

Electric dishwashers for household use — Test methods for measuring the performance

The European Standard EN 50242:1998 with the incorporation of amendments A1:1999, A2:2001 and A3:2003 has the status of a British Standard

ICS 97.040.40

National foreword

This British Standard is the English language version of EN 50242:1998 including amendment A1:1999, corrigendum February 2000, amendment A2:2001 and amendment A3:2003.

The UK participation in its preparation was entrusted by Technical Committee CPL/59, Performance of household electrical appliances, to Subcommittee CPL/59/1, Electric dishwashers, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the 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.

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This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 30, an inside back cover and a back cover.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 April 1999

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Amendments issued since publication

Amd. No.	Date	Comments
10593	August 1999	
10950 Corrigendum No. 1	September 2000	
13169	June 2001	
14566	2 September 2003	Indicated by a sideline

ISBN 0 580 30965 7

Descriptors: Household electrical appliances, dishwashers, performance, measurements, comparative tests

English version

Electric dishwashers for household use — Test methods for measuring the performance

(includes amendments A1:1999, A2:2001 and A3:2003)

Lave-vaisselle électriques pour usage
domestique — Méthodes d'essai pour la mesure
de l'aptitude à la fonction
(inclut les amendements A1:1999, A2:2001
et A3:2003)

Elektrische Geschirrspülmaschinen für den
Hausgebrauch — Meßverfahren für
Gebrauchseigenschaften
(enthält Änderungen A1:1999, A2:2001
und A3:2003)

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Ref. No. EN 50242:1998 + A1:1999 + A2:2001 + A3:2003 E



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Foreword

This European Standard was 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 as EN 50242 on 1998-08-01.

This European Standard supersedes HD 378 S1:1978.

Significant technical differences include the introduction of:

- a) a reference dishwashing machine;
- b) a new test method for cleaning performance;
- c) a revised calculation for determining the cleaning and drying performance indexes;
- d) tolerances;
- e) a new (phosphate free) reference detergent.

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) 1999-08-01
- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 2001-08-01

In accordance with the decision of CLC/TC 59X, taken at the meeting in Paris on 12th April 1995 this standard was drawn up as a self-contained CENELEC document. It follows, as far as possible, the structure of the present IEC 60436:1981.

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 92/75/EEC on "Indication by labelling and standard product information of the consumption of energy and other resources by household appliances".

Test results obtained according to this standard are for direct comparison and in conjunction with the reference machine considered sufficiently reproducible within given limits for the purpose of energy labelling according to the Commission Directive on energy labelling and standard product information.

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, Annex A, Annex B, Annex C, Annex D and Annex E are normative and Annex F and Annex G are informative.

Foreword to amendment A1

This amendment has 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 as amendment A1 to EN 50242:1998 on 1999-04-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-10-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2001-08-01

Foreword to amendment A2

This amendment was prepared by Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances. It is meant to clarify unmistakably the test cycle to be used for the existence of energy labelling and the end of the test cycle.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A2 to EN 50242:1998 on 2000-08-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2001-08-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2001-08-01

Foreword to amendment A3

This amendment to the European Standard EN 50242:1998 was prepared by WG 2, Dishwashers, of the Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A3 to EN 50242:1998 on 2002-12-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-12-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2005-12-01

This amendment comprises:

- updates of addresses given in Annex C and Annex F;
- the introduction of common ambient conditions for washing machines, tumble dryers and dishwashers, according to the decision made by CLC/TC 59X at the meeting in May 2000;
- more precisely specified test conditions to improve the reproducibility of the test procedures. The improvements do not change the test procedures in principle.

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1 Scope

This standard is applicable to electric dishwashers for household use that are intended to be supplied with cold water and incorporate an electrical heating system.

It is not applicable to dishwashers supplied with hot water or hot and cold water. It is applicable to dishwashers intended to be supplied by hot or cold water when supplied with cold water only.

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

Safety aspects for electric household dishwashers are dealt with by EN 60335-2-5.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 60335-2-5, *Safety of household and similar electrical appliances — Part 2: Particular requirements for dishwashers* [IEC 60335-2-5, modified].

EN 60704-2-3, *Test code for the determination of airborne acoustical noise emitted by household and similar electrical appliances — Part 2: Particular requirements for dishwashers* [IEC 60704-2-3, modified].

EN 60704-3, *Part 3: Procedure for determining and verifying declared noise emission values* [IEC 60704-3].

