

Methods for measuring the performance of electric household coffee makers

The European Standard EN 60661:2001, with the incorporation of amendments A1:2003 and A2:2005, has the status of a British Standard

ICS 97.040.50

National foreword

This British Standard is the official English language version of EN 60661:2001, including amendments A1:2003 and A2:2005. It is identical with IEC 60661:1999, including amendments 1:2003 and 2:2005. It supersedes BS 3999-8:1984 (1990) which was withdrawn on 1 November 2003.

The start and finish of text introduced or altered by IEC amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated in the text by **A1** **A1**.

The UK participation in its preparation was entrusted by Technical Committee CPL/59, Performance of household electrical appliances, to Subcommittee CPL/59/7, Small kitchen appliances, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

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English version

**Methods for measuring the performance
of electric household coffee makers**

(includes amendments A1:2003 + A2:2005)
(IEC 60661:1999 + A1:2003 + A2:2005)

Méthodes de mesure de l'aptitude à la fonction des
cafetières électriques à usage domestique
(inclut les amendements A1:2003 + A2:2005)
(CEI 60661:1999 + A1:2003 + A2:2005)

Prüfverfahren zur Bestimmung der
Gebrauchseigenschaften elektrischer
Haushalt-Kaffeebereiter
(enthält Änderungen A1:2003 + A2:2005)
(IEC 60661:1999 + A1:2003 + A2:2005)

This European Standard was approved by CENELEC on 2000-01-01. Amendment A1 was approved by CENELEC on 2003-04-01 and amendment A2 was approved by CENELEC on 2005-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of the International Standard IEC 60661:1999, prepared by SC 59G, Small kitchen appliances, of IEC TC 59, Performance of household electrical appliances, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 60661 on 2000-11-01 without any modification.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2001-11-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2003-11-01

Annexes designated “normative” are part of the body of the standard.
In this standard, annex ZA is normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60661:1999 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 59G/128/FDIS, future amendment 1 to IEC 60661:1999, prepared by SC 59G, Small kitchen appliances, of IEC TC 59, Performance of household electrical appliances, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60661:2001 on 2003-04-01.

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- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2006-04-01

Endorsement notice

The text of amendment 1:2003 to the International Standard IEC 60661:1999 was approved by CENELEC as an amendment to the European Standard without any modification.

Foreword to amendment A2

The text of document 59L/21/FDIS, future amendment 2 to IEC 60661:1999, prepared by SC 59L, Small household appliances, of IEC TC 59, Performance of household electrical appliances, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A2 to EN 60661:2001 on 2005-12-01.

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at national level by publication of an identical
national standard or by endorsement (dop) 2006-09-01
- latest date by which the national standards conflicting
with the amendment have to be withdrawn (dow) 2008-12-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of amendment 2:2005 to the International Standard IEC 60661:1999 was approved by CENELEC as an amendment to the European Standard without any modification.

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METHODS FOR MEASURING THE PERFORMANCE OF ELECTRIC HOUSEHOLD COFFEE MAKERS

1 Scope and object

This International standard applies to electric coffee makers for household and similar use. It does not apply to appliances designed exclusively for commercial or industrial use.

The object of this standard is to state and to define the main performance characteristics, which are of interest to the user and to describe the standard methods for measuring these characteristics.

This standard is concerned neither with safety nor performance requirements.

Taking into account the degree of accuracy and repeatability, due to variations in time and origin of test materials and ingredients and the influence of the subjective judgement of test operators, the described test methods may be applied more reliably for comparative testing of a number of appliances at approximately the same time, in the same laboratory, by the same operator and with the same utensils, rather than for testing single appliances in different laboratories.

NOTE 1 Similar use denotes use in premises other than household, for example offices, where the appliance is used in a similar way to normal household use.

