
International Standard



4198

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Surface active agents — Detergents for hand dishwashing — Guide for comparative testing of performance

Agents de surface — Détergents pour le lavage de la vaisselle à la main — Principes directeurs pour des essais comparatifs d'évaluation de performance

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

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It has been approved by the member bodies of the following countries:

Australia	Germany, F.R.	Spain
Austria	Iran	Switzerland
Belgium	Italy	United Kingdom
China	Nigeria	USA
Egypt, Arab Rep. of	Poland	USSR
France	Portugal	

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Hungary
Japan
South Africa, Rep. of

Contents

	Page
0 Introduction	1
1 Scope	1
2 Field of application	1
3 References	1
4 Definition	1
5 General	1
6 Performance characteristics relevant to successive stage of washing	2
7 Load of soiled articles	3
8 Washing process	4
9 Method of assessment of performance characteristics	6
10 Report of the results and their interpretation	7

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Surface active agents — Detergents for hand dishwashing — Guide for comparative testing of performance

0 Introduction

To test the comparative performance of detergents for domestic hand dishwashing, it is necessary to consider several related and also several apparently unrelated variables. The particular variables and their importance vary between regions and countries depending on:

- the variety of soil, consequent on varied dietary habits;
- the materials used in making kitchen utensils, tableware and cutlery;
- the water quality and hand dishwashing habits.

In hand dishwashing, the manual effort, the temperature and volume of water and the dosage of detergent are controlled and varied by the operator.

Recognizing the importance and value to users of comparative test information derived from manual or mechanical test methods, this International Standard lays down the criteria to be considered in designing tests and assessing results. The primary criterion that affects all consumers is the effective removal of a wide variety of soils from all kinds of domestic utensils soiled by foods and drinks.

Although it is recognized that odour, mildness, appearance and feel may influence choice, these factors are not taken into account in this International Standard nor are toxicological or ecological properties, although it is recognized that they are of extreme importance. It is assumed, from the conditions of use, that detergents used for hand dishwashing will not damage kitchen utensils, tableware and cutlery.

This International Standard shows how to devise satisfactory comparative test methods despite the complexities of different habits of populations; yet no single test or series of tests carried out in the laboratory can define completely the limits of performance for the numerous hand dishwashing products on the market today.

1 Scope

This International Standard establishes guidelines for carrying out comparative tests for determining the principal performance characteristics of detergents, solid or liquid, for domestic hand dishwashing which are of interest to the consumer. It lists and defines the performance characteristics considered; it gives details of the variables to be considered, indicates their significance and provides a basis for designing adequate comparative test methods.

2 Field of application

This International Standard applies to detergents sold for use in domestic hand dishwashing. This type of dishwashing is understood to include hand washing of all domestic utensils used for food storage, preparation, cooking, eating and drinking. It does not apply to washing products designed for machine dishwashing.

3 References

ISO 607, *Surface active agents and detergents — Methods of sample division.*

ISO 862, *Surface active agents — Vocabulary.*

4 Definition

detergent for hand dishwashing; Detergent¹⁾ in powder or liquid form manufactured for use in domestic dishwashing by hand.

5 General

Performance testing shall be carried out on products available (or being introduced) in the country concerned. The test dishwashing process, together with the selection of utensils and other variables, shall be influenced by current consumer practice in that country.

Sampling of solid and liquid products shall be carried out following the procedures specified in ISO 607.

1) See definition in ISO 862.

This International Standard covers the principal considerations for assessing products for hand dishwashing, namely:

- a) the performance characteristics relevant to the successive stages of washing (see clause 6);
- b) the soiled articles required for assessing these characteristics (see clause 7);
- c) the washing processes to be employed (see clause 8).

In dealing with the load of soiled articles and the washing processes, a number of primary and secondary variables is listed.

Methods of assessment of performance characteristics and the way in which results of tests shall be reported and interpreted are also covered.

6 Performance characteristics relevant to successive stages of washing

6.1 General

To assess the performance of products intended for hand dishwashing it is necessary to select the washing process to be used.

6.2 Stages of the dishwashing process

The operations to be carried out should be chosen according to consumer habits as each step has an influence on the end result.

