

INTERNATIONAL STANDARD

NORME INTERNATIONALE



AMENDMENT 1 AMENDEMENT 1

**Electric dishwashers for household use – Methods for measuring
the performance**

(standards.iteh.ai)

**Lave-vaisselle électriques à usage domestique – Méthodes de mesure
de l'aptitude à la fonction**

<https://standards.iteh.ai/catalog/standards/sist/7bfc8184-2f13-419d-b146-51a32e198b87/iec-60436-2015-amd1-2020>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2020 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

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

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22,000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67,000 electrotechnical terminology entries in English and French extracted from the Terms and definitions clause of IEC publications issued between 2002 and 2015. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et définitions des publications IEC parues entre 2002 et 2015. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



AMENDMENT 1 AMENDEMENT 1

**Electric dishwashers for household use – Methods for measuring
the performance**

(standards.iteh.ai)

**Lave-vaisselle électriques à usage domestique – Méthodes de mesure
de l'aptitude à la fonction**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 97.040.40

ISBN 978-2-8322-8334-9

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

FOREWORD

This amendment has been prepared by subcommittee 59A: Electric dishwashers, of IEC technical committee 59: Performance of household and similar electrical appliances.

The text of this amendment is based on the following documents:

FDIS	Report on voting
59A/229/FDIS	59A/231/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

3.1 Terms and definitions

3.1.14

Replace the entire entry by the following:

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

Note 1 to entry: Usually, an end of programme indicator signals the end of the programme and the user has access to the load.

3.1.15

Add the note to entry after the definition:

Note 1 to entry: The cycle can be equal to or last longer than the programme.

3.1.16

Replace the definition by the following:

length of time beginning with the initiation of the **cycle** (of the selected **programme**), excluding any user-programmed delay, until all activity ceases

3.1.17

Replace the definition by the following:

length of time beginning with the initiation of the **programme**, excluding any user-programmed delay, until an end of **programme** indicator is activated and the user has access to the load

3.1.25

Replace the entire entry by the following:

end of programme mode

mode that begins immediately after the completion of the **programme**, and continues without any further intervention from the user

Note 1 to entry: This mode can persist indefinitely or can be of limited duration if the **dishwasher** is equipped with a power management system.

3.1.26

Replace the entire entry by the following:

left-on mode

mode that begins as soon as the **dishwasher** door has been opened and/or unlatched by the user after the completion of the **programme**, and continues without any further intervention from the user

Note 1 to entry: In some products, this mode can be equivalent to the **off mode**.

Note 2 to entry: This mode can persist indefinitely or can be of limited duration if the **dishwasher** is equipped with a power management system.

3.1.27

Replace the entire entry by the following:

off mode

lowest power consumption mode of the **dishwasher** while it is connected to a mains power source, achieved either automatically by the power management system of the **dishwasher** or manually by switching it off using controls or switches on the **dishwasher** that are accessible and intended for operation by the user during normal use

3.1.28

Replace the definition by the following:

mode where the user has selected and activated a specified delay to the commencement of the **cycle** (of the selected **programme**) using a built-in function of the **dishwasher**

3.1.29

Replace the entire entry by the following:

end-of-programme mode duration

time from the start of **end of programme mode** until the **dishwasher** reverts automatically to **off mode**

Note 1 to entry: This time span is only applicable to **dishwashers** equipped with power management systems.

3.1.30

Replace the entire entry by the following:

left-on mode duration

time from the start of **left-on mode** until the **dishwasher** reverts automatically to **off mode**

Note 1 to entry: This time span is only applicable to **dishwashers** equipped with power management systems.

Add the following new entry:

3.1.36

all activity ceases

power consumption decreases to a low steady state in which the power fluctuates by no more than 10 % or 0,1 W, whichever is the greater, over a period of at least 60 min

Note 1 to entry: The current waveform shall be sampled at a frequency of 1000 Hz and averaged over the duration of 60 s.

