

# SLOVENSKI STANDARD SIST EN 50593:2017

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# Električni pomivalni stroji za komercialno uporabo - Preskusne metode za merjenje lastnosti

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

Elektrische Geschirrspüler für den gewerblichen - Gebrauch Messverfahren für Gebrauchseigenschaften

# iTeh STANDARD PREVIEW

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

SIST EN 50593:2017

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#### SIST EN 50593:2017

# EUROPEAN STANDARD NORME EUROPÉENNE **EUROPÄISCHE NORM**

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

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

Elektrische Geschirrspüler für den gewerblichen Gebrauch -Messverfahren für Gebrauchseigenschaften

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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# **European foreword**

This document (EN 50593:2017) has been prepared by CLC/TC 59X "Performance of household and similar electrical appliances".

The following dates are fixed:

be withdrawn

•	latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-01-16
•	latest date by which the national standards conflicting with this document have to	(dow)	2020-01-16

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#### 1 Scope

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

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

This 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 plates.

This European Standard does not address 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.

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EN 10088 (all parts), Stainless steels STANDARD PREVIEW

#### Terms and definitions 3

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

The following definitions are related to the appliance. NOTE

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#### 3.1

#### commercial dishwasher

electric dishwasher which is specially designed for use in commercial environment and which 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 one detergent-circulating zone and a fresh water rinse

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 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 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

Note 1 to entry: Examples of operations that may occur after the completion of the programme are refilling of the boiler, 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 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 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

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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

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https://standards.iteh.ai/catalog/standards/sist/5c6f56bd-17b2-44b4-b41dready-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, etc.) 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 which 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 the 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 washware 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 washware with water. Pre-cleaning reduces the soiling of the dishwasher and improves the cleaning result.

#### 3.14

3.15

# (standards.iteh.ai)

#### ballast soil

artificial soil for testing certain machine characteristics 50593:2017

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#### fresh water rinsing

washing 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

#### drvina

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

#### contact time

time during which the detergent solution is in contact with the washware

#### 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.
- energy, water consumption and time measurement according to clause 7 (standards.iten.al)

Rinsing performance measurement is under consideration.

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### 5 General conditionspforameasurementstandards/sist/5c6f56bd-17b2-44b4-b41d-

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### 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.

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

Note: deactivate the automatic start for appliances with automatic start cycle when the door/hood is closed.

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 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  $\pm$  1 % for voltage and  $\pm$  1 % for frequency.

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 which 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 ± 2)	°C;
—	relative humidity:	(55 ± 5)	% 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 iTeh STANDARD PREVIEW

#### 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. <u>SIST EN 50593:2017</u>

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# **5.6.2** Water supply – Temperature b00990e9b57/sist-en-50593-2017

The temperature of the supply water shall be  $(15 \pm 2)$  °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  $< 3^{\circ}$ dH or a total hardness of (Ca<sup>2+</sup> + Mg<sup>2+</sup>) < 0.54 mmol/l shall be used.

NOTE Procedures to reach a defined hardness of water are described in e.g. EN 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  $(15 \pm 2)$  l/min shall be maintained.

### 5.7 Detergent

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

The concentration shall be  $(3 \pm 0,3)$  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 solely the reference rinse aid shall be used (see A.2).

The dosing is done according to manufacturer's instruction

The concentration shall be set according the manufacturer's instruction.

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 in accordance with the manufacturer's instructions. The washware used for the test purpose are defined in A.4.

Only washware with no visible damage on the surface, e.g. scratches or similar damages, 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 (Accuracy  $\pm$  2K) positioned in the centre of the upper surface of stainless steel support fixed on the holder (see A.6), exact position first row on the left hand side in the front of the rack.

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## 6 Cleaning and resoiling performance test (standards.iteh.ai)

### 6.1 Purpose and general description

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The purpose of this test is to evaluate the cleaning and resolling 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 as 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 cycles shall be done 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 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 following procedure.

In case 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 procedure 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 A.3) with a dosage of  $300 \text{ g} \pm 5 \%$  per 10 l of fresh water at a temperature of 50 °C to 65 °C. The plates shall be pre-soaked for at least 20 min followed by manual pre-scrapping, if needed, so that the soil or other residues are completely removed from the plate surface. 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 (no chemicals) shall be used for the dishwasher.

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