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Household and similar electrical rice cookers – Methods for measuring the performance

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Cuiseurs à riz électrodomestiques et analogues – Méthodes de mesure de l'aptitude à la fonction

IEC 63399:2024

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IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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HOUSEHOLD AND SIMILAR ELECTRICAL RICE COOKERS – METHODS FOR MEASURING THE PERFORMANCE

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IEC 63399 has been prepared by subcommittee 59L: Small household appliances, of IEC technical committee 59: Performance of household and similar electrical appliances. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
59L/269/FDIS	59L/273/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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HOUSEHOLD AND SIMILAR ELECTRICAL RICE COOKERS – METHODS FOR MEASURING THE PERFORMANCE

1 Scope

This document applies to household and similar electrical **rice cookers**.

This document defines the main performance characteristics that are of interest to the user and specifies methods for measuring these characteristics.

This document does not specify the requirements for performance.

This document does not apply to the pressure type **rice cooker** or the micro-pressure **rice cooker**.

This document does not apply to **rice cookers** with the **rated volume of rice cooker** larger than 8 L.

NOTE 1 The pressure type **rice cooker** refers to a **rice cooker** that cooks at a pressure more than 40 kPa.

NOTE 2 The micro-pressure **rice cooker** refers to a **rice cooker** that cooks at a pressure larger than 10 kPa but not more than 40 kPa.

NOTE 3 This document does not deal with safety requirements (covered in IEC 60335-2-15).

NOTE 4 Some of the tests which are specified in this document are not considered to be reproducible since the results can vary between laboratories. They are therefore intended for comparative testing purposes only.

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.

IEC 62301, *Household electrical appliances – Measurement of standby power*

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:

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

3.1

rice cooker

appliance for cooking rice that is placed in a detachable inner pot, the inner pot being placed within the appliance when cooking

3.2

rated volume of rice cooker

total volume of the inner pot of a **rice cooker** declared by the manufacturer

3.3

stand-by mode

any product modes where the energy using product is connected to a mains power source and offers one or more of the following user oriented or protective functions which usually persist

- to facilitate the activation of other modes (including activation or deactivation of active mode) by remote switch (including remote control), internal sensor, timer;
- continuous function: information or status displays including clocks;
- continuous function: sensor-based functions

Note 1 to entry: Optional definition: a power on state in which the **rice cooker** is ready for interaction with the user, before confirming to heat up or cook.

[SOURCE: IEC 62301:2011, 3.6, modified – Note was replaced.]

3.4

reservation state

power on state in which the **rice cooker** counts the timing and starts to work once a period of time set by the user in advance elapses

3.5

keep-warm state

power on state in which the **rice cooker** keeps a low electric heating power to maintain the warm temperature of the cooked rice

3.6

expansion rate

ratio of the volume increase of the cooked rice to the volume of the raw rice

Note 1 to entry: The raw rice becomes bigger sized after cooked.

4 List of measurements and tests

- Volume of inner pot of **rice cooker** (6.1.1);
- Endurance of the inner pot coatings – Abrasion resistance (6.1.2);
- Endurance of the inner pot coatings – Corrosion resistance (6.1.3);
- Cooking uniformity (6.2.1);
- Moisture deviation (6.2.2);
- Burnt levels of the cooked rice (6.2.3);
- Temperature retention during **keep-warm state** (6.3);
- Energy efficiency (6.4);
- Power consumption in **stand-by mode** (6.5.1);
- Power consumption in **reservation state** (6.5.2);
- Power consumption during **keep-warm state** (6.5.3);
- Performance in low-voltage supply (6.6).

Evaluation of physical characteristics of the cooked rice is provided in informative Annex A.

5 General conditions for measurements

5.1 General

Unless otherwise specified, the tests are carried out under the conditions of 5.1 to 5.8.

If the instructions for use of the **rice cooker** recommend the setting, then that setting shall be used.

If the instructions for use of the **rice cooker** do not recommend the setting, the default function setting shall be used.

Unless otherwise specified, the water used in the test is the drinking water with the ambient temperature.

NOTE The drinking water refers to the water which is used for cooking in the area of the lab.

5.2 Test environment

The tests are carried out in a draught-free location at an ambient temperature of $20\text{ °C} \pm 5\text{ °C}$. Ambient temperature is maintained at $23\text{ °C} \pm 2\text{ °C}$ for temperature-sensitive cooking and warming performance test.

The relative humidity is maintained at 45 % ~ 75 %.

The air pressure for the test shall be 98 kPa ~ 102 kPa.

5.3 Limits of voltage variation

During the tests, the variation in the voltage shall not exceed $\pm 1\%$ of the test voltage.

5.4 Test voltage

Unless otherwise specified, the tests are carried out at a specific voltage within a voltage range (e.g. 100 V to 240 V) or at the rated voltage or voltages (e.g. 120 V, or 120 V and 240 V).