Add the following new entry:

3.1.37

intermittently recurring function

function that occurs during some, but not all, cycles of a specific programme (or programmes) and that is directly related to water-softening operations, water-reuse operations or similar operations and that alters water consumption, energy consumption and/or programme time for the cycle

3.2.2

Add the following symbol after the symbol $D_{T,i}$:

$D_{R,t}$ the target drying score of the **reference machine**

5.2 Sequence of test procedures and conditioning of the test machine

In the fourth line of the third paragraph, delete ", cycle time".

5.3.1.1 Voltage

In the second line, replace ± 2 % with ± 1 %.

5.3.2.1 Voltage

In the first line, replace ± 2 % with ± 1 %.

Add the following new subclause:

5.10 Intermittently recurring functions

5.10.1 Provision of information

Either the manufacturer or supplier shall provide information for all **intermittently recurring functions** that relate to the **programme** selected for testing. This data shall include details of changes to energy consumption, water consumption and **programme** duration that are caused by each **intermittently recurring function**. The data shall also include a description of the conditions that trigger each **intermittently recurring function**. An example of a format for describing **intermittently recurring functions** is shown in Table V.1.

If no data is provided by the manufacturer or supplier, **intermittently recurring functions** may take place during valid test cycles and, if this happens, it is likely that the measured and averaged consumption values as well as the uncertainty of measurement will be significantly higher.

The measured energy, water, and time of **intermittently recurring functions** can vary. If these values differ by more than 10 % from the consumption values provided by the manufacturer, then the laboratory should seek further guidance from the manufacturer.

5.10.2 Impact of intermittently recurring functions on reproducibility and the validity of test results

When a **dishwasher** is tested over a **test series** of 5 to 8 **test runs**, **intermittently recurring functions** may cause the results to be different to the true long-term average. For example, if the **dishwasher** regenerates its softener every 3 **cycles** and uses a significant amount of water to regenerate, the average water consumption for the **test series** would be higher if two **regenerations** occurred than if only one occurred in the **test series**. Neither of these cases would give the same result as the long-term average. Reproducibility of such a test would be poor. Two options to resolve this problem are given in 5.10.3.

5.10.3 Treatment of intermittently recurring functions

For **dishwashers** with **intermittently recurring functions**, testing can be conducted according to one of the following two options:

- i) Excluding consumption data from **test runs** where the **intermittently recurring function** takes place, from the calculation of the mean. In this case, testing shall follow the procedures in Clause 8. This option should give reproducible results, but the values determined will not account for the consumption associated with the **intermittently recurring function(s)**.

- ii) Extending the **test series** as necessary to include a suitable number of **test runs** where the **intermittently recurring function** does not take place and a suitable number of **test runs** where **intermittently recurring function** does take place. From such a **test series**, consumption data for each case can be combined to give an appropriately weighted average which would be representative of the long-term average. In this case, testing shall follow the procedures in Clause 8 and Annex V. This option should give reproducible results and account for the consumption associated with the **intermittently recurring function(s)**.

6.4.4.2 Preparation and storage

Replace the text of 6.4.4.2 by the following:

Mix 50 g of whisked whole egg (see 6.4.5) to every 150 g minced meat (see 6.4.4). Mix well and divide into 20 g, or multiple of 20 g, portions. Store the portions in watertight containers and **freeze**. Before use, allow to defrost to ambient temperature and mix with water (see 5.6 for specification) at a ratio of 20 g of minced meat to 6 g of water, until the minced meat mixture is homogeneous.

6.4.4.3 Application

Replace the five occurrences of "minced meat" by "minced meat mixture".

6.4.6.2 Preparation

In the second sentence, replace "to simmer" with "simmering"

6.4.7.2 Preparation and storage

Add the following paragraphs between NOTE 1 and the last paragraph:

After mincing, the spinach may be freeze-dried using lyophilisation and stored until use. By using lyophilisation, the water content of the spinach is extracted and only 6 % to 8 % of the original weight will remain as dry matter spinach. This dry matter spinach may be stored for up to 12 months in an airtight container and kept in the dark. Once the container has been opened, the remaining dry matter spinach may be used for four weeks, provided it is stored in a re-sealed container in the dark.

