



Designation: E145 – 94 (Reapproved 2011)

Standard Specification for Gravity-Convection and Forced-Ventilation Ovens¹

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This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers the performance requirements for general-purpose air ovens ordinarily used in testing operations, which have a testing chamber up to 0.6 m³ (25 ft³) in volume. It is applicable to gravity-convection ovens designed to operate over all or part of the temperature range from 20°C above ambient temperature to 200°C and to forced-ventilation ovens designed to operate over all or part of the temperature range from 20°C above ambient temperature to 500°C.

NOTE 1—Ovens are designed for maximum operating temperatures of about 200°C, 300°C, and 500°C, the thermal insulation and cost of the oven being dependent on the maximum temperature required.

1.2 This specification does not include safety requirements that are essential for ovens used in the presence of combustible vapors or gases.

1.3 The values stated in inch-pound units are to be regarded as the standard. The metric equivalents of inch-pound units may be approximate.

2. Types

2.1 This specification covers the following four types of air ovens:

2.1.1 *Type IA*—An oven ventilated by gravity convection having a uniformity of temperature within $\pm 2\%$ of the differential between oven and ambient temperatures.

2.1.2 *Type IB*—An oven ventilated by gravity convection having a uniformity of temperature within $\pm 5\%$ of the differential between oven and ambient temperatures.

2.1.3 *Type IIA*—An oven having forced ventilation and a uniformity of temperature within $\pm 1\%$ of the differential between oven and ambient temperatures.

2.1.4 *Type IIB*—An oven having forced ventilation and a uniformity of temperature within $\pm 2.5\%$ of the differential between oven and ambient temperatures.

¹ This specification is under the jurisdiction of ASTM Committee E41 on Laboratory Apparatus and is the direct responsibility of Subcommittee E41.06 Weighing Devices.

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3. Performance Requirements

3.1 The temperature within the testing chamber shall be controllable by an automatic device, and shall be uniform within the tolerances given in Table 1 for the particular type of oven when tested in accordance with Section 4.

3.2 The “time constant” is an arbitrary measure of the rate at which a standard specimen is heated following the procedure prescribed in Section 5. The value of the time constant shall not exceed the maximum value given in Table 1 for the particular type of oven.

3.3 The rate of ventilation of the testing chamber shall conform to the requirements specified in Table 1 for the particular type of oven when measured in accordance with the procedure given in Section 6.

TEST METHODS

4. Temperature Uniformity

4.1 Place nine calibrated thermocouples (Note 2) made from iron or copper-constantan wire, approximately 0.5 mm in diameter (No. 24 gauge) and having a junction size of not more than 2 mm (0.08 in.), in the empty testing chamber with shelves in place and vents open. Locate one thermocouple in each of the eight corners of the oven approximately 5 cm (2 in.) from each wall and place the ninth thermocouple within 2.5 cm (1 in.) of the geometric center of the chamber. A minimum length of 30 cm (12 in.) of lead wire for each thermocouple shall be inside the oven to minimize the conduction of heat from the thermocouple.

NOTE 2—If calibrated thermocouples are not available, nine thermocouples made from the same spool of wire may be used provided they give the same value for temperature when placed adjacent to one another in the testing chamber at the temperature of test.

4.2 Bring the oven to the specified temperature and allow it to reach a steady state (Note 3). Record the temperatures of the nine thermocouples for a period of at least 24 h, and determine from the record the maximum deviation of each point from the desired temperatures. The ambient room temperature shall vary by not more than a total of 10°C, and the line voltage for electrically heated ovens shall vary by not more than a total of 5 % during the test.