5.5 Test frequency

The appliances are tested at the rated frequency or within a rated frequency range (e.g. rated as 50 Hz and 60 Hz, or 50 Hz to 60 Hz).

5.6 Test electrical supply system

Total harmonic distortion of the test electrical supply system shall be less than 5 %.

5.7 Conditioning prior to the test

The **rice cooker** including the inner pot, the outer pot and the water for the test shall remain 6 h under the ambient temperature.

The control setting of the **rice cooker** shall be set to the function of rice-cooking.

5.8 Requirements for measurement instruments

The accuracy of voltmeter and wattmeter shall be $\pm 0,5\%$.

The resolution of the instrument used to measure temperature shall be $0,1\text{ °C}$.

The accuracy of weighing apparatus of full scale shall be $\pm 0,1$ % and its resolution shall be less than 1 g.

The accuracy of measurement of time shall be ± 5 s.

The wire diameter of thermocouple shall not be larger than 0,3 mm.

6 Measurements

6.1 Cooking inner pot

6.1.1 Volume of inner pot of rice cooker

- a) The mass of the inner pot is weighed and recorded as m_1 .
- b) The inner pot is positioned horizontally, and filled with the water until the level of water reaches the top edge of the inner pot. See Figure 1. The total weight of the inner pot and the water is measured and recorded as m . If the top surface of water is affected by the surface tension, the water is levelled with a surfactant.

NOTE Any commercially available rinsing agent can be used as the surfactant.

- c) The actual volume of the inner pot is calculated by Formula (1). The deviation from the **rated volume of rice cooker** is calculated by Formula (2).

$$V_c = \frac{m - m_1}{\rho} \quad (1)$$

where

V_c is the actual volume of the inner pot, in L;

m is the total mass of the inner pot and the water filled in it, in kg;

m_1 is the mass of the inner pot, in kg;

ρ is the density of water, taken as 1 kg/L.

$$\delta = \frac{V_c}{V_e} \times 100\% \quad (2)$$

where

δ is the volume deviation of the inner pot, in %, accurate to two decimal place;

V_e is the **rated volume of rice cooker**, in L.

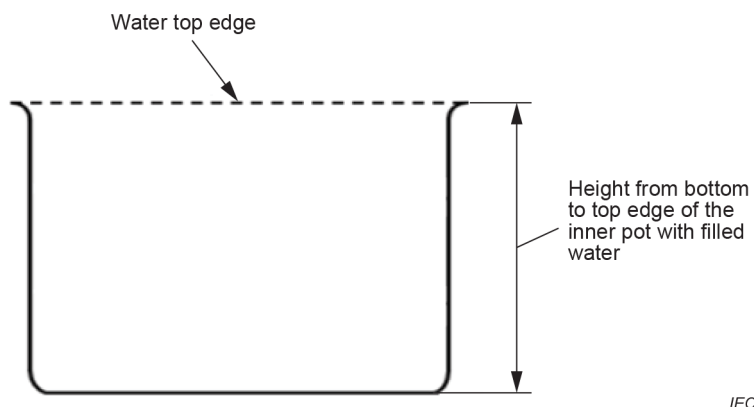


Figure 1 – Drawing of top edge of inner pot with filled water

6.1.2 Endurance of the inner pot coatings – Abrasion resistance

The test set up is shown in Figure 2.

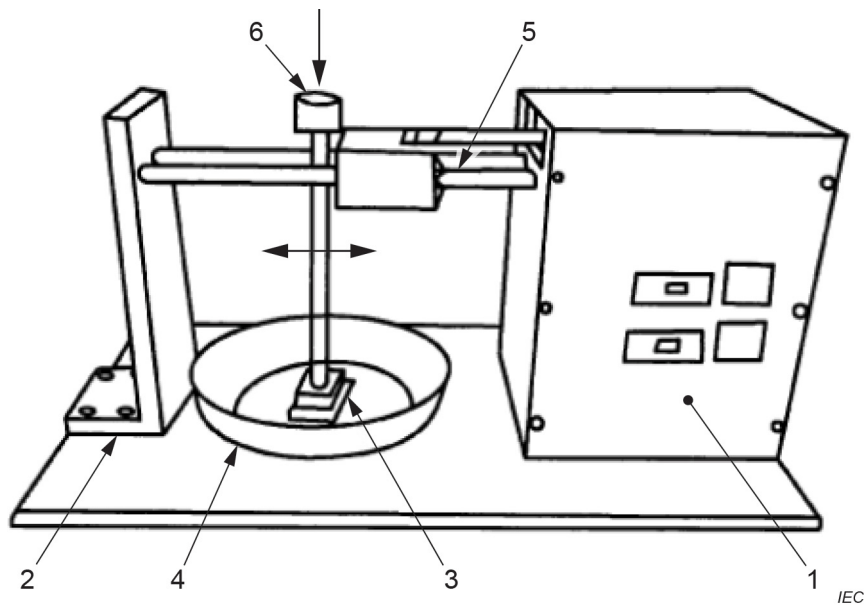
A clean inner pot of a **rice cooker** is fixed on the test equipment as shown in Figure 2. The size of the jig to which the scouring pad is attached is $60 \text{ mm} \pm 3 \text{ mm}$ in length and $20 \text{ mm} \pm 3 \text{ mm}$ in width. The scouring pad¹ with dimensions of $70 \text{ mm} \pm 5 \text{ mm}$ length and $30 \text{ mm} \pm 5 \text{ mm}$ width, which has been thoroughly soaked with water, is placed at the centre of the bottom of the inner pot. A downward force of 15 N is applied on the scouring pad. The pad is moved in a reciprocating manner with the speed of 30 cycles/min. The movement of the pad is started from the middle of the inner pot. One cycle includes 4 strokes, including the movements from the middle to the left end, from the left end back to the middle, from the middle to the right end and from the right end back to the middle. The distance of one stroke is 50 mm.