NOTE 2 The measuring methods of this standard are specific to coffee makers with a view to the following types of coffee percolator, filter type coffee makers and espresso coffee makers; they may, however, be used for coffee makers having other systems, as far as this is reasonable.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO/DIS 3310-1, *Test sieves – Requirements and tests – Part 1: Metal wire cloth sieves* ¹⁾

ISO 3696:1987, *Water for analytical laboratory use – Specification and test methods*

ISO 3972:1991, *Sensory analysis – Methodology – Methods of investigating sensitivity of taste*

ISO 4121:1987, *Sensory analysis – Methodology – Evaluation of food products by methods using scales*

Ⓐ IEC 60584-2, *Thermocouples – Part 2: Tolerances* Ⓐ

¹⁾ To be published.

3 Definitions

For the purpose of this standard the following definitions apply:

3.1

coffee maker

appliance to prepare coffee

3.2

coffee percolator

coffee maker with a liquid container and a strainer or basket for holding ground coffee through which the heated water ascends in a rising pipe and falls passing through the ground coffee into the container in a continuous process

NOTE In some countries, this type of coffee maker is named "coffee brewer".

3.3

filter coffee maker

coffee maker with separate containers for water and for the coffee brewed and with a filter arranged above the coffee container. The heated water passes once through a filter containing ground coffee into a container

3.4

espresso coffee maker

coffee maker with water heated and forced through ground coffee and filter by steam pressure or mechanical pump

4 Grinding degrees

For the purpose of performance testing of coffee makers, the grinding degrees are defined as follows.



- a) COARSE more than 50 % of the grounds are larger than 0,71 mm;
- b) MEDIUM more than 50 % of the grounds are larger than 0,355 mm but smaller than 0,71 mm;
- c) FINE more than 50 % of the grounds are smaller than 0,355 mm.

Test sieves

| Mesh size of sieve mm |
|--------------------------|
| 0,71 |
| 0,355 |

NOTE The mesh sizes are based on ISO/DIS 3310-1.

5 List of measurements and assessment of performance

- Overall dimensions (clause 7)
- Mass (clause 8)
- Length of flexible cord (clause 9)
- Operating elements (clause 10)
- Capacities (clause 11)
- Maintenance of the coffee maker and exchange of wearing parts (clause 12)
- Cleaning (clause 13)
- Instructions (clause 14)
- Quantity of coffee produced with maximum quantity of cold water (clause 15)
- Quantity of coffee produced with minimum quantity of cold water (clause 16)
- Time to prepare maximum quantity of coffee (clause 17)
- Time to prepare minimum quantity of coffee (clause 18)
- Temperature of the coffee (clause 19)
- Measurement with maximum quantity of ground coffee (clause 20)
- Residual water (clause 21)
- Pouring out of the coffee (proper handling) clause 22)
- Quality of the coffee (clause 23)
- Additional tests for espresso coffee makers (clause 24)
- Descaling test (clause 25)
-  — Energy consumption (clause 26)
- Steam function to froth-up milk and to heat-up water (clause 27). 

6 General conditions for the measurements

Unless otherwise specified, the measurements are made under the following conditions:

- ambient temperature: $20\text{ °C} \pm 5\text{ °C}$;
- cold water temperature: $15\text{ °C} \pm 2\text{ °C}$;
- NOTE In Japan the cold water temperature is $20\text{ °C} \pm 3\text{ °C}$.
- input: rated power input $\pm 1\%$;
- frequency: $\pm 1\%$;
- test room: substantially draught-free;
- during the test the ambient temperature shall be kept at a constant level, with admissible deviations $\pm 2\text{ °C}$;
- placing of the appliance: on a matt black painted wooden support, projecting beyond the appliance by at least 50 mm on all sides and at least 300 mm from the walls.

7 Overall dimensions

The overall dimensions of the appliance, length, height, width or diameter, including any controls, handles, control knobs or other protrusions, the cord guard of any flexible cord and the appliance connector of any cord set supplied with the appliance, shall be measured and indicated in millimetres.

For espresso coffee makers, filter boxes and steam tubes are not taken into account.

8 Mass

The mass of the empty appliance with flexible cord is measured and indicated in kilograms to the nearest 0,05 kg.

