

## ENVIRONMENTAL STRESSES AND THEIR EFFECTS

Creating and designing a product isn't enough. You need to ensure the product will function as it should after shipment and during routine use in the field. Even if you use the product in the same location, think of how a normal use environment would change from season to season. As environmental stresses are applied, the physical and electrical characteristics of products can vary greatly. The environmental stresses appropriate for testing any specific product depend on the product's design and components and the end goal of the test.

Temperature, humidity, and vibration are common environmental stresses applied to products.

**Temperature**, the most common environmental stress, causes a variety of effects. Changes in electrical constants due to temperature swings can cause unforeseen problems in the product's function. Mechanical issues arising from expansion and contraction can become evident when the coefficient of thermal expansion does not match. Interactions of dissimilar materials, changes in flexibility, and PCB delamination can all occur when temperature stresses are used to uncover problems in the product's design.

**Humidity** can cause physical changes, such as swelling and embrittlement for some materials, causing the product to malfunction or break. Oxidation (corrosion) and leakage paths between conductors are also exposed with extreme humidity conditions.

**Vibration** stresses can cause a loss of mechanical strength from fatigue, cracking, displacement, or the impairment of the product's mechanical functions. This is true for both electrodynamic and repetitive shock vibration.

**Altitude, corrosion, and sand & dust tests** are other environments that can be used to stress products, though, they are less common. Altitude testing is usually combined with temperature-humidity to evaluate airplane components, test items that will ship via air, or items used in high altitude climates. Corrosion tests are performed to determine a material's sensitivity and reactions to salt water spray, for example. Sand and dust tests place a product in a workplace and send puffs of sand and dust into the air to settle on the product to see how it reacts over time.

By diversely and thoroughly stressing products, you can help ensure that your product will operate as intended in its normal use environment. Trying to replicate these stresses without the proper equipment can be a challenging undertaking with poor or disappointing results. Environmental test chambers and vibration shaker systems are essential to consistent and dependable results.



For more than 55 years, Thermotron has provided quality environmental test equipment. We've worked to establish a trusted reputation among our peers, and when people hear the name *Thermotron*, they have confidence in the testing of their own product. We've been building our name since 1962; now it's your turn.

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