Temperature Effects

⚠ CAUTION

CALCULATIONS ARE PROVIDED AS GUIDELINES ONLY. THEY SHOULD NOT REPLACE A STRUCTURAL ENGINEERING EVALUATION OF THE APPLICATION BY A REGISTERED PROFESSIONAL ENGINEER WHO IS FAMILIAR WITH LOCAL BUILDING CODES.

Temperature can affect a weigh module system by causing structural supports to expand and contract or by exceeding the operating limits of the strain-gauge load cells. As a tank expands and contracts, it pushes or pulls on attached piping. If the piping connections are rigid, this can cause weighing errors. The following equation can be used to calculate the change in the length of a tank as the temperature changes:

$$DL = a \times L \times DT$$

Where:

DL = Change in Length

a = Coefficient of Linear Expansion

L = Original Length

DT = Change in Temperature

Table 4-3 lists temperature specifications for METTLER TOLEDO load cells. The compensated range is the temperature range in which the load cell will meet or exceed NIST Handbook 44 legal-for-trade tolerances. The service/storage range is the temperature range in which the load cell will operate without physical damage.

METTLER TOLEDO Load Cells	
Compensated Range	-10°C to +40°C (+14°F to +104°F)
Service/Storage Range	-50°C to +85°C (-58°F to +185°F)

Table 4-3: Load Cell Temperature Specifications

In applications with high temperatures inside the tank, you can reduce thermal conduction by placing insulation between the tank and the weigh modules. Use insulating material with a compressive strength above 15,000 psi and thermal conductivity ratings below 2.0 BTU-in/ft^2/hr. The material must be able to withstand the exposure temperature for prolonged periods without breaking down or deforming. Two recommended FDA-approved materials are listed below:

Acetron® GP Acetal (Acetron is a registered trademark of DSM)

- Continuous Service Temperature: 180°F
- Heat Deflection Temperature at 264 psi: 220°F
- Thermal Conductivity: 1.6 BTU inches/hour/foot^2/°F
- Coefficient of Thermal Linear Expansion: 5.4×10^{-5}
- Compressive Strength: 15,000 psi

Ultem 1000 Polyetherimide (PEI)

- Continuous Service Temperature: 340°F
- Heat Deflection Temperature at 264 psi: 392°F
- Thermal Conductivity: 0.9 BTU inches/hour/foot^2/°F
- Coefficient of Thermal Linear Expansion: 3.1×10^{-5}
- Compressive Strength: 22,000 psi

