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TEMPERATURE COEFFICIENT CALCULATION

To calculate the temperature coefficient of a sample, the sample must be read in the Refractive Index mode (NOT THE REFRACTIVE INDEX TEMPERATURE CORRECTED MODE!). Take note of the reading and the reading temperature. The sample must then be read at a second temperature. The following calculation may then be used.

Temperature Coefficient = $(nD1 – nD2)/(T1-T2)$ where

:

       nD1 = Refractive Index of sample at temperature 1

       nD2 = Refractive Index of sample at temperature 2

       T1 = Temperature of Refractive Index reading 1

       T2 = Temperature of Refractive Index reading 2

The temperature coefficient is almost always a negative number, in other words, refractive index increases as temperature decreases and vice versa. Typical temperature coefficients for fluids will be from –0.0001 to –0.0004.

Once a temperature coefficient is known, the temperature corrected refractive index can be calculated from an actual refractive index reading by the following formula:

RITC = $((RT-AT)*TC)+RI$ Where:

       RITC = Refractive Index Temperature Corrected

       RT = Reference Temperature

       AT = Actual Temperature as Read on Instrument

       TC = Temperature Coefficient Of Sample

       RI = Actual Refractive Index As Read On Refractometer

Example: Calibration Verification of an instrument using a known fluid

1. A certified calibration oil is read on an automatic refractometer as having a refractive index of 1.51519 at 22.48°C.

2. The actual value of the oil as certified by N.I.S.T. is R.I. = 1.51416, Reference Temperature = 25°C, Temperature Coefficient = -0.000412 dn/dt.

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3. Temperature Differential = Reference Temp. - Actual Reading Temperature = 25.00 - 22.48 = 2.52

4. Temperature Compensation Factor = Temperature Differential times Temperature Coefficient = (2.52) x (-0.000412) = -0.00103824

5. -0.00103824 + 1.51519 = 1.51415176 (This would be the temperature corrected refractive index at 25°C

In this case, if the value obtained above differs from the known value of the calibration standard by more than the accuracy tolerance for the instrument, calibration of the instrument is necessary.