Keysight Technologies
Verifying the Operation of Temperature-Controlled Ovens

Application Note

Handheld test tools that enable troubleshooting and repair personnel to perform temperature measurement tests on temperature-controlled ovens

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Introduction

Electronics manufacturing factories typically have temperature-controlled ovens of various types and sizes. They are used for temperature-related tests such as design validation, manufacturing burn-in tests, quality and reliability tests, and product qualification.

Temperature-controlled ovens can be as small as a table top box, a size suitable for design engineers to perform temperature performance characterization of a product. On the other end of the scale, there are ovens that are large enough to test multiple devices at the same time, as shown in Figure 1.

To ensure accurate product characterization, the temperature in the oven have to be precise and consistent. This application note describes how handheld measurement tools are used to maintain and verify the functionality of ovens deployed in an electronics factory.

Figure 1. An example of a large oven with multiple products tested simultaneously

2. Verifying the functionality of the temperature controller

Temperature-controlled ovens used for burn-in tests have built-in temperature sensors and controllers. When these ovens are shipped to the factory, they may encounter accidental knocks and drops during transportation. Typically, before the delivered ovens can be deployed for use in production, the factory equipment maintenance personnel need to perform oven commissioning test processes first.

One of the commissioning test processes is to verify the functionality of the temperature sensor and temperature controller using an independent temperature measurement tool. Figure 2 shows a handheld digital multimeter with thermocouples, performing temperature verifications as part of the commissioning of burn-in ovens into production use. The handheld digital multimeter communicates with the notebook computer, and the Keysight Handheld Meter Logger software running on the computer logs the temperature measured by the handheld multimeter (see Figure 3) and generates a report of the temperature profile of the burn-in oven (see Figure 4).
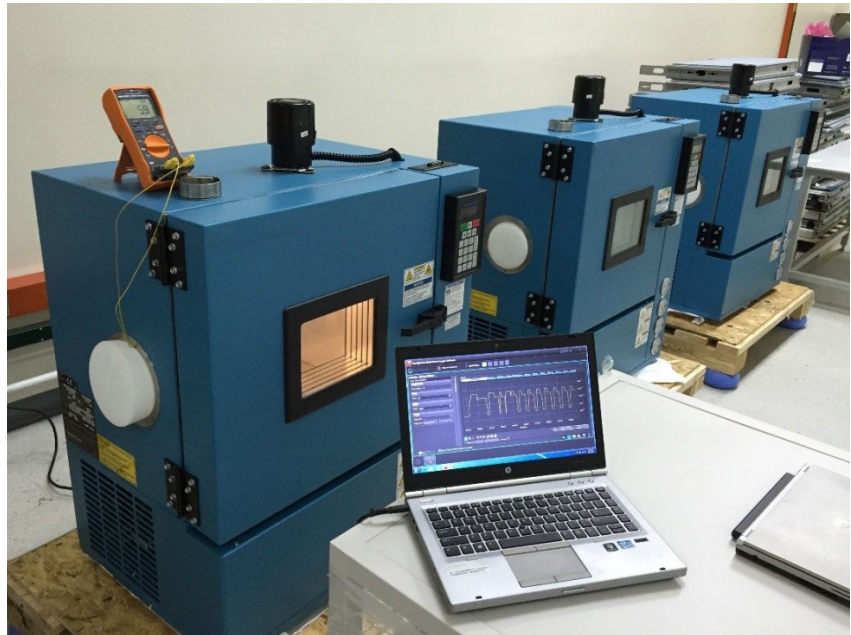

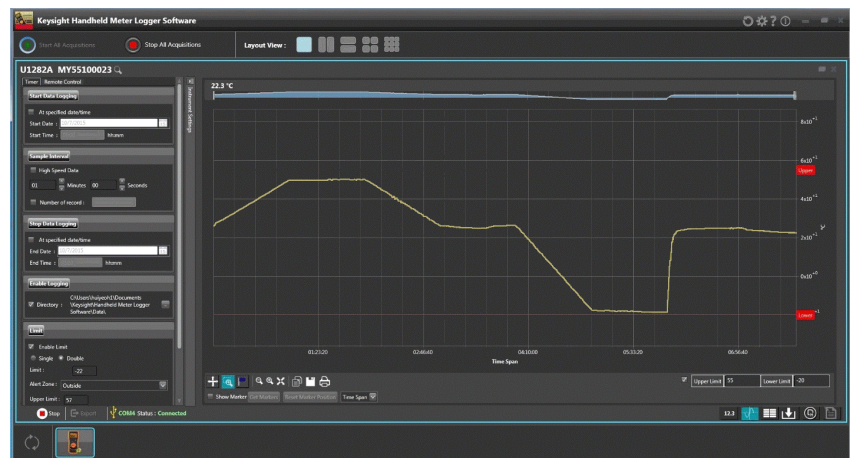Figure 2. Testing prior to the commissioning of burn-in ovens into production