For reconstitution of the quantities of minced spinach needed, an appropriate amount of this dry matter spinach is taken, and distilled water is added. Follow the supplier's (e.g. see L.1.11) instruction when reconstituting the spinach for a test. After reconstituting, the spinach shall be handled and stored like the de-frosted and ground spinach.

Freeze dried spinach from listed suppliers (refer to Annex L) has been proven to result in equivalent test results compared to using frozen spinach. Alternative sources shall prove equivalency through testing. Refer to Clause L.2 for guidance on equivalency.

6.6.2 Operating

Replace the text of first paragraph by the following:

During the performance tests, the starting of the machines can have to be staggered to ensure that there is enough time for a single assessor to assess the performance of each machine at the prescribed time after its **programme** finishes. However, **test machines** shall run at the same time as part of the **reference machine programme**.

7.2.1 General requirements to enable subsequent cleaning assessment

Replace the text of the fourth paragraph as follows:

A partial or complete wet rim (not a drop or streak) around soil residue adhered to the surface of the tableware shall not be taken into account for the drying assessment.

Add the following paragraph before the last paragraph:

Check all surfaces during the drying evaluation. Do not take into consideration water found on unglazed edges of porcelain, pot handles or caught between a handle and a pot's body.

7.2.2 Drying assessment procedure

In the first line, replace "cycle" with "programme".

Replace Table 1 by the following:

Table 1 – Evaluation of the drying performance

Score	Residual water
2	The item is completely free from water residue.
1	The item has up to two drops of water, or one wet streak (run), or a total wet area of up to 50 mm ² .
0	The item has more than two drops of water, or one drop and one streak, or two streaks, or a total wet area of more than 50 mm ² .

IEC 60436:2015/AMD1:2020

Replace the last paragraph (just before Table 2) by the following:

Record four scores for each pot excluding pot handles:

- inner bottom;
- inner wall;
- outer surfaces;
- all pot surfaces .

Water found on the top side of the pot's rim is scored on the inner wall. Water found on the bottom side of the pot's rim is scored on the outer surface. Do not include the pot handles in the evaluation and do not include any area of water which bridges both a pot handle and the pot.

7.2.3 Calculation of the drying index

Replace Equation (5) by the following:

$$\ln R_{D,i} = \ln \left(\frac{D_{T,i}}{D_{R,t}} \right) \quad (5)$$

where:

$D_{R,t}$ is (0,82) the target drying score of the reference machine

7.3.1 General

Replace the last paragraph (just before Table 3) by the following:

Record four scores for each pot:

- inner bottom;
- inner wall;
- outer surfaces;
- all pot surfaces.

Replace the text of Clause 8 by the following:

8 Energy consumption, water consumption, programme time

8.1 General and purpose

Clause 8 defines how to measure and evaluate the electrical energy consumption, the calculated energy contained in the hot water if an external source of hot water is used, the quantity of water consumed by the **dishwasher** and the time it takes to complete a particular **cycle** used for measuring the cleaning and drying performance.

Low-power mode measurements shall be conducted in accordance with Annex K.

NOTE This document recognises that, in some countries, other legally mandated national standards are required for testing and labelling, pre-empting Clause 8.

8.2 Method of measurement

Energy consumption, water consumption, **cycle time** and **programme time** measurements shall be measured in conjunction with combined cleaning and drying performance tests specified in Clause 6 and 7.

The energy consumption, the water consumption, and **programme time** shall be measured for each complete **cycle** and the results for the test series shall be calculated as described in Clause 8.3.

Measurements shall be made using equipment meeting the specifications given in Annex T.

