SLOVENSKI STANDARD
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Električni pomivalni stroji za komercialno uporabo - Metode za merjenje lastnosti

Electric dishwashers for commercial use - Test methods for measuring the performance

Elektrische Geschirrspüler für den gewerblichen - Gebrauch Messverfahren für Gebrauchseigenschaften

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

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Electric dishwashers for commercial use - Test methods for measuring the performance

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This draft European Standard is submitted to CENELEC members for enquiry.
Deadline for CENELEC: 2015-10-03.

It has been drawn up by CLC/TC 59X.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

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Foreword

This document [prEN 50593:2015] has been prepared by CLC/TC 59X "Performance of household and similar electrical appliances".

This document is currently submitted to the Enquiry.

The following dates are proposed:

• latest date by which the existence of this document has to be announced at national level	(doa)	dor + 6 months
• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	dor + 12 months
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	dor + 36 months (to be confirmed or modified when voting)

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

1 Scope

This draft European Standard applies for manually loaded undercounter 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, butcher shops, etc.

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

This draft European Standard does not apply to undercounter water-change dishwashers.

This draft European Standard 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 of plates.

This draft European Standard is not dealing with safety requirements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and 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 10088 (all parts), *Stainless steels*

3 Terms and definitions

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

NOTE The following definitions are related to the appliance.

3.1
commercial dishwasher
dishwasher which is specially designed for use in commercial environment and which cleans and rinses dishware, glassware, cutlery, and, in some cases, cooking utensils by chemical, mechanical, thermal, and electric means

Note 1 to entry: A dishwasher may or may not have a specific drying operation at the end of the programme.

3.1.1
under-counter one tank dishwasher
manually loaded, programmable, undercounter front loader with one detergent-circulating zone and a fresh water rinse

Note 1 to entry: The wash ware 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 rinse

3.2
operation
event that occurs during the dishwasher programme such as cleaning and rinsing

3.3
programme
series of operations which are pre-defined within the dishwasher and which are declared by the manufacturer as suitable for cleaning certain wash ware

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

Note 1 to entry: Examples of **operations** that may occur after the completion of the **programme** are refilling of the boiler, monitoring, heating, pumps, fans, etc.

3.5
programme time
time which is measured from the initiation of the programme (excluding any user programmed delay) until an end of programme indicator

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 which 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 which 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 described by the manufacturer

3.9
rack
removable support for holding wash ware in the dishwasher

3.10
energy consuming element
electrical consumer (e.g. heaters, fans, pumps, etc.) in the dishwasher

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

3.11
wash ware
materials and utensils that come into contact with foodstuffs and re-usable crates/containers which are cleaned in a commercial dishwasher

Note 1 to entry: Examples of wash ware 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 plates in dishwashers

3.12.1
detergent
chemical product used to remove soiling from plates 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 reduction of water marks.

3.12.4
rinse aid solution
fresh water mixed with rinse aid used for fresh water rinsing

3.13
pre-cleaning
removal of loose waste and leftover food on the plates and 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 plates with water. Pre-cleaning reduces the soiling of the dishwasher and improves the cleaning result.

3.14
detergent circulation
process in which the detergent solution kept at the rated temperature is sprayed onto the surface of the plates

3.15
fresh water rinsing
washing process after cleaning, during which the plates are 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 plates

3.17
cleaning
removal of soiling

3.18
re-soiling
soiling of the plates e.g. on the back side of the plates by the cleaning process which causes a deterioration of the cleaning result

3.19
contact time
time during which the detergent solution is in contact with the plates

3.20
cleaning process
process including at least one washing process and one fresh water rinsing process

3.21
operating time
period during which the dishwasher is operational

3.22
spray system
sum of all pipelines, jets and spray pipes required to circulate and spray detergent and rinse aid solutions

3.23
water softener
device which reduces the hardness of water

3.24
start-up time
time needed for the initial fill

3.25
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 according to Clause 6;

— energy, water consumption and time measurement according to 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 standard shall prevail.

Performance tests according to this standard document shall be generally carried out on a new machine.

The cleaning and resoiling performance test according to Clause 6 and the energy and water consumption and programme time measurement according to Clause 7 are done together.

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 temperature according to 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.

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 following procedures. All parts of the machine shall be inspected and any residues shall be removed.

5.3 Power supply

In every case the appliance is supplied at 230 V or 400 V and 50 Hz.

The tolerance on power supply shall be ± 1 % for voltage and ± 1 % for frequency.

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

5.4 Test programme

The programme to be tested shall be the one which cleans normally soiled plates (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 ± 2)**	°C;
— relative Humidity:	**(55 ± 5)**	% rH;
— air velocity max:	**0,5**	m/s.

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 with a water hardness of < 3°dH, or a total hardness of (Ca^{2+} + Mg^{2+}) < 0,54 mmol/l, shall be used.

NOTE EN 60734 describes procedures to reach defined hardness of water.

5.6.4 Water Pressure

The pressure of the water supply shall be set to a pressure of 240 kPa and shall be maintained within the range ± 20 kPa.

5.7 Detergent

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

The concentration shall be 3 g/l ± 0,3 g/l for the tests.

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 a reference rinse aid shall be used (see A.2).

The concentration shall be 0,3 g/l ± 0,05 g/l for the tests.

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

The rinse aid shall be added directly into the rinse system

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 A.4.

The rack is loaded due to the advice of the manufacturer. The plates used for the test purpose are defined in A.4.

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

It is recommended to place paper between the plates to stack them without scratching.

5.10 Temperature measurement

The last rack used in the conditioning cycles with ballast soil (7.2.4) is equipped with a temperature probe (Accuracy ± 2K) positioned in the centre of the upper surface of stainless steel support fixed on the holder (see A.6).

The temperature shall be measured and recorded during the cycle.

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 under 7.2.4.

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

To evaluate performance degradation during continuous operation particles according to 6.2.2.3 are added directly into the wash tank before the machine cycle starts. For statistical plausibility in total, five dish racks shall be cleaned in the preconditioned dishwasher using the described cleaning solution and standard dishwasher manufacturer settings. The plates are evaluated by visual inspection at the end of the procedure. The number of completely removed soil dots, as well as the number of remaining sesame particles on the plates are counted and statistically analysed as described in the following procedure.

In case of more than one rack being cleaned in one cycle, parameters referred to number of racks involved shall be considered accordingly.