NOTE For the inner pot with small volume (less than 3 L), the stroke distance can be accordingly adjusted.

The coating surface of the inner pot is inspected at the interval of 250 cycles by means of a 10-multiple magnifying glass. At the same interval, the scouring pad is thoroughly soaked with water. The scouring pad is replaced with a new one at a rate of 2 500 cycles. The test is terminated when a trace of the exposed substrate with a width of more than 1 mm is detected on the coating surface of the inner pot.

Record the total number of cycles before termination of the test.

¹ Scotch-Brite™ 7447B, 7447 and 7447C are examples of a suitable scouring pad available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by IEC.

**Key**

- 1 driving device
- 2 fixture
- 3 scouring pad
- 4 inner pot of **rice cooker**
- 5 fixture
- 6 weight for applying 15 N downwards force

Figure 2 – Coating abrasion resistance test set up

6.1.3 Endurance of the inner pot coatings – Corrosion resistance

The inner pot is filled with 5 % saline water (obtained by mixing pure water and sodium chloride) to the maximum level as marked or specified in the instructions for use of the **rice cooker**. The inner pot is placed in correct position of the **rice cooker** and covered with its lid. Switch on the cooking function to heat the water to boil and keep cooking function for 8 h. The inner pot is refilled with the saline water every two hours to keep the water level at the starting level. At the end of 8 h, the **rice cooker** is transferred from cooking function to **keep-warm state** and kept in warming preservation condition for 16 h.

The combination with 8 h heating and 16 h warming preservation is considered as one test cycle. 8 h heating can include several cooking cycles. When one cooking cycle is ended, another cooking cycle is manually restarted. This process is repeated until the total 8 h heating period is reached.

The test is carried out for 4 test cycles and the coating is inspected after each test cycle. A 10-multiple magnifying glass is used for inspection.

Inspection result is recorded. If a trace of corrosion is detected, the size of corrosion is measured and recorded.

6.2 Cooking control

6.2.1 Cooking uniformity

6.2.1.1 Preparing the test sample of cooked rice

- a) The rice used for the test is obtained from the normal consumer market, which was produced not more than 12 months.

NOTE Production means milling and polishing operation.

- b) According to the instructions for use supplied by the manufacturer, the inner pot is filled with the medium amount of rice and the corresponding water, and the cooking function is switched on.
- c) At the end of the cooking cycle, turn off the power supply and leave it for 15 minutes. Then turn the inner pot over and remove all the cooked rice onto the table while maintaining the cylindrical shape of the inner pot.
- d) The whole cooked rice is divided into 12 equal parts, i.e. 12 cooked rice samples, as shown in Figure 3.

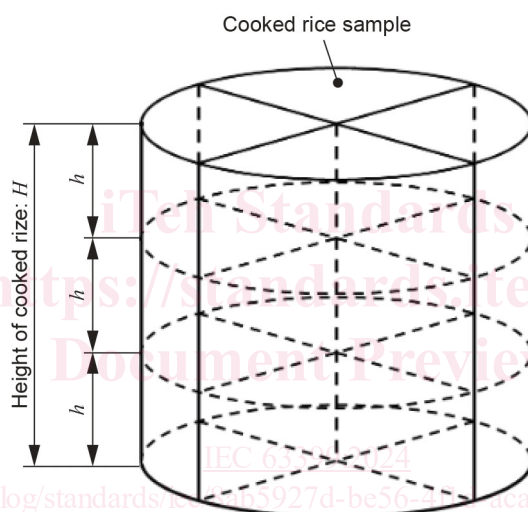


Figure 3 – Cooked rice divided into 12 equal parts