What is claimed is:

1. A method for determining a mass flow measurement, comprising:

calibrating a flowmeter sensor at a first temperature;

flowing a fluid having a second temperature that is different from the first temperature through the flowmeter sensor;

inputting a density of the fluid into a flowmeter electronics;

determining a compensated mass flow rate of the fluid with the meter electronics, wherein the Modulus of Elasticity of the flowmeter sensor is unknown, wherein the compensated mass flow rate is calculated as: $\dot{m} = FCF \cdot (\Delta t - zero) \cdot \frac{\rho_f \cdot (1+\alpha \cdot \Delta T)^3 + C_2}{K^2 \cdot C_1}$.

2. The method of claim 1, wherein the density is a known reference value.

3. The method of claim 1, wherein the density is calculated from an equation of state.

4. The method of claim 3, wherein the equation of state comprises a pressure term and a temperature term.

5. The method of claim 1, wherein the accuracy of the compensated mass flow value is ±0.5%.

6. The method of claim 1, wherein the first temperature is a non-cryogenic temperature, and the second temperature is a cryogenic temperature.

7. A flowmeter (5) comprising meter electronics (20) configured to receive a process fluid having a second temperature, the meter electronics (20) configured to communicate with a sensor assembly (10) of the flowmeter (5), wherein the flowmeter (5) comprises:

at least one flow conduit (103A, 103B) configured to receive the process fluid;

at least one driver (104) configured to vibrate the at least one flow conduit (103A, 103B);

and at least one pickoff (105, 105') for detecting vibrations of the at least one flow conduit (103A, 103B);

wherein the flowmeter is calibrated at a first temperature;

wherein a density of the fluid is input into meter electronics (20); and

wherein the meter electronics (20) is configured to determine a compensated mass flow rate of the fluid wherein the Modulus of Elasticity of the at least one flow conduit (103A, 103B) is unknown, wherein the compensated mass flow rate is calculated as: $\dot{m} = FCF \cdot (\Delta t - zero) \cdot \frac{\rho_f \cdot (1+\alpha \cdot \Delta T)^3 + C_2}{K^2 \cdot C_1}$.

8. The flowmeter (5) of claim 7, wherein the density is a known reference value.

9. The flowmeter (5) of claim 7, wherein the density is calculated from an equation of state.

10. The flowmeter (5) of claim 9, wherein the equation of state comprises a pressure term and a temperature term.

11. The flowmeter (5) of claim 7, wherein the accuracy of the compensated mass flow value is ±0.5%.

12. The flowmeter (5) of claim 7, wherein the first temperature is a non-cryogenic temperature, and the second temperature is a cryogenic temperature.