



BSI Standards Publication

Commercial dishwashing machines — Hygiene requirements and testing

National foreword

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European foreword

This document (EN 17735:2022) has been prepared by Technical Committee CEN/TC 429 “Food hygiene - Commercial warewashing machines - Hygiene requirements and testing”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2023, and conflicting national standards shall be withdrawn at the latest by June 2023.

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1 Scope

This document specifies hygiene requirements for the operation of commercial dishwashing machines (hereinafter referred to as dishwashing machines) and the tests to be performed on these machines. It specifies requirements for reaching an appropriate hygienic status of articles treated in the dishwashing machines. This document also includes guidelines for the hygienic and proper operation, care and maintenance of dishwashing machines. Furthermore, methods for testing hygienic operation are defined.

This document applies to dishwashing machines used in a professional environment for cleaning wash ware that is used in contact with food, such as plates, crockery, glassware, cutlery, reusable boxes and similar articles.

Dishwashing machines are used in professional kitchens, e.g. in restaurants, canteens and hospitals and in businesses such as bakeries, butcher's shops, etc.

This document does not apply to domestic dishwashing machines, washer disinfectors for the treatment of medical devices and machines for industrial use.

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.

EN 10088-3, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

EN IEC 63136, *Electric dishwashers for commercial use — Test methods for measuring the performance (IEC 63136)*

EN ISO 18593, *Microbiology of the food chain — Horizontal methods for surface sampling (ISO 18593)*

3 Terms and definitions

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

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

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

3.1

wash ware

articles and utensils that come into contact with foodstuffs and re-usable crates/containers that are cleaned in a dishwashing machine

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

3.2

re-usable container

wash ware that is used to store and transport unpacked easily perishable foods used in a professional environment

Note 1 to entry: The container can be a crate.

3.3

wash ware carrier

device for holding and/or supporting wash ware in the optimum orientation for cleaning

Note 1 to entry: The wash ware carrier can be e.g. racks, conveyor belts, cutlery trays.

3.4

dishwashing machine

appliance that is specially designed for use in professional environments and that cleans and rinses plates, glasses, cutlery, and, in some cases, cooking utensils by chemical, mechanical and thermal means

3.4.1

batch dishwashing machine

dishwashing machine, in which the wash ware carrier loaded with wash ware stays in the same treatment zone during the cleaning process

Note 1 to entry: A distinction is made between the following machine designs:

- dishwashing machine in which recirculated detergent solution is used for the detergent circulation process and fresh water is used for the fresh water rinsing; the fresh water rinsing circuit is separate from the detergent circulation circuit;
- dishwashing machine in which fresh water is used in each detergent circulation or rinsing process; the rinsing circuit is not necessarily separate from the detergent circulation circuit.

Note 2 to entry: Batch-type dishwashing machines can be loaded with one or more racks at the same time.

3.4.2

conveyor dishwashing machine

dishwashing machine in which the wash ware carriers loaded with wash ware are automatically conveyed through the machine during the cleaning process

Note 1 to entry: A distinction is made between the following machine designs:

- rack conveyor dishwashing machine; dishwashing machine in which racks loaded with wash ware are conveyed through the machine automatically by a rack transporting system;
- flight conveyor dishwashing machine; dishwashing machine in which the wash ware is conveyed through the machine automatically on an endless conveyor.

Note 2 to entry: Conveyor type dishwashing machines can include different treatment zones. Zones are for example prewash zone, detergent circulation zone and fresh water rinsing zone.

3.5

treating agent

product used to clean and/or sanitize and/or rinse and/or descale wash ware in dishwashing machines

Note 1 to entry: Examples of treating agents are: detergent, rinse aid and granules.

3.5.1

detergent

chemical product used to remove soil from wash ware and which prevents re-contamination of the wash ware by soil in the detergent solution

Note 1 to entry: A detergent can also improve the sanitisation process.

3.5.2**detergent solution**

water mixed with detergent used for the detergent circulation process

3.5.3**rinse aid**

chemical product added to the water in the final rinsing operation which decreases the surface tension of the rinse aid solution

Note 1 to entry: Rinse aid can also improve drying and reduce water spots on wash ware.

