



BSI Standards Publication

# **Electric forced convection ovens, steam cookers and combination ovens for professional use — Test methods for measuring the performance**

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## National foreword

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The UK participation in its preparation was entrusted to Technical Committee CPL/59, Performance of household electrical appliances.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

**Electric forced convection ovens, steam cookers and  
combination ovens for professional use - Test methods for  
measuring the performance**

Fours électriques à convection forcée, cuiseurs à vapeur et  
fours combinés à usage professionnel - Méthodes d'essai  
pour le mesurage de l'aptitude à la fonction

Elektrische Heißluftöfen, Dampfgeräte und  
Heißluftdämpfer für den professionellen Gebrauch -  
Verfahren zur Messung der Gebrauchseigenschaften

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## European foreword

This document (EN 50733:2025) has been prepared by CLC/TC 59X “*Performance of household and similar electrical appliances*”.

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2026-03-31
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2028-03-31

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Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

## 1 Scope

This document applies to electric **forced convection ovens**, **steam cookers** and **combination ovens** for professional use.

These appliances are used in professional kitchens, such as restaurants, canteens, hospitals and in businesses such as butcher shops.

NOTE 1 These appliances are designed for one or more of the following cooking methods: blanching, frying, steaming, proofing, roasting, toasting, au gratin, sous vide cooking, etc

This document does not apply to:

- appliances that exclusively perform rethermalizing processes;

NOTE 2 Rethermalizing process is used for maintaining the temperature of hot food and for the warming of pre-cooked food (e.g. hot cupboard).

- pizza ovens;
- bakery ovens;
- static ovens;
- pressure steam ovens;
- appliances designed exclusively for industrial purposes.

The purpose is to define the principal performance characteristics of electric **forced convection ovens**, **steam cookers** and **combination ovens** for professional use and to describe the standard methods for measuring these characteristics.

This document does not deal with safety, food quality and or minimum performance requirements.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 631-1, *Materials and articles in contact with foodstuffs — Catering containers — Part 1: Dimensions of containers*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

### 3.1

#### **forced convection oven**

appliance intended for the cooking of food by heated air that is circulated by mechanical means within the **cooking chamber**

**3.2****steam cooker**

appliance intended for the cooking of food only by means of direct steam contact

Note 1 to entry: The pressure within the **cooking chamber** does not exceed atmospheric pressure.

**3.3****combination oven**

appliance intended for the cooking of food either by means of direct steam contact or by heated air circulated by mechanical means within the **cooking chamber** or by combination of these two modes

Note 1 to entry: The pressure within the **cooking chamber** does not exceed atmospheric pressure.

**3.4****cooking chamber**

interior of the appliance in which food products are cooked or processed

**3.5****sensible heat**

$Q_{sensible}$

heat which results in an increase in temperature and is therefore measurable

**3.6****latent heat**

$Q_{latent}$

heat which results in the phase change of the water during the cooking process

**3.7****brick**

test load not fitted with a temperature measuring sensor

**3.8****M-brick**

test load fitted with a temperature measuring sensor at its geometric centre

**3.9****GN-container**

chrome-nickel-steel container according to the dimensions of EN 631-1

**3.10****volume fraction of water vapour**

ratio between the water vapour partial pressure and atmospheric pressure in %

**3.11****oxygen concentration sensor**

electronic device that measures the proportion of oxygen

**4 List of measurements**

The performance and consumption characteristics are determined as follows:

- preheat-time and energy consumption measurement in convection mode in accordance with 8.2.1;
- time, energy and water consumption measurement with an empty appliance in convection mode in accordance with 8.2.2;

- time, energy, water consumption and water loss measurement with a loaded appliance in convection mode in accordance with 8.2.3;
- preheat-time and energy consumption measurement in steam mode in accordance with 8.3.3;
- time, energy, water consumption and volume fraction water vapour measurement with an empty appliance in steam mode in accordance with 8.3.4;
- time, energy, water consumption and volume fraction water vapour measurement with a loaded appliance in steam mode in accordance with 8.3.6.

## 5 General conditions for measurements

### 5.1 General

The instructions for use regarding installation and use of the professional oven shall be followed, except if they stand in conflict with the requirements in this document. In this case, this document shall prevail.