EN 60705, *Methods for measuring the performance of microwave ovens for household and similar purposes* [IEC 60705].

EN 60734, *Hard water to be used for testing the performance of some household electrical appliances* [IEC 60734].

IEC 60436:1981, *Methods for measuring the performance of electric dishwashers*.

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

DIN 6164-1:1980, *DIN-Farbenkarte — Teil 1: System der DIN-Farbenkarte für den 2°-Normalbeobachter (DIN colour chart — Part 1: System based on the 2° standard colorimetric observer)*.

3 Definitions

For the purpose of this European Standard, the following definitions apply.

3.1 definitions related to the appliance

3.1.1

dishwasher

a machine which cleans, rinses and dries dishware, glassware, cutlery and, in some cases cooking utensils by chemical, mechanical and electric means

[IEC 60436:1981, 3.1]

3.1.2

rated dishwasher capacity

the number of place settings together with the service pieces (see Annex A) stated by the manufacturer, when the dishwasher is loaded in accordance with the manufacturer's instructions

[IEC 60436:1981, 4.1]

3.1.3

cycle

the sequence of events occurring in the dishwasher during the cleaning, rinsing and drying process

[IEC 60436:1981, 4.2; modified]

The cycle is considered to be completed:

- a) if there is an indicator: when it indicates that the programme is finished;
- b) if there is no indicator: when all functional components stop working.

3.1.4

dispenser

automatic dispenser

a device activated automatically which injects or dispenses detergent, rinse agent, etc., one or more times into the dishwasher at predetermined intervals throughout the dishwasher cycle

non-automatic dispenser

a 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. The dispenser is emptied when the dishwasher door or cover is closed, or requires water circulation to flush the detergent from the dispenser

[IEC 60436:1981, 4.3; modified]

3.1.5

water softener

a device which reduces the hardness of water

[IEC 60436:1981, 4.4]

3.2 definitions related to the methods for measuring the performance

3.2.1

cutlery basket

container for holding cutlery in the dishwasher

[IEC 60436:1981, 5.1]

3.2.2

rack

support for holding dishware and glassware in the dishwasher

[IEC 60436:1981, 5.2]

3.2.3

detergent

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

[IEC 60436:1981, 5.3]

3.2.4

rinse agent

a chemical agent sometimes added to the last rinsing water to improve the drying effect and reduce water marks

[IEC 60436:1981, 5.4]

3.2.5

place setting

a unit of standardized cutlery, crockery and glassware

NOTE It represents the needs of one person.

3.2.6

serving pieces

a unit of standardized cutlery and crockery used in addition to the place settings

NOTE It represents the additional items used for serving a meal.

4 List of measurements

For the purposes of this standard the performance of the dishwasher is determined by the following measurements.

- cleaning performance according to Clause 6;
- drying performance according to Clause 7;
- energy and water consumption according to Clause 8;
- airborne acoustical noise according to Clause 9.

5 Conditions of measurement

5.1 General

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

Dishwashers designed to be built-in shall be installed using the test enclosure as described in Annex D. The front edge of the housing of the dishwasher (except 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 or enclosure, these means shall be used accordingly. If such means are not provided, the gap(s) are left open.

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

Moreover 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 D. If no instructions are given by the manufacturer a skirting board as described above shall be pressed against the skirting board of the appliance. [EN 60704-2-3, 6.5.5, modified]

NOTE 1 Appliances to be integrated are understood as built-in appliances which shall be completed at the door usually by a board identical with the doors of the kitchen furniture and by a plinth identical with the plinth of the kitchen furniture. Both pieces must be ordered from the manufacturer of the kitchen furniture.

Performance tests according to this standard shall be carried out with a reference machine running parallel with the machine(s) under test, i.e. at the same time under the same conditions. The reference machine shall be in accordance with the description given in Annex C.

NOTE 2 The reference machine is always installed as a free-standing machine independent of the type of the machine under test (e.g. built-in, under table).

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

Unless otherwise specified, measurements are conducted under the following conditions.

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

First step. Before conducting the performance tests, the dishwasher shall be operated in the test laboratory for two or maximum three complete cycles using detergent (specified in 5.7) and a clean load and no rinse agent. No additional cycles shall be carried out on the machine under test between the sequential steps of the test procedure.