3.5.4**rinse aid solution**

fresh water mixed with rinse aid used for fresh water rinsing

3.5.5**soaking agent**

special detergent used in pre-soaking tanks outside the dishwashing machine to remove e.g. stubborn soil from wash ware

3.5.6**descaling agent**

chemical product used to remove lime-scale, mixed lime, calcium or magnesium phosphate deposits in the dishwashing machine and on the wash ware

3.5.7**granules**

particles, e.g. of plastic, which are added to the detergent solution to assist the mechanical cleaning effect

3.6**fresh water**

untreated or treated water which, from the microbiological point of view, is of drinking water quality, contains no substances that are harmful to health, and is used to supply the dishwashing machine

3.7**treated water**

water which has been subjected to a treatment process to modify its ingredients

Note 1 to entry: A distinction is made between processes for softening the water and processes for reducing the overall salt content

3.7.1**softened water**

water from which the hardness ions or minerals have been removed in a water softener by cation exchange processes without any reduction in the overall salt content

Note 1 to entry: The precipitation of water-insoluble salts is prevented.

3.7.2**demineralized water**

water from which the salt content has been removed

Note 1 to entry: For example, by ion exchange or reverse osmosis processes.

3.8

pre-cleaning

removing loose scraps and food residues from the wash ware and emptying hollow vessels

Note 1 to entry: Pre-cleaning is normally carried out by wiping off the residues into waste containers and - if possible - by rinsing the wash ware with warm water (max. 35 °C). Pre-cleaning reduces the amount of soiling entering the dishwashing machine.

3.9

detergent circulation

process during which the detergent solution, which is kept heated to the nominal temperature, is circulated and sprayed onto the surface of the wash ware to remove the soil

3.10

auxiliary rinsing

circulation rinsing upstream to fresh water rinsing, in which no detergent is dosed

3.11

fresh water rinsing

process after detergent circulation, during which the wash ware is sprayed with rinse aid solution in order to remove residues of detergent solution, dissolved and undissolved soil particles

3.12

drying

process during which the moisture drips or evaporates from the surface of the wash ware

3.13

cleaning process

process including at least one detergent circulation process and one fresh-water rinsing process

3.14

sanitisation

chemical and/or physical process that reduces microorganisms to a level which is neither harmful to health nor impairs the quality of foodstuffs

3.15

re-contamination

soiling of the wash ware between the end of the cleaning process and the preparation for further use which causes deterioration of the cleaning result

3.16

contact time

time during which the detergent solution impacts the wash ware

Note 1 to entry: For conveyor-type machines the contact time commences from the centre of first prewash nozzle and extends until the centre of the first fresh water rinse nozzle. For batch type dishwashing machines, the contact time commences upon start of the detergent circulation and lasts until the start of the fresh water rinsing.

3.17

operating time

period during which the dishwashing machine is operational

3.18**spray system**

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

3.19**interior**

all parts of the dishwashing machine which come into contact with detergent solution, rinse aid solution or the wash ware during the cleaning process as intended

3.20**exterior**

all parts of the dishwashing machine which do not come into contact during the cleaning process with detergent solution and rinse aid solution (e.g. pedestals, adjustable feet, handles, casing) but which are accessible from outside

3.21**bioindicator**

standardised test object meant to be contaminated with a test soiling media and a test microorganism and is used to check the sanitisation performance of dishwashing machines

Note 1 to entry: Examples are stainless steel bioindicators.

3.22**operating company**

company who actually uses the appliance to clean wash ware within its own activity

Note 1 to entry: Examples are the operators of restaurants or canteens.

3.23**hygiene requirement**

condition of the wash ware which is neither harmful to health nor impairs the quality of foodstuffs

3.24**programme**

series of operations that are pre-defined within the dishwashing machine and that are declared by the manufacturer as suitable for cleaning certain wash ware

Note 1 to entry: Programme time, conveyer speed and temperatures are examples of main parameters which define a programme.

Note 2 to entry: If there is no end of programme indicator, the programme time is equal to the cycle time.

3.25**cycle**

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

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.

4 Requirements

4.1 Process requirements

4.1.1 General

Each cleaning process as well as the resultant cleanliness and the hygienic condition of the wash ware are determined by the interaction of several main factors:

- temperature of all process steps;
- contact time;
- treating agents;
- mechanics;
- design and interior shape of the wash ware;
- rinsing;
- drying.

4.1.2 Requirements for obtaining hygienic washing results

General requirements are:

- a) The wash ware shall be visually clean under practical conditions at the customers' side.
- b) The wash ware shall be dry upon removal from the wash ware carriers, with remaining droplets on the supporting points and residual moisture in the interior of hollow articles being tolerated.
- c) The machine shall lead, under test conditions (see 5.3.1.2), to a level of hygienic performance in accordance with the requirements as specified in Table 1.
- d) Treating agents used in the cleaning process shall be removed from the wash ware to a level that is not harmful to health.

NOTE For further information see Annex B and Annex C.

