltage and allow the sensor to warm up.
2. Set the temperature chamber to slowly ramp down to 0˚C/32˚F and have it soak for up to 20 minutes.
3. Slow ramping and long soak times ensure stable, more accurate RTD readings.
4. Measure the RTD resistance and the reference temperature reading and record both values, for example a resistance measurement of 1032 Ohm at 0˚C.
5. Ramp the chamber slowly up to 37.8˚C/100˚F and have it soak for up to 20 minutes.

Measure the RTD resistance and the reference temperature reading and record both values, for example a resistance measurement of 1132 Ohm at 37.8˚C.

How do you correlate its output?

Now you can establish an accurate resistance to temperature conversion for your RTD. This conversion is performed with the following equation using the resistance and temperature values captured earlier:

$$Temperature = Slope \times RTD\ Resistance + Intercept$$

Where:

$$Slope = \frac{Temp_{max} - Temp_{min}}{RTD_{max} - RTD_{min}}$$

$$Intercept = Temp_{min} - Slope \times RTD_{min}$$

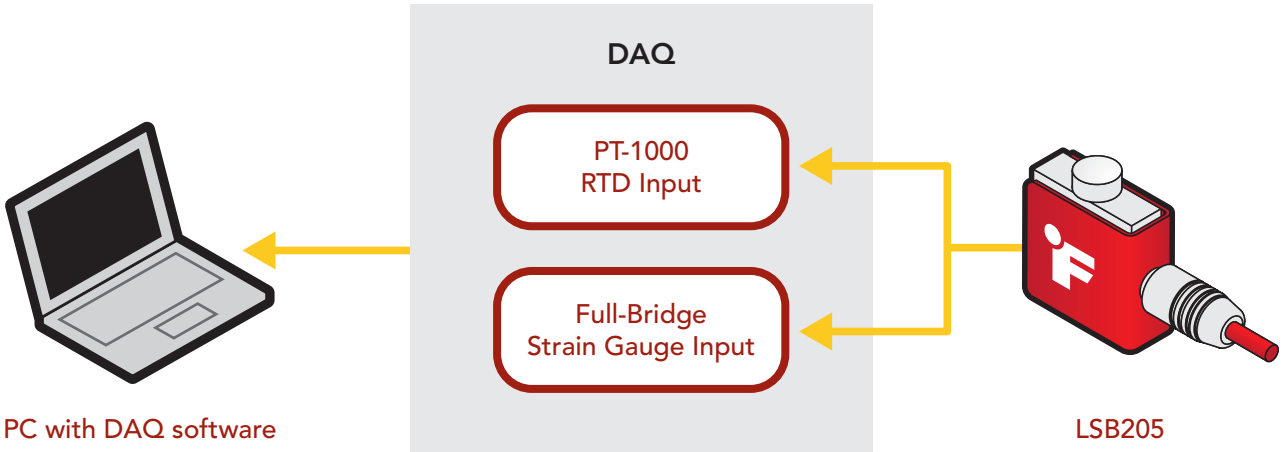
Note that the above applies to temperatures above freezing as RTD sensors will have different slopes for above freezing and below freezing. When operating below freezing a 2nd temperature correlation must be established using the same method above with a subzero temperature as the 2nd data point instead.

Going further, by also loading the sensor with a known load and observing the output at different temperature points you can correlate force change per resistance change, or temperature change. For example, finding the load will change 10lbs over 100 ohms will help estimate to predict how much the force readings from the sensor will change per degree temperature.

What's next?

For more information on our sensors with the PT-1000 RTD, as well as our complete line of sensors and instruments, contact FUTEK Sales at: (949) 297-9658 or futek@futek.com.

EXAMPLE SETUP



10 Thomas, Irvine, CA 92618 USA
Tel: (949) 465-0900
Fax: (949) 465-0905
www.futek.com