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Električni pomivalni stroji za gospodinjstva - Metode za merjenje lastnosti (IEC 60436:2004, spremenjen)

Electric dishwashers for household use - Methods for measuring the performance

Elektrische Geschirrspüler für den Hausgebrauch - Messverfahren für Gebrauchseigenschaften

Lave-vaisselle électriques pour usage domestique - Méthodes de mesures de l'aptitude à la fonction

Ta slovenski standard je istoveten z: **EN 50242:2008**

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97.040.40 Pomivalni stroji Dishwashers

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EUROPEAN STANDARD

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English version

Electric dishwashers for household use - Methods for measuring the performance
(IEC 60436:2004, modified)

Lave-vaisselle électriques pour usage domestique -
Méthodes de mesures de l'aptitude à la fonction
(CEI 60436:2004, modifiée)

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Messverfahren für Gebrauchseigenschaften
(IEC 60436:2004, modifiziert)

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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.

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

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Foreword

This European Standard consists of the text of IEC 60436:2004 prepared by SC 59A, Electric dishwashers, of IEC TC 59, Performance of household electrical appliances, together with all common modifications necessary for application in Europe. These common modifications have been prepared by the Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances.

The text of the draft was submitted to the formal vote and was approved by CENELEC with a double numbering: EN 50242/EN 60436 on 2007-09-01.

This European Standard supersedes EN 50242:1998 (+ corrigendum February 2000) + A1:1999 + A2:2001 + A3:2003.

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)	2008-10-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-09-01

Clauses, subclauses, notes, tables and figures which are additional to those in IEC 60436:2004 are prefixed “Z”.

Text of EN 50242/EN 60436

The text of this European Standard consists of the text of the International Standard IEC 60436:2004 including the European common modifications written in red and identified by a vertical line in the left margin of the text.

Contents

1 Scope

This European Standard applies to electric dishwashers for household use that are supplied with hot and/or cold water.

The object is to state and define the principal performance characteristics of electric dishwashers for household use and to describe the standard methods of measuring these characteristics.

This standard is concerned neither with safety nor with performance requirements.

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.

EN 60350, *Electric cooking ranges, hobs, ovens and grills for household use – Methods for measuring performance* (IEC 60350)

EN 60704-2-3, *Household and similar electrical appliances – Test code for the determination of airborne acoustical noise – Part 2-3: Particular requirements for dishwashers* (IEC 60704-2-3)

EN 60704-3, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances – Part 3: Procedure for determining and verifying declared noise emission values* (IEC 60704-3)

EN 60705, *Household microwave ovens – Methods for measuring performance* (IEC 60705)

EN 60734, *Household electrical appliances – Performance – Hard water for testing* (IEC 60734)

ISO 607, *Surface active agents and detergents – Methods of sample division*

ANSI/AHAM DW-1:1992, American National Standard: *Household electric dishwashers*

ISO 3310, *Test sieves - Technical requirements and testing*

3 Definitions related to the appliance

3.1
dishwasher
machine which cleans, rinses, and dries dishware, glassware, cutlery, and, in some cases, cooking utensils by chemical, mechanical, thermal, and electric means. A dishwasher may or may not have a specific drying operation at the end of the program

3.2
rated dishwasher capacity
whole number of place settings together with the serving pieces (see Annexes A & B) stated by the manufacturer, which can be cleaned and dried when loaded in accordance with the manufacturer's instructions

3.3
operation
each event that occurs during the dishwasher programme such as cleaning, rinsing or drying

3.4
programme
series of operations which are pre-defined within the dishwasher and which are declared as suitable for specified levels of soil and/or type of load and together form a complete cycle

3.5
cycle
complete washing, rinsing, and drying process, as defined by the programme selected, consisting of a series of operations

3.6
programme time
programme time is measured from the initiation of the programme (excluding any user programmed delay) until an end of programme indicator. If there is no end of programme indicator, the programme time is equal to the cycle time

