# 84C Custom Density Slope Calculation for User-defined Liquids

**BACKGROUND**:

The 84C Vortex flow meter is equiped with an integrated RTD temperature sensor, which allows temperature compensation for density of Saturated Steam and User-defined Liquids, even though it does not measure fluid density directly. For User-defined Liquids we do this by entering the fluids reference temperature and its density at this reference temperature into the 84C fluid configuration menu. Additionally, (for user-defined Liquids) we must enter the fluids density slope so that as the fluid's temperature changes, the vortex meter will then be able to compute the fluids temperature-compensated density.

For many fluids, a **Thermal Expansion Coefficient** (a.k.a. Density Slope) can be found using www.flowexpertpro.com . Although we have an extensive list of fluids within www.flowexpertpro.com 's database, it does not have every fluid…therefore it may be necessary at times to determine a Fluid's Density Slope on your own …and that's what this guide will teach.

The formula for determining a User-defined Liquid's density slope is as follows:

$$\text{Slope} = \Delta D / \Delta T = (D1 - D2) / (T1 - T2)$$

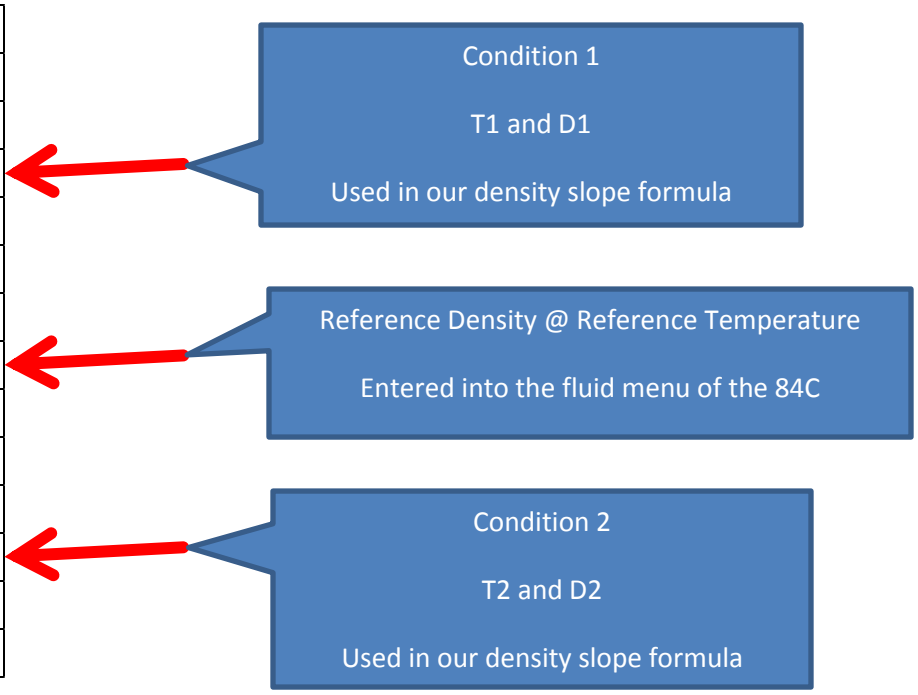
Continue below for an example of how to calculate a User-defined Liquid's density slope…

Below is a density slope calculation example for a liquid using kg/M3 as the Density EGU and Deg C as the Temperature EGU… the result will be the fluid's change in density (kg/M3) per Deg C.

Example:

Below is a table of measured fluid density at various temperatures ranging from 20 – 40 Deg C for a Client's Custom Liquid

| ºC | kg/m^3 |
|---|---|
| 20 | 788.89 |
| 25 | 783.92 |
| 26 | 782.93 |
| 27 | 781.93 |
| 28 | 780.92 |
| 29 | 779.92 |
| 30 | 778.91 |
| 31 | 777.91 |
| 32 | 776.90 |
| 33 | 775.88 |
| 34 | 774.87 |
| 35 | 773.85 |
| 40 | 768.74 |




Using the formula: Slope = (D1 – D2)/(T1 – T2)

Slope = (782.93 – 774.87) / (26 – 34)

Slope = (8.06) / (-8)

Slope = -1.0075 kg/M3 per change in Deg C

NOTE: Density Slopes are typically negative (-) numbers