The mass is measured with the appliance fitted with all supplied accessories and ready for use.

9 Length of flexible cord

The distance between the entry points to the appliance and the plug, including any guard, is measured and indicated in metres rounded downwards to 0,05 m.

The existence of a cord storage or cord chamber for the flexible supply cord is noted.

10 Operating elements

An inspection is made with regard to the arrangement, accessibility and markings of all the operating elements including the methods of operation and controls.

The results of this inspection are noted.

11 Capacities

The maximum capacity of the reservoir or the container is measured and noted. The level markers on the reservoir or container are noted. The positions of the filling marks for the ground coffee are noted.

12 Maintenance of the coffee maker and exchange of wearing parts

The ease of maintenance and exchange of parts requiring replacement by the user, following the manufacturer's instructions, are checked and noted.

13 Cleaning

After the tests of clauses 15 to 20, a visual inspection shall be made to assess the level of difficulty of cleaning the appliance and the components made dirty by water and coffee, taking into account aspects such as (listed in decreasing order of importance):

- dismantling (time needed and difficulty);
- easy accessibility to filter holder;
- easy removal of water tank and tray container for dirty water and residues of ground coffee;
- dishwasher resistance of components (e.g. jug, filter, container, water tank, etc.);
- presence of special cleaning features or indication of special cleaning operations given in the manufacturer's instructions.

The overall results of these inspections shall be noted.

For espresso coffee makers this evaluation shall be made after five brewing cycles as stated in clause 24.

14 Instructions

It is noted if there are instructions for use and if they include the following;

- a list of parts that are suitable for use in the dishwasher;
- instructions relating to the disposal of any residual water that could remain for long periods in the appliance;
- information on the amount of water for one cup of filtered coffee and for one cup of espresso coffee.

NOTE 1 It should be noted if in the instruction there is information that a cup size corresponds to 0,125 l for filter coffee and 0,035 l for espresso coffee.

NOTE 2 In Japan the amount of 0,12 l is normally used for one cup of filtered coffee.

- special instructions for the preparation of a minimum amount of coffee;
- the method and frequency of descaling.

15 Quantity of coffee produced with maximum quantity of cold water

The water container is filled with the maximum quantity of cold water as assigned to the appliance by markings, labels or similar instructions of the manufacturer. In the absence of such instructions, the water container is filled with the maximum quantity of cold water.

The maximum quantity of cold water is determined and recorded in litres, rounded off to 0,05 l.

The ground coffee container is filled according to the instructions. In the absence of such instructions it is filled with 50 g per litre of water.

The size of filter paper, its positioning and filling are according to the manufacturer's instructions.

NOTE 1 Not applicable for espresso coffee makers.

NOTE 2 For this test, a representative type of coffee that is normally used in that country is taken.

For the purpose of this test medium ground coffee as specified in clause 4 is used, unless otherwise stated in the manufacturer's instructions.

The coffee machine is operated with any controls that it may contain set at the position that produces the strongest coffee, until:

- in the case of filter types, the moment at which the period between two drops falling consecutively into the coffee container is approximately 2 s;
- in the case of percolators with strength control, this device operates up to the moment at which the period between two drops falling consecutively into the coffee container is approximately 2 s;
- in the case of other percolators, the appliance is disconnected from the supply 8 min after percolation has started and then left up to the moment at which the period between two drops falling consecutively into the coffee container is approximately 2 s;
- in the case when drops of coffee are not visible at the end of the brewing time, the appliance is left for 1 min after the last water has come out of the hot water outlet.

The quantity of coffee produced is measured and indicated in litres, rounded off to 0,05 l.

The loss of water during the preparation of coffee shall be noted.

16 Quantity of coffee produced with minimum quantity of cold water

A further test is made under the conditions of clause 15, but with the minimum quantity of water as stated in the manufacturer's instructions, and the corresponding quantity of ground coffee. In the absence of instructions, the test is made with 0,3 l water.

It shall be stated whether the coffee maker functions properly under these conditions. The quantity of coffee produced is measured and indicated in litres, rounded off to 0,01 l.