3.7
cycle time
cycle time is measured from the initiation of the programme (excluding any user programmed delay) until all activity ceases (i.e. the end of the cycle)

3.8
automatic dispenser
device activated automatically which injects or dispenses detergent, rinse agent, etc., one or more times into the dishwasher at predetermined points in the dishwasher cycle

3.9
non-automatic dispenser
device, usually a fixed cup or cavity on the dishwasher door, cover, or dish rack, which deposits a previously measured amount of detergent, rinse agent, etc., into the dishwasher at the beginning of the dishwasher cycle

3.10
water softener
device which reduces the hardness of water

3.11
rack
support for holding dishware, cutlery, and/or glassware in the dishwasher

3.12
detergent
cleaning agent in powder, granular, tablet or liquid form, manufactured for use in household electric dishwashers to aid in the removal of food soils by chemical means

NOTE A reference detergent in powder form is specified for use in this standard (see 5.7).

3.13
rinse agent
chemical agent added to the water in the last rinsing operation to improve the drying effect and reduce water marks

NOTE Two reference rinse agents are specified for use in this standard (see 5.8).

3.14
serving pieces
defined set of crockery and cutlery for serving (see Annexes A and B)

3.15
place settings
defined set of crockery, glass and cutlery for use by one person (see Annexes A and B)

4 List of measurements

Standard methods of measuring the performance characteristics are determined as follows:

– the cleaning performance according to Clause 6;
– drying performance according to Clause 7;
– energy, water consumption and time according to Clause 8;
– airborne acoustical noise according to Clause 9.

5 General conditions for measurements

For energy labelling purposes the standard is only used with cold water.

5.1 General

The dishwasher manufacturer's instructions regarding installation and use of the dishwasher shall be followed, except where there is a conflict, in which case this standard shall prevail.

Performance tests according to this standard document shall be generally carried out on a new machine, with a reference machine running parallel with the machine(s) under test, i.e., at the same time under the same conditions using soil prepared at the same time from the same batch. The reference machine shall be in accordance with the description given in Annex E.

The reference machine shall always be installed as a free standing machine independent of the type of machine under test.

Before commencing measurements, the dishwasher and the reference machine shall be checked to ensure that they are operating properly.

All tests shall be started with the appliances at the ambient temperature according to 5.5.

5.1.1 Free standing dishwashers

Dishwashers shall be tested as free standing except where they are designated as built–in or integrated (refer to 5.1.2).

The dishwasher manufacturer's instructions regarding installation and use of the dishwasher shall be followed.

5.1.2 Built in and integrated dishwashers

Built-in dishwashers have to be installed in an enclosure. See Annex I, Figure I.1.

The front edge of the housing of the dishwasher (except the door) shall be 20 mm to 25 mm behind the front edge of the test enclosure. If required by the manufacturer's instructions, the enclosure shall be provided with ventilation openings accordingly.

If an appliance is provided with spacers, strips or other special means of solid or resilient material for closing the gap(s) between the contours of the appliance and the cabinet enclosure, these means shall be used accordingly. If such means are not provided, the gap(s) shall be left open.

Appliances to be integrated shall be installed under the same conditions as built-in appliances. In addition, the door of the dishwasher shall be equipped, in accordance with the manufacturer's instruction, with a board of the maximum size allowed by the manufacturer and of the same material and thickness as the test enclosure; see Annex I.

Moreover, for integrated types, the test enclosure shall be provided, in accordance with the manufacturer's instructions, at its lower front side with a skirting board of the maximum height which corresponds with the size of the board on the door of the appliance and of the same material and thickness as the test enclosure, see Annex I. If no instructions are given by the manufacturer, a skirting board as described above shall be pressed against the skirting board of the appliance.

5.2 Conditioning of the machine under test and sequence of test procedures

Before conducting the performance tests, the dishwasher shall be operated for three complete cycles using a clean load with reference detergent (specified in 5.7) and without rinse agent. No additional cycles shall be carried out on the machine under test between the sequential steps specified in the following procedure.

