

No direct conclusions about the reliability of the control behaviour while heating up can be drawn from the technical data on temperature stability and homogeneity as provided by the manufacturers of ovens and incubators. For this reason, the accredited service provider Testo Industrial Services was contracted to test the Memmert UFP 500 oven. The oven yielded top results for temperatures of 50°C, 150°C and 250°C and fan speeds from 0 to 100%.

“Testo industrial services GmbH is an ideal partner when it comes to temperature distribution measurement. The independent service provider is one of the few companies in Germany accredited for ovens and incubators.”

Author Details:

Tim Tröndle
Head of Physics Lab
Testo Industrial Services GmbH
Kirchzarten/Germany

Tel: +49 (0) 7653 681 700
Fax: +49 (0) 7653 681 701
Email: info@testo.de
Web: www.testo.de

Specifications of Ovens Verified by Temperature Distribution Measurement

An increasing number of manufacturers of ovens and incubators now proudly claim in their data sheets that their appliances are tested in accordance with DIN 12880, which has been tightened in 2007. In reality, yet all measurements were done once and do not necessarily allow conclusions to be made about the control behaviour of an appliance over longer periods of time.

In order to reproduce processes at any given time in daily routines, however, reliability in temperature stability and uniformity are imperative. Constant temperatures and controlling accuracy are imperative. Shortly after the introduction of the new standard, the accredited calibration lab Testo Industrial Services therefore conducted measurements on the Memmert UFP 500 oven in accordance with the updated 12880:2007-05. These measurements clearly showed that in spite of comparable statements of other manufacturers with respect to temperature distribution and stability, there were significant temperature deviations while heating up and in a stabilised state over longer periods of time. This indicates that several appliances on the market are in dire need of having their heating and controlling technology optimised.

TIGHTENED REQUIREMENTS OF DIN 12880:2007-05

In 2007, the test requirements of the DIN 12880:2007-05 for ovens and incubators were extended. Instead of the previous nine measuring points, the test standard now requires 27 measuring points for appliances with more than 50 litres chamber volume to determine the stability and homogeneity of temperatures.

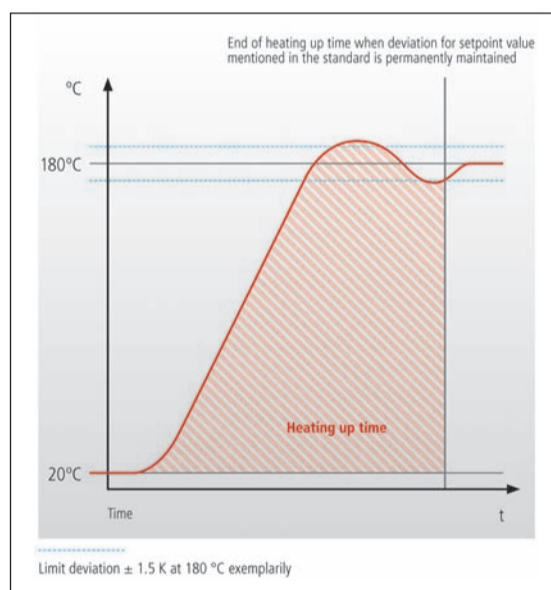


Figure 1. Determining the heating-up time of an oven to 180°C in this example, in accordance with DIN 12880:2007-05.

The second main modification of the DIN 12880:2007-05 is also likely to sort the wheat from the chaff. Until now, performance, meaning fast heating up and cooling down, was the focal point. However, this did not include the time it takes until the temperature has reached a stabilised state, so that it really is controlled reliably. According to the new standard, the times stated for heating up, cooling down and recovery are defined by the point in time when the actual temperature in the centre of the oven or incubator chamber stays permanently within the tolerances defined in the standard.

STABILISING AND CONTROLLING BEHAVIOUR

Testo Industrial Services GmbH is an ideal partner when it comes to temperature distribution measurement. The independent service provider is one of the few

companies in Germany accredited for ovens and incubators. The Memmert UFP 500 oven yielded excellent results with different temperature and fan speed combinations in all measurements. Reaching a constant temperature homogeneity even when the fan is off presents a challenge for all ovens. Since warm air rises, heating and controlling technology must be extremely fine-tuned, so that a permanent heat exchange is guaranteed in the whole chamber even for natural convection. Figure 2 exemplifies an even distribution of heat in the Memmert UFP 500 over 120 minutes at 50°C and 0% fan speed. The red curve represents the divergence of the most deviating measured values out of 27 measuring points.

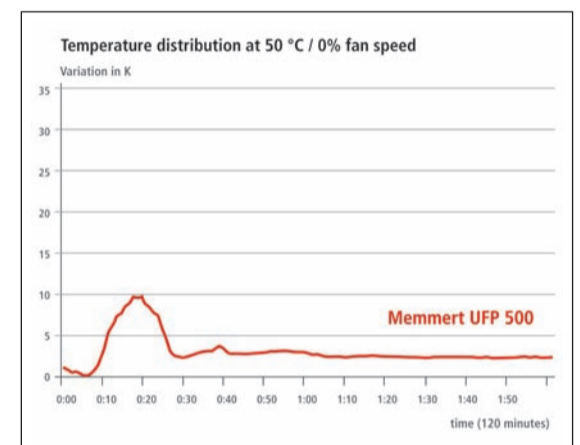


Figure 2. Deviation in K over 120 minutes at 50°C and 0% fan speed.

Temperature overshoots really must be avoided in an oven or incubator, especially when the load is sensitive. If the fan is activated to enhance heat exchange within the chamber, the heating and controlling technology must interact in such a way that the temperature can only increase or decrease within limited tolerances. Appliances with simple ring heaters are likely to reach their limits here. The example in Figure 3 shows that the Memmert UFP 500, with its large-area heating of the entire chamber and its two separately controlled heating zones, controls the temperature very consistently in its stabilised state over 120 minutes, even for a temperature of 250°C and at full fan speed. Moreover, the temperature is quite homogeneous even during heating up. The red curve shows the difference between the highest and lowest temperature deviation out of a total of 27 measuring points distributed evenly in the chamber.

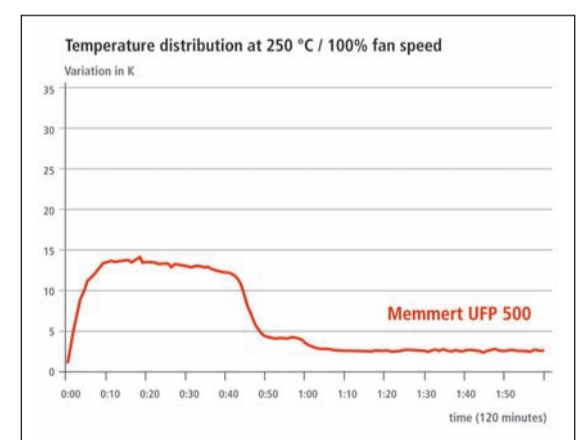


Figure 3. Deviation in K over 120 minutes at 250°C and 100% fan speed.

With the new standard 12880:2007-05, ovens and incubators with excellent controlling accuracy and temperature stability came out on top. And it proves that developing device-specific heating and cooling technology for high consistency, as Memmert has done for years, yields the best results.