**Table 1 — Hygienic Performance
Microbiological requirements**

Type of test	Test object	Criteria	Requirement	Test method
Type test	Bioindicators in the cutlery tray, on test plates	Bacterial reduction	In the cutlery tray: Minimum 7 out of 8 bioindicators shall show a minimum reduction of 5-log levels ^a ; None of the bioindicators shall show a reduction below 4-log levels ^a . On test plates: Minimum 90 % of the bioindicators shall show a minimum reduction of 5-log levels ^a ; None of the bioindicators shall show a reduction below 4-log levels ^a .	according to A.2.1
	Bioindicators in the test rack	Bacterial reduction	All 10 bioindicators shall show a minimum reduction of 5-log levels ^a .	according to A.2.1
Post-installation test	Wash ware except of re-usable crates/containers made of plastic	Aerobic colony count	≤5 cfu ^b per 10 cm ²	Contact plate method according to A.2.2
	Detergent solution	Aerobic colony count	<500 cfu ^b /ml	according to A.2.3
^a Log levels are expressed as logarithms (base 10). ^b cfu: colony forming units.				

4.2 Technical requirements

4.2.1 Requirements relating to construction materials

In terms of hygiene, the materials used shall be serviceable, scratch-proof, ageing-resistant and corrosion-resistant under normal conditions of use. These conditions are:

- in the interior: contact with food remnants, detergents, disinfectants and rinse aids, descaling agent solutions and hot air;
- on the exterior: contact with water, cleaning agents, disinfectants and care products.

4.2.2 Functional requirements

4.2.2.1 General

It shall be possible to place the wash ware easily into the wash ware carriers and the wash ware carriers in the intended optimum position.

4.2.2.2 Temperature control

To ensure that the nominal temperature range has been reached, an indication (e.g. lamp, display information) is required. Alternatively, the machine controls shall be designed so that the machine can start operating only when the nominal temperature range is reached. In the intended range of temperatures, the measurement instruments shall have an uncertainty of measurements of ± 3 K. This can be temperature in tanks, zones, boilers.

The operation of a dishwashing machine requires a constant supply of energy. It is principally not permissible to switch off heating elements temporarily to avoid electrical peak loads (operation at partial load) as this would involve a reduction of the temperature.

Additional recommendations are given in Annex B.

4.2.2.3 Programme

Dishwashing machines usually have several programmes with different contact times.

At least one programme shall ensure that the requirements specified in 4.1.2 are fulfilled and it shall be in accordance to 5.3.1.2.2.

4.2.2.4 Dosing

Correct dosing of the detergent and rinse aid into the detergent and rinse aid solutions shall be ensured at any time.

NOTE Automatic dosing equipment is a good possibility for providing a correct dosing.

4.2.2.5 Design

Effective distribution of detergent solution and rinse aid solution to the wash ware shall be ensured.

All parts which have to be removed for cleaning (e.g. strainers and parts of the spray system) shall be removable without use of tools and easily accessible. The removal and the reposition of the parts shall be done according to the manufacturer's instruction.

NOTE Additional information is given in Annex C.

4.3 Requirements relating to the treating agents

If treating agents are used they shall be used according to the manufacturers' instructions.

NOTE Additional information is given in the Annex B.

5 Testing

5.1 General

The dishwashing machine manufacturer's instructions regarding installation and use of the dishwashing machines shall be followed, except if they stand in conflict to this document. In this case, this document shall prevail.

The dishwashing machine shall be checked to ensure that it is operating correctly before measurements are made. All tests shall be started with the appliance at the conditions in accordance with 5.3.1.2.

The test materials specified in A.1 shall be used.

The following tests, which differ in scope, shall be carried out to check the hygienic results of the articles treated in the dishwashing machine:

Types of test:

- type test;
- post-installation test.

Additional test method is under consideration (see Annex E).

5.2 Type and scope of tests

The individual types of test and the scope of testing can be found in Table 2.

Table 2 — Types of test and scope of testing

Type of test	Area of application	Test Methods/checks
Type test (arranged by manufacturer)	Machines in series production	— Temperature check^a — Check of dosing/concentration of treating agents^a — Tests with bioindicators — Visual inspection of cleanliness and dryness of the wash ware
Post-installation test (arranged by the operating company)	Customised machines after installation under practical conditions	— Temperature check^a — Check of dosing/concentration of treating agents^a — Incoming fresh water quality check — Determination of the aerobic colony count of the wash ware surface — Microbiological testing of the detergent solution — Visual inspection of cleanliness and dryness of the wash ware
^a According to information/specification given by the manufacturer of the machine and/or the treating agents.		