Figure 3. Temperature profile logged in the Keysight Handheld Meter Logger software

Your logo here

Logging Session

Device under test	Oven03
Meter ID	U1282A MY55100023
Start Time	10/7/2015 09:42:37.687
Stop time	10/7/2015 17:29:37.577
Elapsed Time	00:07:46:59:891
Interval	00:00:59:998
Total Readings	468

Min	Max	Average	Marker X1	Marker X2
-18.9 °C	50.0 °C	22.951°C		
10/7/2015 15:34:37.663	10/7/2015 11:13:37.689	-		
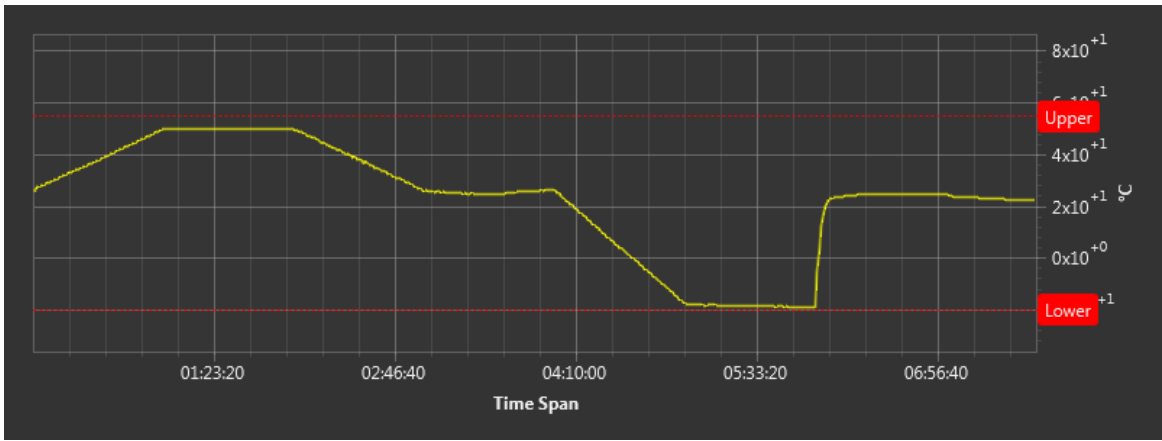
Trend Chart

Remark

Within limits and temperature profile

Figure 4. Example of a report generated from the Keysight Handheld Meter Logger software

3. Verifying the temperature distribution of the oven

Some electronic products are extremely sensitive to environmental temperatures, and they are therefore calibrated to function accurately over their tested operating temperature range. The temperature-controlled ovens used to calibrate these electronic products must have a consistent temperature distribution throughout the chamber.

The Keysight U1242C handheld digital multimeter with dual and differential temperature measurements can fulfill the measurement requirements mentioned above. The temperature measurement setup is shown in Figure 5. The U1242C can measure the temperatures of two points, T1 and T2, simultaneously. Place a thermocouple at T1 point at one end of the chamber and another thermocouple at T2 point at another end of the chamber. The difference in temperature between the two points should be minimal or close to zero; otherwise, the inconsistent temperature distribution in the chamber may result in inaccurate product testing or characterization.

Figure 5. The oven is tested periodically to ensure it is functioning properly

4. Conclusion

Keysight Technologies has a comprehensive handheld solution that will meet the requirements for identifying faults and troubleshooting issues affecting ovens used in temperature-related tests, as well as for other types of equipment, in an electronics factory.

For more information on Keysight Technologies handheld tools, please visit: www.keysight.com/find/handheld-tools

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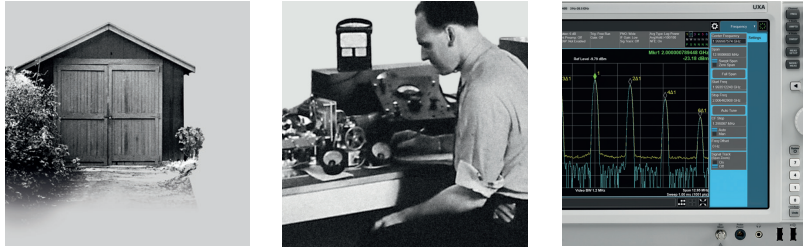
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