The complete process may include the following stages:

- a) scraping off gross soil loads;
- b) soaking baked or dried soils;
- c) pre-rinsing;
- d) scouring (before, during or after washing);
- e) washing (with additional detergent);
- f) rinsing;
- g) draining and air drying;
- h) wiping dry (if designed).

6.3 Classification of performance characteristics during the washing process

As the consumer is involved in each operation, the performance of the product as observed in the end result is influenced by the actions of the consumer at each stage of the process. The following factors may play a role in this assessment.

- a) Dosage and ease of dissolution of the detergent

When designing tests, the dosage has to be considered. The speed and completeness of dissolution is particularly important where solids are used.

- b) Cleaning performance by comparing physical effort with effect, taking into account:

- 1) soil and grease removal during washing;
- 2) degree of dispersion of soil and grease in the washing solution;
- 3) the extent of redeposition of soil (if any) on dishes, plastics items, cutlery or glasses;
- 4) the extent of deposition (if any) of soil on the washing basin or the dishwashing aid or of stains on the drying towel (if used).

- c) Sudsing characteristics including:

- 1) initial volume of suds, type of suds and speed of sudsing;
- 2) stability of suds during washing;
- 3) ease of removal of excess suds during the rinse.

- d) Speed of drainage.

- e) Final appearance of articles, cleanliness, absence of streaks, spots or smears.

- f) Amount of product necessary to obtain the performance level consistent with the object of the test.

This should be expressed by volume for liquids and by mass for solids.

The relative mass and volume are of importance to consumer economics, although both liquids and solid are measured, in practice, by volume.

NOTE — Characteristics such as the odour and feel of the washing solution, although of importance in the comparative choice of product, have no place in the appraisal of their technical performance, apart from requiring subjective evaluation.

Similarly, the effect on hands resulting from frequency of exposure is extremely important in the choice of product. However, the evaluation of these effects, as also of toxicological and ecological properties, is outside the scope of this International Standard, requiring a separate testing programme by appropriate experts.

7 Load of soiled articles

7.1 General

In tests it is preferable to use normally soiled articles provided by families or canteens. Owing to the variety of articles and soils, replicate tests are required to obtain statistically mean-

ingful results. While short time storage of dirty articles should be considered normal, it should not be longer than part of a day. Moreover, the nature of soiling will be a major variable.

Soiling by normal use can be simulated in the laboratory by controlled application to dishware of the foods which are common in the country. If artificial soils are used, the conditions under which the soil is applied to the articles and the interaction between the soil and the articles have an effect on the test

results and therefore should be standardized. Particular difficulty may be encountered in simulating "burn on" during cooking.

7.2 lists the variables which should be controlled when preparing and using soiled articles. This table may also be used as a guide for the preparation of comparable loads of artificially soiled articles when naturally soiled articles are not available.

7.2 Load of soiled articles – Variables

Main variables	Secondary variables	Essential conditions for the test	Comments
Soils	Type and composition	Food ingredients and food preparation used for soiling shall represent those commonly used in the country or area in which the products are to be used, e.g. fats and oils, proteins, carbohydrates, solid food residues and tannins from tea, coffee and wine; lipstick, fruit stains and burnt or baked on foods, etc. Several types of soil are needed to assess correctly the performance of dishwashing products.	Several individual soils may be applied separately to the same substrate, but they must be applied in separate areas.
	Physical state	Use solid, liquid and pasty soils. For reproducibility of the comparison it is recommended that the soil components be identical and characterized by their physical and chemical properties, if possible.	Ideally, soils should be stable or should be uniformly applied and aged prior to washing to give a valid comparison.
Substrate (tableware, cutlery and kitchen utensils)	Type of article and material of construction	Include a variety of different substrates. Use the commonest types of kitchen utensils, tableware and cutlery in the country, made of the most commonly used construction materials, e.g. porcelain, glass, ceramic, metal, plastics, PTFE, etc, but soft and/or porous materials (wood, stoneware) should not be part of the evaluation.	It is essential that the surface of the article used shall not be modified during the successive washings in a series of tests. In particular, scratching and other physico-chemical modifications of the surface should be avoided.
	Nature of surface	Dish loads for comparative testing should be comparable as far as the nature of the surface is concerned e.g. porous (stoneware), non-porous (porcelain, earthenware), hydrophilic (wood), hydrophobic (plastics).	For this reason, porous plates are not to be used for this type of test. Use of wood substrates is not recommended.
Preparation of the soiled articles	Amount of soil	The amount of soil applied on each article should realistically represent naturally soiled articles, and should be carefully measured.	If soiled articles have to be stored for a certain time before use, the duration of storage should be controlled and the storage conditions (for example: temperature and relative humidity) kept constant.
	Application of the soil to the substrate	Apply soils evenly and reproducibly to clean articles. When soils are applied in the molten state (for example certain cooking fats), the temperature at which the soil is applied to the articles and the temperature at which the soil solidifies shall be controlled.	In practice, this is a major variable.