The tests shall be performed in the following order: cleaning performance (Clause 6) then drying performance (Clause 7). The determination of energy, water and cycle/program time (Clause 8) shall be done in conjunction with a cleaning performance test (Clause 6).

NOTE 1 The above sequence is necessary for better reproducibility, i.e. to avoid differences in drying performance due to the aging process of the plastic parts in the dishwasher (for example, racks).

NOTE 2 Any cycles or operations performed on the appliance during the manufacture of the product are ignored.

NOTE 3 Noise tests require that the test should be carried out before the rinse aid dispenser is filled for the first time.

5.3 Electricity supply for machines

5.3.1 Electricity supply for test machine

5.3.1.1 Voltage

The supply voltage shall be maintained at 230 V ± 1 %.

The supply voltage measured during the tests shall be recorded.

NOTE Also the micro-wave oven shall be operated under the same conditions.

5.3.1.2 Frequency

The supply frequency shall be set at the rated frequency of the machine and maintained within the range ± 1 % throughout the test. If a frequency range is indicated, then the testing shall be carried out at the nominal frequency of the country in which the appliance is intended to be used. The measured frequency shall be reported.

NOTE If the rated frequency of the machine differs from the system frequency of the country of intended use, measurements should be carried out at the nominal frequency of the country of intended use.

5.3.2 Electricity supply for the reference machine

5.3.2.1 Voltage

The supply voltage shall be set at 230 V a.c. and maintained within ± 1 % throughout the test. The measured voltage shall be reported.

5.3.2.2 Frequency

The supply frequency shall be set at 50 Hz and maintained within ± 1 % throughout the test. The measured frequency shall be reported.

5.4 Test programme

The first programme to be tested shall be the one recommended by the manufacturer for a normally soiled load.

NOTE The manufacturer has to declare the programme to be used for the purpose of energy labelling. It shall be a programme for normal use, using normal table ware, excluding cooking utensils.

The same programme shall be used for measuring the cleaning performance according to Clause 6, the drying performance according to Clause 7, the energy and water consumption and time according to Clause 8, and the noise according to Clause 9, if tested.

Additional programmes may then be tested.

5.5 Ambient conditions

The following ambient conditions shall be maintained throughout the measurements.

Oven drying method

– Ambient temperature of the room:	(23 ± 2)	°C
– Relative humidity:	(55 ± 5)	% RH

Air dry method

– Ambient temperature of the room:	(23 ± 2)	°C
– Relative humidity:	(65 ± 10)	% RH

The ambient temperature and the relative humidity measured during the tests shall be reported in the test report.

For energy label purposes the air dry method is not permitted.

5.6 Water supply

5.6.1 General

The actual water conditions (temperature, hardness, and pressure) maintained during the tests shall be reported in the test report.

NOTE Some countries specify a hot water temperature for regulatory purposes, in which case this water temperature should be used for testing.

5.6.2 Water supply – Temperature

The temperature of the supply water shall be

– cold water feed temperature:
  - (15 ± 2) °C.
– hot water feed temperature:
  - temperature indicated by the manufacturer ± 2 °C, or
  - where a range is specified which does include 60 °C, (60 ± 2) °C, or
  - where a range is specified which does not include 60 °C, the value nearest to 60 °C ± 2 °C, or
  - (60 ± 2) °C, if instructions are not given.

For energy label purposes the use of hot water is not permitted.

5.6.3 Hardness

A water hardness of (2,5 ± 0,5) mmol/l for hard water areas or ≤ 0,7 mmol/l for soft water areas shall be used. If water hardness needs to be adjusted to meet these specifications, it shall be prepared according to EN 60734 – Method C. The measured water hardness shall be reported. The water hardness used in the test shall be the one most applicable to the country of intended use.

For energy label purposes only water of 2,5 +/- 0,5 mmol/l shall be used.

If the appliance is not equipped with a water softener the hardest water which is permitted by the manufacturer's instructions shall be used.