All testing shall be performed on the same appliance.

Before commencing measurements, the professional oven shall be checked to ensure that it is operating properly.

All tests shall be started with the appliances at the ambient conditions in accordance with 5.2.

For all tests, the appliance shall be free-standing in the room without any excess coverage other than originally equipped. All protective surface cover foils shall be removed.

All sides of the professional oven shall have a minimum clearance of 0,5 m from any walls.

Test material for laboratories are specified in Annex A.

### 5.2 Ambient temperature

The following ambient conditions shall be maintained throughout the measurements.

- ambient temperature of the room:  $(23 \pm 2) ^\circ\text{C}$ ;
- air velocity max: 2 m/s.

The ambient temperature shall be measured and recorded during the test.

### 5.3 Electrical supply

The appliance is supplied at a voltage of 230 V or 400 V with a tolerance of  $\pm 2\%$  and shall be maintained at the appliance's terminal throughout the test and a frequency of 50 Hz with a tolerance of  $\pm 1\%$ .

The voltage and frequency shall be reported.

### 5.4 Water supply

The temperature of the water supply shall be  $(18 \pm 5) ^\circ\text{C}$ .

The actual water temperature maintained during the tests shall be measured and recorded.

### 5.5 Instrumentation and quantities to be measured and calculated

The following measurement accuracies shall be met:

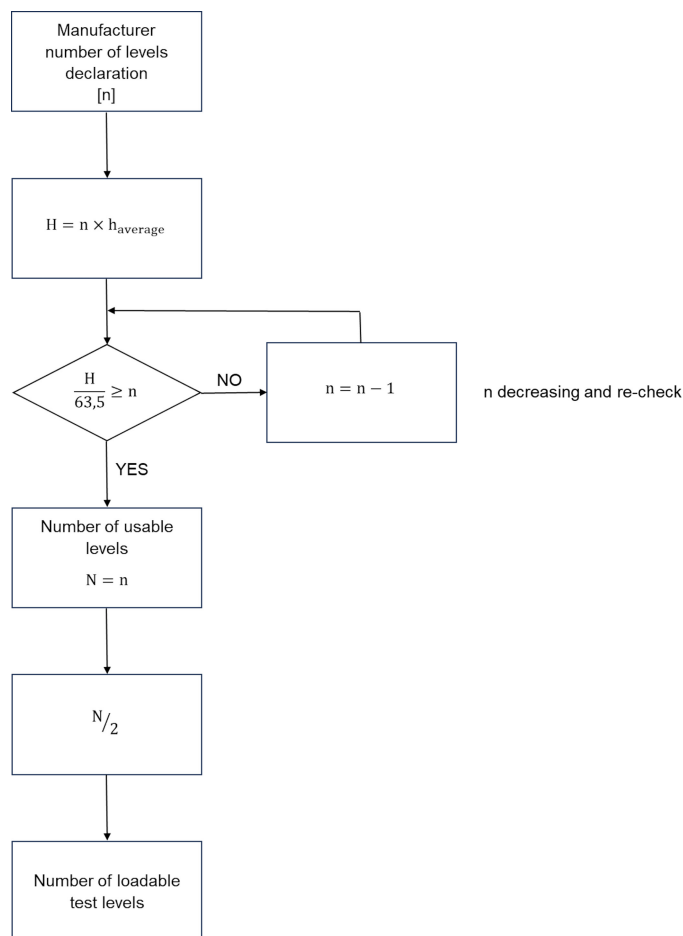
- thermocouple used for temperature measurement shall be flexible, insulated (no steel tube) and the thermocouple sensing element shall have a diameter from 0,5 mm to 3,0 mm. The temperature measurements shall be made to an accuracy of  $\pm 1,5\text{ K}$ ;

NOTE For example, type K class 1 or type T class 1 or 2 can be used.

