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Electric dishwasher for commercial use – Test methods for measuring the performance

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Lave-vaisselle électriques à usage collectif – Méthodes d'essai et de mesure de l'aptitude à la fonction

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TEST METHODS FOR MEASURING THE PERFORMANCE**

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International Standard IEC 63136 has been prepared by subcommittee 59A: Electric dishwashers, of IEC technical committee 59: Performance of household and similar electrical appliances.

EN 50593:2017 has served as a basis for the elaboration of this standard.

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

CDV	Report on voting
59A/223/CDV	59A/226/RVC

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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INTRODUCTION

This first edition has been developed to provide a globally applicable and agreed method to test the performance of electric dishwashers for commercial use.

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ELECTRIC DISHWASHER FOR COMMERCIAL USE – TEST METHODS FOR MEASURING THE PERFORMANCE

1 Scope

This document applies to manually loaded under-counter one-tank and one-tank hood-type electrically heated dishwashing machines for washing plates, dishes, glassware, cutlery and similar articles.

These machines are used in commercial kitchens, such as restaurants, canteens, hospitals and in businesses such as bakeries, butchers' shops, etc.

This document does not apply to commercial dishwashers with transport systems (flight-type and rack conveyor dishwashers) and utensil washers.

This document does not apply to undercounter water-change dishwashers.

This document does not apply to appliances designed exclusively for industrial purposes.

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

The characteristics are measured by washing plates.

This document is concerned neither with safety nor with minimum performance requirements.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15510, *Stainless steels – Chemical composition*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

3.1

commercial dishwasher

electric dishwasher that is specially designed for use in commercial environments and that cleans and rinses dishes, glasses, cutlery, and, in some cases, cooking utensils by chemical, mechanical, thermal and electrical treatment

Note 1 to entry: Commercial dishwashers evaluated with a specific drying operation at the end of the programme should be declared as such in the test report.

3.1.1

under-counter one-tank dishwasher

manually loaded, programmable, undercounter front loader with typically one detergent-circulating zone and a fresh-water rinsing process

Note 1 to entry: The washware is cleaned using a detergent solution that is regenerated. The technical equipment is geared to the performance that is required in the specific application.

3.1.2

hood-type dishwasher

manually loaded, programmable, hood-type, pass-through machine with typically one detergent-circulating zone and a fresh-water rinsing process

3.2

operation

event that occurs during the dishwasher's programme, such as cleaning, rinsing or drying

3.3

programme

series of operations that are pre-defined within the dishwasher and that are declared by the manufacturer as suitable for cleaning certain washware

3.4

cycle

complete cleaning process, as defined by the programme selected, consisting of a series of operations (washing, rinsing, drying, etc.) and including any operations that occur after the completion of the programme

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Note 1 to entry: Examples of operations that can occur after the completion of the programme are refilling of the boiler, heating, operation of pumps and fans.

3.5

programme time

time that is measured from the initiation of the programme (excluding any user-programmed delay) until an end of programme indicator is showing the end of the programme

Note 1 to entry: If there is no end of programme indicator, the programme time is equal to the cycle time.

3.6

cycle time

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

3.7

automatic dispenser

device activated automatically that injects or dispenses detergent or rinse agent one or more times into the dishwasher at predetermined points in the dishwasher cycle

3.8

ready-to-use mode

mode after which the dishwasher has been filled with water, the water has been heated (ready for operation) and the machine is ready to start the cycle as indicated in the instructions for use

3.9

rack

removable support for holding washware in the dishwasher

3.10**energy-consuming element**

electrical consumer (e.g. heaters, fans, pumps) in the dishwasher

Note 1 to entry: The control system is not considered as an energy-consuming element.

3.11**washware**

materials and utensils that come into contact with foodstuffs and re-usable crates/containers that are cleaned in a commercial dishwasher

Note 1 to entry: Examples of washware are plates, crockery, cutlery, kitchen equipment, glasses, pots, containers, crates and trays made of materials such as porcelain, plastic, glass, stainless steel and silver as well as coated materials.