NOTE Not applicable for espresso coffee makers.

17 Time to prepare maximum quantity of coffee

During the test of clause 15 the total operation time is measured and indicated in minutes and seconds, rounded off to the nearest 10 s. This should be compared with any indications in the manufacturer's instructions and noted.

NOTE Not applicable for espresso coffee makers.

18 Time to prepare minimum quantity of coffee

During the test of clause 16 the total operation time is measured and indicated in minutes and seconds, rounded to the nearest 10 s.

NOTE Not applicable for espresso coffee makers.

19 Temperature of the coffee

On completion of the test according to clause 15 the temperature of the coffee produced is measured in the centre of the lower half of the liquid by means of a watertight thermocouple or equivalent device.

In the case of coffee makers with provisions to keep coffee hot, half of the quantity is then poured out as quickly as possible.

In the case of filter-type coffee makers, the filter with the coffee residues is removed and replaced by a lid, if supplied.

The coffee container is put on the warming device again. The temperature of the liquid is measured again after 30 min and after 60 min. The three temperatures measured are indicated in degrees Celsius with the corresponding times.

In the case of a thermostatically controlled warming device the temperature in the centre of the coffee is recorded during 60 min and the average temperature in degrees Celsius, is indicated.

The temperature required to keep the coffee hot should be noted.

NOTE For testing of espresso coffee makers, see clause 24.

20 Measurement with the maximum quantity of ground coffee

The test of clause 15 is repeated using the maximum quantity of ground coffee possible, according to manufacturer's instructions.

It is determined and stated, if the ground coffee container (filter) can hold this maximum quantity, whether it has overflowed or if the filter paper has been perforated.

NOTE Not applicable for espresso coffee makers.

21 Residual water

After the machine has cooled down to room temperature, it shall be determined whether residual water remains in the coffee maker. The amount remaining shall be indicated in millilitres rounded up to the nearest millilitre.

22 Pouring out of the coffee (proper handling)

The pouring of coffee into cups, based on coffee made using the maximum amount of cold water, shall be observed and noted.

If possible, the pouring out shall be tested with and without a lid, unless otherwise indicated by the manufacturer.

Coffee shall be poured out of the coffee maker or collecting receptacle into a cup, as in normal practice, with any soiling of the machine and its surroundings noted.

23 Quality of the coffee

23.1 Brewing temperature of the coffee

The brewing temperature is a criterion of the coffee flavour for the tasting.

The measurement shall be carried out during the test according to clause 15 in the centre of the coffee filter at 20 mm from the bottom, when a stabilised temperature has been reached.

NOTE 1 Not applicable for espresso coffee makers.

NOTE 2 The brewing temperature should not be less than 88 °C and not more than 96 °C.

23.2 Taste of the coffee

A high quality of coffee with a major market share should be used for test purposes. It is also possible to use coffee which is available in ground form. The type of coffee used is noted.

In accordance with the conditions of clause 15, the coffee shall be prepared with water of medium hardness complying with grade 3 of ISO 3696, free from chlorine and other foreign flavours. After the termination of the coffee preparation, the coffee shall be stirred in the container with a spoon that is free of taste, and then poured into cups. Each cup should contain 0,125 l of coffee. The cup shall be coded.

As soon as the coffee in the cups has cooled down to $55\text{ °C} \pm 5\text{ °C}$, the coffee is tasted by slurping.

A descriptive test according to ISO 4121 shall be carried out by 10 non-professional coffee tasters. The tasting can also be carried out by at least 5 professional coffee tasters.

The qualifications of the professional coffee tasters shall be determined according to ISO 3972.

Separate indications for the individual cups are made by each person for the following characteristics:

- the richness (strength, bitter substances),
- the taste (acid);
- the off-taste.

The assessment should be graded as follows:

- poor;
- little;
- mild;
- rich;
- strong.

The average assessment shall be recorded.

Any undissolved matter or off-taste, such as the taste of plastic, metal etc., in the coffee which is noticeable shall be recorded.

