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Temperature Reading Confirmation:

Many laboratory refractometers feature digital temperature measurement. A common question asked about this method of temperature measurement is: “How do I calibrate the temperature reading?” There are two main reasons for this question:

1. The customer has the unit connected to a water bath circulator which is running at a specific temperature, but the temperature reading on the refractometer is not the same. The customer may not understand that the refractometer will almost always run at a different temperature than the water bath setting due to heat loss from the prism, through the tubing, and heat generated by the built in power supplies within the refractometer.
2. The customer needs to certify the readings from the instrument, therefore they assume that any reading from the instrument, whether it be refractive index, percent solids, temperature, etc. must be certified.

In actuality, the temperature reading does not need to be calibrated! This brings up the question how can that be possible? First, the refractometer in actuality only takes two readings; refractive index and temperature. Refractive index is temperature dependent. As a general rule, when temperature increases refractive index generally decreases. Therefore, calibration of the refractive index is dependent upon the temperature variable.

When you calibrate an automatic refractometer for instance, you tell the refractometer the refractive index, temperature coefficient, and reference temperature of the calibration standard. The refractometer determines the difference between the reference and the actual temperature, multiplies this by the temperature coefficient and then calculates the refractive index at the operating temperature by applying the temperature correction factor to the refractive index standard. The refractometer determines the position of the shadowline on the Linear Scanned Array, and assigns a cell crossing number as having that refractive index. Any further samples’ that has a shadowline which falls on that same cell crossing number will thus have the same refractive index regardless of temperature. A temperature reading is then attained and the calculation made again for temperature compensation (from actual temperature reading to the constant reference temperature) if the TC mode is selected. Therefore, the critical temperature factor is actually differential temperature, which is, factored out due to the refractive index temperature dependence of calibration.

Had the temperature reading been incorrect, it would thus be factored out by the calibration for refractive index. Calibration for temperature dependent refractive index actually eliminates the need for temperature calibration. In fact, if you were to calibrate the temperature sensor, you would then have to recalibrate for the refractive index .

Reichert, Inc., 3362 Walden Avenue, Depew, NY 14043
Telephone: 716 686 4500 • Fax: 716 686 4545 •
Email: REICHERTAI.REFRACTOMETERS@AMETEK.COM
www.reichertai.com • ISO9001 Registered