8.3 Method of evaluation

8.3.1 General

When calculating the arithmetic mean value of the energy, water consumption and **programme time** for dishwashers where the relevant **intermittently recurring function** depends on parameters such as water hardness and frequency of use, and does not take place on every **cycle**, **test runs** where an intermittently recurring function took place within the **test series** shall be disregarded when increased water, energy consumption and **programme time** are in line with manufacturer's instructions to the consumer in regard to the following points:

- the quantity of water, and electrical energy and the period of time required to complete the **relevant intermittently recurring function**;
- the frequency with which the **intermittently recurring function** occurs;
- the moment(s) in time during the programme that the relevant **intermittently recurring function** event takes place.

The **intermittently recurring function** may consist of several stages. It may start during one **test run** and finish during the following **test run**. When the **intermittently recurring function**

event is in line with manufacturer's suggestion, all **test runs** during which an **intermittently recurring function** affecting the consumption values took place within the **test series** shall be disregarded for the purposes of calculating the mean consumption values. No more than two **test runs** in a **test series** of five runs, and no more than three **test runs** in a **test series** of six to eight runs shall be disregarded.

NOTE The information expected to be provided would include regeneration information relevant to the water used for testing in accordance with this document.

The measured energy, water, and time of intermittently recurring functions may vary. If these values differ by more than 10 % from the consumption values provided by the manufacturer, then the laboratory should seek further guidance from the manufacturer.

Data from all **test runs** shall be used for the calculation of the mean value for the **test series** if

- the information provided by the manufacturer is not in line with the measurement, or
- consumer information regarding the impact of the relevant **intermittently recurring function** on water, energy, and time, is not provided by the manufacturer.

In the test report, the **test runs** in which **intermittently recurring functions** occurred shall be identified. The information provided by the manufacturer concerning **intermittently recurring functions** shall also be included in the test report.

Specific guidance is provided in 8.3.2 to 8.3.5.

8.3.2 Energy consumption (standards.iteh.ai)

The energy consumption for each whole **test run** shall be calculated from the electrical energy consumption E_e and the energy of the supplied hot water E_h (if any) and stated for each **test run** in the test report.

The mean energy consumption shall be calculated from the energy consumption for every whole **test run**, except those **test runs** where an **intermittently recurring function** event has been identified in accordance with the manufacturer's instructions to the consumer as described in 8.3.1.

NOTE Annex U provides an informative method to correct energy consumption from cold water within the $(15 \pm 2)^\circ\text{C}$ limit or for larger differences that can arise owing to local regional requirements.

8.3.3 Hot water energy

Hot water energy shall be calculated if the **dishwasher** uses any hot water from an external source.

It is calculated as the energy contained in the externally supplied hot water relative to the cold-water temperature of 15°C in accordance with Equation (18).

$$E_h = (Q_h \times (t_h - 15)) / 860 \quad (18)$$

where

E_h is the hot water energy, in kWh;

$$t_h \text{ is } (\sum (t_{hi} \times Q_{hi})) / \sum Q_{hi}; \quad (19)$$

which means the volume-weighted average inlet temperature, in degrees Celsius, of all hot water supplied to the **test machine**;

where

t_{hi} is the temperature of each increment of hot water supplied to the **test machine**;

Q_{hi} is the volume of each increment of hot water supplied to the **test machine**;

Q_h is the total volume of hot water ($\sum Q_{hi}$), in litres, supplied to the **test machine**.

Incremental measurements of water volume and temperature shall be made with a minimum sampling frequency of once per second.

NOTE The hot water energy, so calculated, includes only the energy embodied in the hot water, relative to the nominal cold-water temperature and does not take into account any losses associated with the conversion and distribution of hot water that occur in different households and in different countries.

8.3.4 Water consumption

Total water consumption shall be reported for each **test run** (including water used for **intermittently recurring functions**).

The mean water consumption for the **test series** shall be calculated from the water consumption for every **test run**, except those **test runs** where an **intermittently recurring function** event has been identified in accordance with the manufacturer's instructions as described in 8.3.1.

8.3.5 Time

Programme time shall be measured from the initiation of the **programme**, excluding any user-programmed delay until an end-of-**programme** indicator (this could be a sound, light or a symbol on a display to indicate that the **programme** is complete, and the user has access to the load). If there is no end-of-**programme** indicator, the **programme time** ends when **all activity ceases**. **Programme time** shall be reported for each **test run**.