3.12**treating agents**

chemical products used to clean or rinse, as rinse aids or descalers, when treating washware in dishwashers

3.12.1**detergent**

chemical product used to remove soiling from washware, and which counteracts resoiling from the detergent solution

3.12.2**detergent solution**

water mixed with detergent in the detergent circulation tank

3.12.3**rinse aid**

chemical agent added to the water in the final rinsing operation, which decreases the interfacial tension of the rinse aid solution

Note 1 to entry: It improves the drying effect and reduces water marks.

3.12.4**rinse aid solution**

supply water mixed with rinse aid used for fresh-water rinsing

3.13**pre-cleaning**

removal of loose waste and leftover food on the washware and the emptying of hollow vessels

Note 1 to entry: Pre-cleaning is generally implemented by pushing the residue into waste containers and, if possible, by rinsing the washware with water. Pre-cleaning reduces the soiling of the dishwasher and improves the cleaning result.

3.14**ballast soil**

artificial soil for testing certain machine characteristics

3.15**fresh-water rinsing**

process after cleaning during which the washware is sprayed with a rinse aid solution to remove residues of detergent solution, dissolved and undissolved dirt particles

3.16**drying**

process in which the moisture drips, vaporises or evaporates from the surface of the washware

3.17

cleaning

removal of soiling

3.18

re-soiling

soiling of the washware (e.g. on the rear side of the washware) by the cleaning process, which causes a deterioration of the cleaning result

3.19

cleaning process

process including at least one washing process and one fresh-water rinsing process

3.20

operating time

period during which the dishwasher is operational

3.21

spray system

sum of all pipelines, jets and spray pipes required to circulate and spray detergent and rinse aid solutions

3.22

water softener

device which reduces the hardness of water

3.23

start-up time

time needed for the initial fill

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3.24

initial fill

first water filling process between activation of the machine and reaching the ready-to-use mode

4 List of measurements

The performance and consumption characteristics are determined as follows:

- **cleaning** and **resoiling** performance test in accordance with Clause 6;
- energy, water consumption and time measurement in accordance with Clause 7.

5 General conditions for measurements

5.1 General

The dishwasher manufacturer's instructions regarding installation and use of the **commercial dishwasher** shall be followed, except if they stand in conflict. In this case, this document shall prevail.

The **cleaning** and **resoiling** performance test in accordance with Clause 6 and the energy and water consumption and time measurement in accordance with Clause 7 are done together.

Deactivate the automatic start for appliances with automatic start **cycle** when the door/hood is closed.

No chemical agents other than the ones mentioned in 5.7 and 5.8 shall be used.

All testing shall be performed on the same machine.

Before commencing measurements, the **commercial dishwasher** shall be checked to ensure that it is operating properly.

All tests shall be started with the appliances at the ambient conditions in accordance with 5.5.

For all tests, the appliance shall be free-standing in the room without any excess coverage other than originally equipped. All protective surface cover foils shall be removed.

Test materials for laboratories are specified in Annex A.

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

Before conducting the performance tests, the dishwasher shall be initially filled and dosed with reference detergent (specified in 5.7) and reference **rinse aid** (specified in 5.8). No additional **cycles** shall be carried out on the machine under test between the consecutive steps of the procedures specified in Clauses 6 and 7. All parts of the machine shall be inspected, and any residues shall be removed.

5.3 Electricity supply

The appliance is supplied at rated voltage $\pm 2\%$ and shall be maintained at the appliance's terminal throughout the test.

If the appliance has a rated voltage range, the tests are carried out at the nominal voltage of the country where the appliance is intended to be used.

The supply frequency shall be at the rated frequency $\pm 1\%$.

If a frequency range is indicated, then the test frequency shall be the nominal frequency of the country in which the appliance is intended to be used.

The voltage and frequency shall be measured and recorded during the test.

5.4 Test programme

The **programme** to be tested shall be the one that cleans normally soiled **washware** (standard **cleaning cycle**).

The manufacturer shall declare the **programme** to be used for testing.

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: $(55 \pm 5) \% \text{RH}$;
- air velocity max: 1 m/s.

The limit value for the air velocity shall only apply to the room area where the drying of the soiled plates is carried out (see 6.2.3).

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

5.6 Water supply

5.6.1 General

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

5.6.2 Water supply – Temperature

The temperature of the supply water shall be (15 ± 2) °C.