24 Additional tests of espresso coffee makers

24.1 The coffee is prepared according to the manufacturer's instructions. If the manufacturer does not specify the quantify of ground to be used, 7 g of ground coffee per cup shall be used for espresso coffee.

The manufacturer's instructions shall be followed.

For this test a representative type of espresso coffee which is normally used in that country is used and recorded.

The porcelain cup shall have a capacity of 0,070 – 0,100 l and a wall thickness of 5 mm – 7 mm.

24.2 The temperature of the freshly prepared coffee shall be measured in the middle of the cup, during the first and second run-through, based upon a cup volume of 0,035 l. The cups shall be preheated according to the manufacturer's instructions, if any.

The average value of the measured temperature shall be indicated.

24.3 If two cups of coffee can be filled at the same time, it shall be noted if these cups have been filled equally. This test is carried out at least 10 times. The differences should be recorded and expressed in millilitres.

24.4 The taste shall be determined as in the case of coffee makers (23.2).

In addition the visual impression of the crema has to be assessed using the following rating scale:

- 5 thick covering all over;
- 4 all covered with little holes;
- 3 patchy covering all over;
- 2 sparsely covered;
- 1 none.

The espresso coffee maker shall be operated with a one-cup capacity as well as with the maximum cup capacity.

25 Descaling test

This test shall be carried out with a filter, but without ground coffee and with a normal coffee container. The water that is run through shall be drained off and discarded.

The coffee maker shall be operated at 1,15 rated power input.

The test shall be carried out using fresh water having a general hardness of approximately 3,0 mmol/l.

The coffee maker shall be filled with the maximum amount of cold water according to clause 15, a collecting device inserted and the coffee maker switched on. When the water has run through it is discarded and the coffee machine is left switched on and allowed to run dry. The coffee maker shall remain switched on for 15 min and then switched off and allowed to cool for 15 min.

The above cycle shall be carried out 500 times. This test shall be repeated 500 times using the minimum amount of cold water.

During this test, a descaling process shall be carried out according to the instructions of the manufacturer. If there are no instructions, the descaling process is carried out when the brewing time has increased by 20 %. It shall be recorded if the instructions include sufficient information concerning descaling and how the descaling agent can be poured in and removed at the end of the descaling process.

If the instructions do not include any or include insufficient information, descaling agents for electric domestic appliances usually available in the trade are used according to the instructions of the manufacturer of the descaling agent.

At the end of the descaling process, the appliance shall be inspected and the test according to clause 17 shall be repeated. The change of preparation time shall be recorded.

The following shall be recorded:


- the change in preparation time compared with the time noted in clause 17;
- if the coffee maker withstands the tests without affecting its features and functions for use;
- if the manufacturer's instructions include sufficient information on descaling, including how the descaling agent is poured in and is removed at the end of the descaling process;
- the ease of handling.

26 Energy consumption

26.1 Coffee makers

During the tests of Clause 15 the energy consumption to produce the coffee shall be measured and during the tests of Clause 19 the energy consumption to keep the coffee hot for 30 min shall be measured.

The energy consumption shall be indicated in watt-hours (Wh) per cup, with a volume of 0,125 l of brewed coffee, rounded to the nearest 0,1 Wh.

In addition it shall be indicated whether there exist other energy consuming devices (for example, timer or standby function). 

A1 The energy consumption of appliances with a thermojug is measured only during the tests of Clause 15.

The energy measurements shall be accurate to $\pm 1,5$ %.

26.2 Espresso coffee makers

During the tests of Clause 24 the energy consumption shall be measured.

Two measurements shall be carried out.

First measurement: during the preparation of one cup of espresso, or the maximum number of cups (if several cups can be prepared at the same time), starting with the appliance at room temperature (heating-up time included).

Second measurement: during the preparation of a second cup of espresso, or the maximum number of cups (if several cups can be prepared at the same time), directly after the first measurement.