NOTE The impact of water hardness variation between 0,0 mmol/l to 0,7 mmol/l is still under investigation.

5.6.4 Water pressure

The pressure of the water supply at each water inlet shall be set at 240 kPa and shall be maintained within the range ± 20 kPa, including during all fills. The measured water pressure shall be reported. Where the manufacturer specifies a range of water pressure that does not include 240 kPa ± 20 kPa, the water pressure shall be set at the end of the pressure range closest to 240 kPa ± 20 kPa.

5.7 Detergent

For energy label purposes the reference detergent B, as described in Annex D, shall be used. The quantity shall be as recommended by the manufacturer. But shall not be more than

- 2,5 g/place setting for dishwashers with a capacity of ≥ 10 place settings;
- 3,0 g/place setting for dishwashers with a capacity of < 10 place settings.

If no recommendation is given by the manufacturer, use

- 2,0 g/place setting for dishwashers with a capacity of ≥ 10 place settings;
- 2,5 g/place setting for dishwashers with a capacity of < 10 place settings.

The quantity of detergent, in grams per place setting, used during the tests shall be recorded.

The detergent shall be placed in the dishwasher immediately prior to starting the programme. If a dispenser is incorporated in the dishwasher it shall be used. The dispenser shall be clean and dry prior to the placement of detergent. In the absence of manufacturer's recommendations, the detergent shall be placed in the main compartment of the dispenser.

Detergent from the same batch shall be used for the dishwasher under test and for the reference dishwasher.

The detergent shall be stored in waterproof bags in quantities of no more than 1 kg in a cool and dry atmosphere. It shall be used within six months after production and within one month of opening.

Before using, the detergent shall be homogenized in accordance with ISO 607 for example using a sample dividing device.

NOTE For a supplier of a suitable sample dividing device, see Annex F.

5.8 Rinse agent

The rinse agent as described in Annex D shall be used. For a water hardness of 2,5 mmol/l, Formula III rinse aid (acidic) shall be used. For a water hardness of ≤ 0,7 mmol/l, Formula IV (neutral) rinse aid shall be used.

For energy labelling purposes only Formula III rinse aid (acidic) shall be used.

NOTE 1 As a guide, acidic rinse agent is to be used with hard water and neutral rinse agent with soft water. However, where one type of rinse aid is not generally available in the country of intended use, the other may be specified regardless of the water hardness. In dishwashers with softeners in hardwater areas, the hardness in the final rinse will be below 0,7 mmol/l.

For dishwashers with an adjustable automatic dispenser, the setting shall be as recommended by the manufacturer. In the absence of such an indication, the setting shall be used which gives the lowest quantity of rinse aid.

NOTE 2 Any recommendation by the manufacturer to the user to manually adjust the initial setting, based on experience, is disregarded.

For machines without automatic dispensers, the rinse agent shall be added manually, if so recommended by the manufacturer and in accordance with their instructions.

5.9 Salt

If the dishwasher is equipped with a water softener that requires salt, fill in accordance with the manufacturer's instructions for the water hardness used for the test. For specification of the salt, see Annex D.

6 Cleaning performance

6.1 General and purpose

The purpose of this test is to measure how well the appliance cleans normally soiled place settings and serving pieces.

The tests are carried out in parallel with the reference machine specified in Annex E. Soiling of the test loads for the test machine(s) and the reference machine shall be prepared in parallel.

The reference machine shall also be run in parallel with any test machine(s). For a large number of test loads, it may be necessary to have more than one person preparing soils, but one person shall prepare each soil type for all loads. Similarly, one person shall apply each soil type for all loads (person preparing soils may be different than the person applying soils).

Detergent and rinse agents are used according to 5.7 and 5.8.

The sequence of the test procedure as specified in 5.2 shall be followed.

For details of preparation, the instructions of the video available by the supplier given in Annex F must be followed. Additionally Annex N contains pictures of typical soilings.