The mean programme time shall be calculated from the programme time for every whole **test run**, except those **test runs** where an **intermittently recurring function** event has been identified in accordance with the manufacturer's instructions to the consumer as described in 8.3.1.

Replace Table A.1 by the following:

Table A.1 – Specifications of tableware items

Item Id.	Item description	Material	Diameter/ length in mm ^a	Weight in g ^b	Surface colour
Load items type A + type B					
A 1	Dinner plate	porcelain	250	530	white
A 2	Dessert plate	porcelain	190	250	white
A 3	Dessert bowl	Corelle glass	130	118	white
A 4	Mug	porcelain	70	268	white
B 1	Soup plate	porcelain	230	460	white
B 2	Melamine dessert plate	melamine	195	130	white
B 3	Saucer	porcelain	140	140	white
B 4	Cup	porcelain	78	120	white
A 5 + B 5	Glass	borosilicate glass	60	110	transparent
A 6 + B 6	Fork	(18/10) stainless steel	188	41	metallic
A 7 + B 7	Knife	(18/10) stainless steel	209	55	metallic
A 8 + B 8	Soup spoon	(18/10) stainless steel	190	51	metallic
A 9 + B 9	Dessert spoon	(18/10) stainless steel	156	34	metallic
A 10 + B 10	Teaspoon	(18/10) stainless steel	136	23	metallic
Serving pieces					
S 1 a	Small pot	(18/10) stainless steel	160	820	metallic
S 1 b	Oven pot	(18/10) stainless steel	160	475	metallic
S 2	Glass bowl	borosilicate glass	186	330	transparent
S 3	Oval platter	porcelain	320	850	white
S 4	Melamine bowl	melamine	213	170	white
S 5	Serving spoon	(18/10) stainless steel	260	75	metallic
S 6	Serving fork	(18/10) stainless steel	190	35	metallic
S 7	Gravy ladle	(18/10) stainless steel	180	50	metallic
^a A length and diameter tolerance of 2,5 % of the absolute values is acceptable ^b The weight tolerance for single items B4 Cup, A5+B5 Glass and S2 Glass bowl, A7+B7 Knife, S5 Serving Spoon, S6 Serving fork and S7 Gravy ladle shall be within ±20 % of the absolute values; for all other single items the weight tolerance shall be within ±10 % of the absolute values.					

Table A.2 – Composition of loads

[illegible]

Rated dishwasher capacity (place settings):		Number of each type of load item to be included in each test load															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Item No.	Item description																
S 6	Serving Fork	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
S 7	Gravy ladle	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total number of items		14	24	34	47	57	67	77	88	98	108	120	130	140	150	160	170
Total mass of crockery including glasses (kg)		1,25	2,21	3,20	4,47	5,75	6,71	7,98	8,94	10,22	11,18	12,46	13,42	14,69	15,65	16,93	17,89
Total mass of cutlery excluding serving pieces (kg)		0,20	0,41	0,61	0,82	1,02	1,22	1,43	1,63	1,84	2,04	2,24	2,45	2,65	2,86	3,06	3,26
Total mass of serving pieces (kg)		0,26	0,26	0,26	2,08	2,08	2,08	2,08	2,41	2,41	2,41	3,05	3,05	3,05	3,05	3,05	3,05
Total mass of load (kg) ^a		1,71	2,87	4,07	7,36	8,84	10,01	11,49	12,98	14,46	15,63	17,75	18,91	20,39	21,56	23,04	24,20

^a Loads prepared in accordance with this table shall have the mass indicated ± 5 %

^b One dinner plate (A1) and oval platter (S3) is replaced by a dessert plate (A2) each. The respective soil agent and amount for A1 and S3 is applied to the substituted dessert plate(s).

^c Two dinner plates (A1) and one oval platter (S3) are replaced by a dessert plate (A2) each. The respective soil agent and amount for A1 and S3 is applied to the substituted dessert plate(s).