NOTE 1 The first step and the compliance with the given sequence is necessary for better reproducibility, i.e. to avoid differences of drying performance due to ageing processes of the plastic parts in the dishwasher (e.g. baskets).

NOTE 2 Cycles carried out during the production are ignored.

Second step. Testing the cleaning performance and measuring the energy and water consumption according to Clause 6 and Clause 8.

Third step. Testing the drying performance according to Clause 7.

5.3 Electricity supply

5.3.1 Frequency

The supply frequency shall be maintained at the rated frequency ± 1 %.

5.3.2 Voltage

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

The supply voltage measured during the tests shall be recorded.

5.4 Test cycle

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 according to Clause 8 and the noise according to Clause 9, if tested.

Additional measurements for other programmes may only be made after the third step (see 5.2).

5.5 Ambient conditions

The following ambient conditions shall be maintained throughout the measurements:

- ambient temperature of the room: $(23 \pm 2) ^\circ\text{C}$;
- relative humidity: $(55 \pm 5) \%$.

The ambient temperature and the relative humidity measured during the tests shall be recorded.

5.6 Water supply

5.6.1 General

The actual water temperature, hardness, and pressure, maintained during the tests shall be recorded.

5.6.2 Temperature

The temperature of the water supply shall be $(15 \pm 2) ^\circ\text{C}$.

5.6.3 Hardness

For the operation of the machine under test and the reference machine water of defined composition following IEC 60734, 5.4.1. "Composition of hard water prepared by method C" of $(2,5 \pm 0,5) \text{ mmol/l}$ water hardness 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.

5.6.4 Water pressure

The pressure shall be within the range indicated by the manufacturer.

5.7 Detergent

The reference detergent B, as described in Annex B, 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 g/place setting, used during the tests shall be recorded. Detergent from the same batch shall be used for the machine under test and for the reference machine.

If a dispenser is incorporated in the dishwasher it shall be used. In the absence of manufacturer's recommendations, the detergent shall be placed in the main compartment of the dispenser.

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 from the date of production and within one month of opening. Before using, the detergent shall be homogenized in accordance with ISO 607 for example using a probe dividing device.

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

Prior to starting a test run, it shall be assured that the detergent dispenser(s) are dry. The detergent is not added to the dispenser until immediately before the start of the test run.

5.8 Rinse agent

The rinse agent (Formula III) as described in Annex B shall be used.

For dishwashers with an adjustable automatic dispenser, the setting used 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 Any recommendation by the manufacturer to adjust manually 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 his instructions.

6 Cleaning performance

6.1 General

The purpose of this test is to measure how well the appliance cleans normally soiled tableware.

The test is carried out in conjunction with the reference machine specified in Annex C. Soiling of the test loads shall be prepared in parallel. For details of preparation, the instructions of the video given in C.1 must be followed.

Detergents and rinsing agents are used according to 5.7 and 5.8.

The sequence of the test procedure as specified in 5.2 shall be taken into account.

Text deleted

6.2 Load

The test load shall consist of a whole number of complete place settings plus the corresponding serving pieces (see Annex A) which together comprise the manufacturer's rated capacity (see 3.1.2).

All pieces shall be thoroughly clean and dry before soiling.

Dishes, glasses and cutlery without any visible damage of the surface are to be used. It is recommended to use paper between the plates when they are stacked, to prevent scratching.

Before using the pieces for the next test, the scoring of all dishes shall be checked and be rated 5. Pieces not attaining a score of 5 shall be cleaned, by hand, in warm water or using a commercial dishwasher. In either case, the same concentration of reference rinse aid as used in the reference machine shall be used.

The pieces should be used for 200 ± 20 cycles (cleaning, drying, cleaning before soiling, conditioning).

6.3 Soiling agents

The following soiling agents are required:

ultra heat treated (U.H.T.) milk:	10 ml/place setting + 250 ml for preparation of porridge;
tea:	6 g/l $\cong$ 12 place settings;
minced meat:	1,5 g/place setting + 4 g for large serving bowl;
egg:	2 g egg yolk/place setting + eggs for preparation of minced meat;
oat flakes:	50 g for preparation of porridge (enough for about 48 place settings);
spinach:	3 g/place setting;
margarine:	1 g/place setting.

All soiling materials used for the reference machine and for the machine under test shall be from the same batch. It is recommended to ensure that as far as possible the soiling agents are as offered by the supplier given in F.10.