

Understanding the Operating Temperature Test

"Understanding the Product Safety Tests"

The *Operating Temperature Test* is a test for which most people understand the general premise = to measure temperatures on the product while the product is operating at full load conditions. However, when we examine the test objectives, few people can answer the question, at what locations should you measure the temperature?

Failure to understand where and why we measure temperatures is the main reason a lot of young engineers default to measuring just about everything. Done properly, the product should not contain a large nest of thermocouples.

The objective of the Temperature Test is to measure temperatures on:

- a) Surfaces the user can contact for surface temperature limits (risk of burn injury from hot surfaces),
- b) Insulating materials that are critical to safety to insure they are used within their rated limits (verifying reliability of the risk of shock protection levels - basic, supplementary, double, and reinforced insulation),
- c) Combustible materials to insure they are used within their rated limits (as part of risk of fire protection – keeping temperatures below rated limits on combustible materials helps prevent fires),
- d) Critical components to insure they are used within their temperature rating (so the component will continue to operate properly and, so we can be sure that the insulating materials inside the component are being used within their ratings).

The best way to understand these objectives is to consider a resistor inside an electrical product. Electrical products contain a lot of resistors, and resistors can get hot. So do we measure the temperature on all the resistors? No, not only would that not be practical, that would not be necessary.

Considering the objectives identified above, we would only measure the temperature on a resistor if it was accessible to operator contact (i.e. SELV circuit), if it was in contact with a critical piece of electrical insulation (i.e. mounted in direct contact with a circuit board), or if it could be contacted by critical electrical insulation moved using the force limits specified in the standard (i.e. moving a piece of internal wiring and finding that it can touch the heated resistor body). So we really don't care how hot the resistor gets, but we care how hot the resistor can get insulating materials. And we also care how hot parts are that the user can contact. Therefore, we would only measure the temperature on resistors that meet these criteria.

We don't simply perform the tests because they are in the standard. Each test in the standard has a set of objectives that relate to the 6 Hazards of Product Safety. The Operating Temperature Test is performed as part of the Risk of Shock, Risk of Fire, and Risk of Injury compliance review. High temperatures cause serious burns, breakdown of electrical insulation, and in the worst case, a fire. It is therefore a very important test – another test that directly saves lives.

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