The energy consumption either for the preparation of the first cup or for the preparation of the following cups, having each a volume of 0,035 l, shall be indicated in watt-hours rounded to the nearest 0,1 Wh.

In addition the energy consumption for a standby operation for 1 h shall be indicated.

The energy measurements shall be accurate to $\pm 1,5$ %. **A1**

A2 27 Steam function to froth-up milk and to heat-up water

The test procedure is considered as applicable for reproducible testing.

27.1 Steam function to froth-up milk

A glass container with a thickness of about 2 mm having an inner diameter of 80 mm \pm 2 mm and a height of 75 mm \pm 2 mm is placed perpendicular and centered below the steam tube of the appliance.

The distance of the outlet of the steam tube to the inner bottom of the container shall be 10 mm \pm 1 mm.

An amount of 0,1 l \pm 0,001 l of water is put into the glass container, and the water level is marked as level 1. An additional amount of 0,05 l \pm 0,001 l is then put into the glass container, and the water level is marked as level 2. An extra amount of 0,05 l + 0,001 l is added on top of level 2 and that level is marked as level 3 (for water levels, see Figure 1). A supporting surface having a thermal isolation may be used (see Figure 2).

NOTE Varying steam tubes with different steam nozzles may cause differences in levels 1, 2 and 3. **A2**

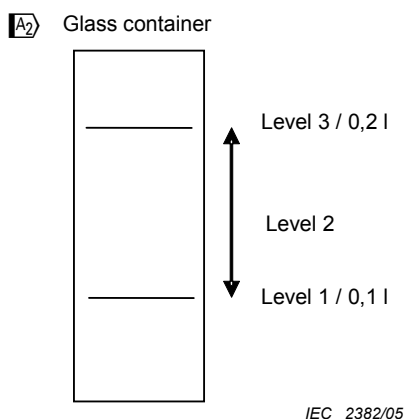
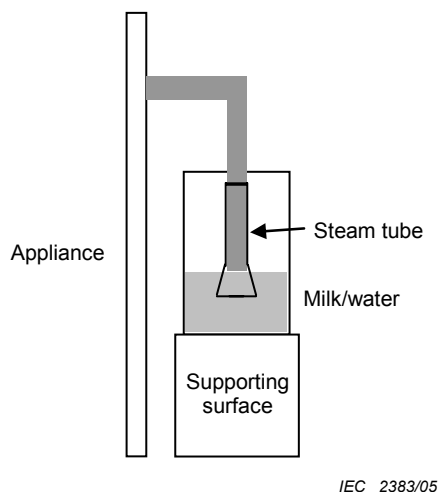


Figure 1 – Markings for levels 1, 2, 3



**Figure 2 – Test assembly
steam function**

After that the glass container is emptied and dried.

The water container of the appliance is then filled with the maximum quantity of cold water as assigned by markings, labels or similar instructions of the manufacturer. In case of absence of such instructions, the water container is filled with the maximum quantity of cold water.

In order to avoid residual water in the steam valve, the steam function has to be operated before the test at least three times for about 5 s.

The glass container is then filled with $0,1 \text{ l} \pm 0,001 \text{ l}$ of homogenized milk with a fat content of approximately 3,5 % at a temperature of $8 \text{ }^{\circ}\text{C} \pm 1 \text{ }^{\circ}\text{C}$.

A watertight thermocouple of class 1 according to IEC 60584-2, accurate to $\pm 1,5 \text{ K}$ and having a nominal diameter of 0,25 mm, is placed beside the steam tube and approximately 5 mm away and 10 mm below the marking for level 2 of the glass container.

The mass M_{L1} of the glass container including the milk shall be determined on a balance having an accuracy of at least 0,1 g and recorded.

The mass M_{L1} is expressed in grams. A2

A2 After that the glass container is placed in the same way as described for the marking procedure (see Figure 2).

The appliance is operated with any controls at the positions specified by the manufacturer. In absence of such instructions, the steam function is operated at the max. setting of the steam function.

The steam function of the appliance is then operated until the upper level of the frothed-up milk reaches the marked level 3.