NOTE If only a cleaning evaluation is to be undertaken, the evaluation may be commenced as soon as the dishwasher indicates the end of the programme and the evaluator can safely handle the load.

6.2 Load

The test load shall consist of the whole number of complete place settings plus the corresponding serving pieces (see Annex A or B) which together comprise the manufacturer's rated capacity.

For energy label purposes load only according to Annex A shall be used.

NOTE The reference machine always uses a load style from Annex A, irrespective of the load style used on the test machine.

All items shall be thoroughly clean and dry so that they could achieve a score of 5 before soiling. Any evaluation shall be done in accordance with 6.7. If a load item needs to be cleaned or reconditioned, items can be washed by hand or washed in a dishwasher but all reconditioned items shall be washed in a dishwasher that dispenses IEC rinse aid (refer Annex D) in the final operation prior to the next test.

NOTE Reconditioning in a dishwasher should be done using detergent B (refer Annex D).

Any items with imperfections likely to affect the evaluation or with chips or cracks shall be removed and replaced.

The items should be used for not more than 200 cycles where soiling is applied.

After each cleaning performance test with five to eight cycles a special normalization cycle shall be performed in order to avoid residual scale formation on the test load. For this purpose clean load is loaded into a dishwasher (no test- or reference machine) having a normal / daily use programme. This programme is run with 30 g of anhydrous fine granular citric acid (Supplier see F.Z2) instead of detergent for one cycle.

In case new test load is started to use in the tests, ten cycles using detergent (specified in 5.7) and rinse aid (specified in 5.7) shall be performed in order to avoid the deviations in the test results of tests performed with new load and used load.

Soup plates (specified in A.2) soiled with oat flakes (specified in 6.4.5) shall be free of starch residues from the previous tests.

NOTE This can be checked by Lugols solution after each cleaning performance test. Lugols solution is a 1 % Iodine/potassium iodide solution (Merck 109261), which may be obtained from supplier mentioned in F.Z2.

6.3 Soiling agents

The following soiling agents are required:

– milk;
– tea;
– minced meat;
– egg;
– oat flakes;
– spinach;
– margarine.

All food products, at the time they are used for the preparation of soiling agents to this standard, shall be within the “use-by” date or before their expiry date stated on the product. The remains of newly opened packets of tea and oat flakes may be used for subsequent tests for a period of up to 60 d after opening, if the contents are stored in a sealed container. Specific directions are provided in the following section for storage and re-use of spinach after defrosting.

All soiling materials used for the reference machine and for the machine under test shall be from the same batch.

For energy labelling purposes it is necessary that the soilings have the same properties in all laboratories to ensure comparable and reproducible results.

Soilings from the same batch are offered by the supplier mentioned in F.14.

6.4 Preparation and application of soiling agents

Unless specifically stated otherwise, all soiling agents are to be freshly prepared for each test and have to be finally prepared and applied to the test items at the date of testing.

The whole amount of each soiling agent needed for the test (grams/setting × number of settings) shall be weighed out, divided into portions as necessary and applied as specified to the parts of the setting.

It is then recommended to start by pre-heating the microwave oven for the milk soiling. During this time prepare the tea soiling. During the pre-drying period for the tea (one hour) prepare and apply the rest of the soiling agents.

NOTE 1 Refer to Annex C for an illustration of soiling distribution and quantities.

NOTE 2 Refer to Annex ZA for illustration of soiling.

6.4.1 Milk

6.4.1.1 Items required for preparation

– Any U.H.T. milk with 1,5 % – 2 % fat content may be used. U.H.T. milk shall have a “use-by” date, or expiry date, of at least 1,5 months from the date of the test. Fresh 2 % fat content homogenized milk may be used within its expiry date and shall be kept refrigerated. U.H.T. milk shall be refrigerated after opening and shall be used within 2 days of opening.

  For energy label purposes only UHT milk shall be used.

– Microwave oven with a glass turntable as specified in Annex G.