5.6.3 Hardness

If the dishwasher is fitted with an integrated water softening unit, it shall be deactivated (set to soft water supply). During testing, soft water shall have a total hardness of $(Ca^{2+} + Mg^{2+}) < 0,54$ mmol/l .

NOTE Procedures to reach a defined hardness of water are described, for example, in IEC 60734.

5.6.4 Water Pressure

The flow pressure of the water supply shall be set to 240 kPa and shall be maintained within the range ± 20 kPa. If it is not possible to maintain the pressure within this range, a flow rate of (15 ± 2) l/min shall be maintained.

5.7 Detergent

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For the tests, solely the reference detergent shall be used (see Clause A.1).

The concentration shall be $(3 \pm 0,3)$ g/l for the tests.

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The amount of detergent shall be calculated by the given concentration and the measured water consumption of the previous **operation**.

The detergent shall be added by hand directly into the wash chamber.

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

The detergent manufacturer's specifications regarding storage and handling shall be observed.

5.8 Rinse aid

For the tests solely the reference **rinse aid** shall be used (see Clause A.2).

The dosing is done in accordance with the manufacturer's instructions.

The concentration shall be set in accordance with the manufacturer's instructions.

Rinse aid from the same batch shall be used for the dishwasher under test.

The **rinse aid** manufacturer's specifications regarding storage and handling shall be observed.

5.9 Load

The load is a **rack** for the appliance under test defined in Clause A.4.

The **rack** is loaded in accordance with the manufacturer's instructions. The **washware** used for test purposes is defined in Clause A.4.

Only **washware** with no visible damage on the surface, e.g. scratches or similar damage, and free of any residues shall be used.

5.10 Temperature measurement

The temperature shall be measured every second and recorded during the **cycle** and reported.

The last **rack** used in the conditioning **cycles** with **ballast soil** (7.2.4) is equipped with a temperature probe (with an accuracy of ± 2 K) positioned in the centre of the upper surface of the stainless-steel support fixed on the holder (see Clause A.6), whose exact position is the first row on the left-hand side, at the front of the **rack**.

6 Cleaning and resoiling performance test

6.1 Purpose and general description

The purpose of this test is to evaluate the **cleaning** and **resoiling** performance and is performed together with the energy and water consumption and time measurement, as described in 7.2.4.

The procedure consists of the removal of the test soiling, applied in the form of 33 soil dots per plate. After the dots are applied, the plates are air-dried under ambient conditions as defined in 5.5.

To evaluate performance degradation during continuous **operation**, particles in accordance with 6.2.2.3 are added directly into the wash tank before the machine **cycle** starts. For statistical plausibility, in total five **cycles** shall be done in the preconditioned dishwasher using the described cleaning solution and the standard settings of the dishwasher manufacturer. The plates are evaluated by visual inspection at the end of the procedure. The number of not completely removed soil dots, as well as the number of remaining sesame seed particles on the plates, are counted and statistically analysed as described in the procedure specified in 6.2.

If more than one **rack** is cleaned in one **cycle**, parameters referring to the number of **racks** involved shall be considered accordingly.

6.2 Description of the cleaning performance test procedure

6.2.1 Preparation

6.2.1.1 Basic cleaning of plates

If new plates are used, follow the procedure in 6.2.1.2.

Before each test, all plates need to be pre-treated with the basic cleaning procedure. Plates are pre-soaked using the basic cleaning **detergent** (see Clause A.3) with a dosage of $300 \text{ g} \pm 15 \text{ g}$ per 10 l of fresh water at a temperature of $50 \text{ }^\circ\text{C}$ to $65 \text{ }^\circ\text{C}$. The plates shall be pre-soaked for at least 20 min followed by manual pre-scraping, if needed, so that the soil or other residues are completely removed from the plates' surfaces. In order to ensure a complete removal of the basic **detergent** after basic plate cleaning, all plates shall be rinsed with fresh water and washed in a dishwasher for two **cycles**. Only demineralized water with conductivity $< 80 \text{ } \mu\text{S}$ (no chemicals) shall be used for the dishwasher to avoid any residuals on the plates' surfaces.

After basic cleaning, the plates need to be completely air-dried and cooled down to ambient temperature.

An alternative procedure can be applied if the same result is obtained (see 6.2.3).