The time t_F to froth-up the milk to level 3 (double volume) shall be determined and noted.

The froth-up time t_F is expressed in seconds and rounded off to the next second.

The temperature T to the froth-up the milk to level 3 is measured with a temperature-recording instrument (accurate to ± 3 K) and is noted.

Immediately after the frothing-up procedure the decomposition time t_{L2} of the frothed-up milk is determined and noted.

t_{L2} is the time taken for the volume of frothed-up milk to reduce to level 2 by natural loss of gas (air) and returning partly into liquid state.

The decomposition time t_{L2} is expressed in seconds and rounded off to the next second.

The time t_{L2} is determined while retaining the glass container at the same position as used for the frothing-up procedure.

NOTE This test is carried out to assess the quality of the frothing-up process and the stability of the frothed-up milk relating to bubble size and stability time.

The mass M_{L3} of the glass container with the frothed-up milk shall be determined on a balance having an accuracy of at least 0.1g and noted.

The mass M_{L3} is expressed in grams.

NOTE Special care has to be taken collect any dripping milk after the test. The measurement of the mass of the milk, including water from the steam function, has to be made after the dripping from the steam tube has finished.

The water absorption M_W of the frothed-up milk shall be determined and noted.

The water absorption M_W of the frothed-up milk is calculated as follows:

$$M_W = M_{L3} - M_{L1}$$

The result of the test is the water absorption M_W of the frothed-up milk and is expressed in grams per 0,1 l of milk and rounded off to 0,1 gram.

27.2 Steam function to heat-up water

A glass container as described in 27.1 is filled with $0,2 \text{ l} \pm 0,001 \text{ l}$ of water at a temperature T_W of $15^\circ\text{C} \pm 1^\circ\text{C}$.

The mass M_{L4} of the glass container including the cold water shall be determined on a balance having an accuracy of at least 0,1 g and recorded.

The mass M_{L4} is expressed in grams. **A2**

A2 After that the glass container is placed in the same way as described for the marking procedure.

In order to avoid residual water in the steam valve the steam function has to be operated before the test at least three times for about 5 s, before the glass container is placed in position.

A watertight thermocouple of class 1 according to IEC 60584-2, accurate to $\pm 1,5$ K and having a nominal diameter of 0,25 mm is placed beside the steam tube and approximately 5 mm away and 20 mm below the marking for level 2 of the glass container.

The steam function of the appliance is then operated under the same conditions described in 27.1 for 120 s.

The temperature T_{120} of the heated-up water shall be measured with a temperature-recording instrument. The measurement shall be accurate to ± 3 K.

The rise in temperature ΔT shall be determined and noted.

The rise in temperature ΔT is calculated as follows:

$$\Delta T = T_{120} - T_W$$

The result of the test is the rise in temperature ΔT for the heated-up water expressed in K rounded off to 1 K.

The mass M_{L5} of the glass container with the heated-up water including absorbed water from the steam function shall be determined on a balance having an accuracy of at least 0,1g and noted.

The mass M_{L5} is expressed in grams.

NOTE Special care has to be taken to collect any dripping water after the test. The measurement of the mass of the water, including water from the steam function, has to be made after the dripping from the steam tube has finished.

The steam (water) absorption M_{ST} of the heated-up water shall be determined and noted.

The steam (water) absorption M_{ST} of the heated-up water is calculated as follows:

$$M_{ST} = M_{L5} - M_{L4}$$

The result of the test is the steam (water) absorption M_{ST} of the heated-up water and is expressed in grams per 0,2 l of water and rounded off to 0,1 gram.

NOTE If the manufacturer does not describe the steam function to heat-up water this test is not carried out. **A2**

Annex ZA
(normative)

**Normative references to international publications
with their corresponding European publications**

Add:

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|-------------------------------------|--------------|-------------|
| IEC 60584-2 | - 1) | Thermocouples Part 2: Tolerances | EN 60584-2 | 1993 2) |

1) Undated reference.
2) Valid edition at date of issue.

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