- temperature measurements, excluding the ones performed with thermocouple, shall be measured to an accuracy of  $\pm 1$  K;
- electrical energy consumption shall be measured to an accuracy of  $\pm 1,5$  % or  $\pm 10$  W, whatever is the greater;
- supply voltage measurements shall be measured to an accuracy of  $\pm 0,5$  %;
- frequency measurements shall be measured to an accuracy of  $\pm 0,5$  %;
- mass measurements shall be measured to an accuracy of  $\pm 3$  g;
- time interval measurements shall be measured to an accuracy of  $\pm 1$  s;
- for all continues measurements, the sampling shall be at least one value per 1 s;
- for Formula (6) and (7) the time sampling shall be 1 s;
- **oxygen concentration sensor** and control board, for measuring the oxygen concentration inside the cavity to ensure the presence of saturated steam, shall have a range of oxygen concentration from 0,1 %  $O_2$  to 25 %  $O_2$ , and shall be made to an uncertainty of  $\pm 0,5$  %  $O_2$ ;
- water consumption shall be measured with an accuracy of  $\pm 3$  % momentary value;
- altitude (m) shall be reported to an accuracy of  $\pm 40$  m.

## 6 Calculation of the number of loadable test level

For the identification of the loads to be used in the tests, number of loadable test levels (N) shall be determined as shown in Figure 1.

**Key**

|                      |                                                                                                                                                                       |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| n                    | the number of GN-container usable levels declared by the manufacturer                                                                                                 |
| h <sub>average</sub> | the average distance between the levels [mm]. (also, the distance between the lowest level and the lower door opening frame is considered in the average calculation) |
| N                    | number of usable levels according to number of loadable test level verification                                                                                       |
| H                    | height parameter                                                                                                                                                      |

**Figure 1 — Number of loadable test level verification**

Height parameter ( $H$ ) is calculated by the Formula (1):

$$H = n \times h_{average} \quad (1)$$

The number of **GN-containers** that shall be loaded is calculated as follow:

Number of loadable test levels =  $N / 2$  (the result is rounded to integer removing the decimal part of the number)

## 7 Loading scheme

### 7.1 Number and position of GN-containers

For the test under load conditions, **bricks** according to Annex A shall be used. The dry mass of each **brick** used shall be measured and recorded.

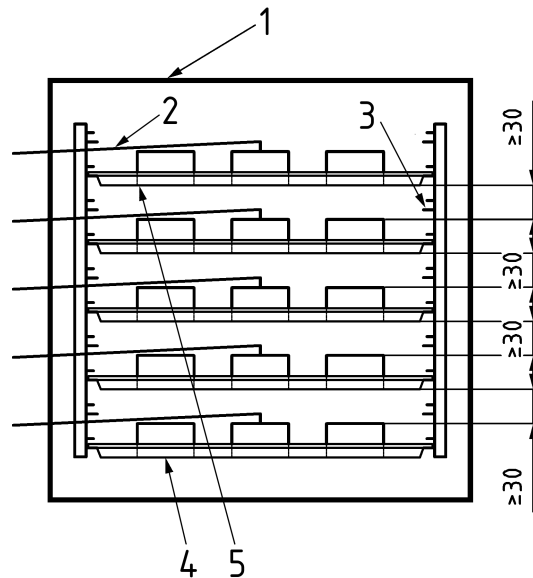
The test is carried out with **bricks** and **GN-containers** with a depth of 20 mm. The weight of each **GN-container** shall be measured and recorded.

Usable **GN-containers** shall be selected in accordance with the instructions for use:

- appliances intended for 1/1 **GN-containers** shall be tested with one 1/1 **GN-container** per usable level;
- appliances intended for 2/3 **GN-containers** shall be tested with one 2/3 **GN-container** per usable level;
- appliances intended for 2/1 **GN-containers** shall be tested with one 2/1 **GN-container** per usable level.

An example of this loading scheme is given in Figure 2.

Dimensions in millimetres



#### Key

- 1 Cavity opening
- 2 Thermocouple
- 3 Empty level
- 4 First load
- 5 Last Load

**Figure 2 — Example of a loading scheme**

Starting from the lowest level the **GN-containers** are loaded using each level in order to ensure a distance equal or greater than 30 mm between the upper part of the **bricks** and the next **GN-container** to guarantee a good airflow in-between. The **bricks** are arranged according to the layout defined in 7.2.

## 7.2 Number and position of M-bricks and bricks

To determine the core temperature of the **bricks**, **M-bricks** shall be used.

1/1 **GN-container** shall be equipped with one **M-brick** according to Figure 3.