8 Washing process

8.1 General comments

The performance of hand dishwashing detergents varies with the conditions of use. Strict control of the main variables and of the washing process is therefore required to obtain a meaningful comparative test of dishwashing products.

These variables shall be related to the consumer habits in the country or area in which the products are to be used. They include the consumers' dishwashing methods, the equipment used, the nature of the kitchen utensils, tableware and cutlery, the type of food soil on them, hardness, temperature and volume of water, quantity of detergent, etc.

The basic objective of cleaning is to overcome the adhesive forces between the soil and the substrate. In the hand dishwashing operation, this is achieved by a combination of the strength and the physical and chemical properties of the dishwashing agent and the input of manual energy by the operator. When comparing the performance of different dishwashing products, it is of particular importance to keep the intensity and duration of the manual action under strict control. Skilled operators should be specially selected for this purpose,

so as to match consumer practice as closely as possible. Alternatively, operators should wash to their acceptance level and the times taken for different detergents be compared.

Alternatively, the use of mechanical devices may allow more accurate control of the mechanical energy applied, on condition that the interpretation of the results is always related to the specific apparatus used and it is not possible to infer consumer practice without close correlation to consumer habits.

In practice, the variables listed in 8.2 may have an influence on the results of washing. When setting up a comparative test method, the variables should be selected according to local conditions, and their corresponding values fixed according to local requirements.

The purpose of comparative testing of detergents is to provide a means of comparing performance under practical domestic conditions. The choice of a single test can never achieve a true comparison. Each individual test may, however, contribute to an estimate of the overall performance.

The dosage of materials to be used in the tests depends on the purpose of the comparison. This is referred to in 6.3 and further discussed in clause 9.

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8.2 Washing process — Variables

Main variables	Secondary variables	Essential conditions for the test	Comments
Washing equipment	Washbasin/ washbowl	Specify the material, type and size of washing basin.	Choice depends on consumer habits.
	Washing aid	Use a well defined and commonly used washing aid such as brush, sponge, dishcloth.	As used in homes.
	Mechanized implement	Use a well defined test device which corresponds to consumer practice.	Controls are needed for producing truly constant mechanical energy. The results must correspond to consumer practice.
Water	Hardness	Control the total hardness and Ca/Mg ratio. Softened water can modify product performance. Several tests using different water hardnesses may be required, depending on the range of water hardness in the country in which the product is to be used.	Artificially prepared hard water may be convenient.
	Temperature	Initial water temperature for all washing processes must be constant. Control rate of the cooling or perform the test at a constant temperature.	Temperature affects the physical state of soil (for example, greasy soils) and the stability of suds and is therefore an important factor. Control of the temperature permits comparison of products under identical conditions.
	Volume	Measure the volume accurately.	Depends on consumer habits.
Preparation of the dishwashing solution	Amount of product	Establish the amount of product to be used.	Depends on the object of the test.
	Method of introducing the product into water	Some consumers put the product in the washbasin first, then pour in the water; others do the reverse. Tests using various orders of introduction may be required.	These variations are important because they can affect the dosage, the ease of dissolution, the initial volume of the suds and the feel and the odour of the solution. All may significantly affect the consumer's judgement.
	Preparation of the solution	Mix the dishwashing solution before washing is started. The method, rate and duration of mixing should be controlled.	Depends on consumer habits.
Load of soiled articles	This is one of the most important factors for reliable comparative testing. Details on composition of load of soiled articles are given in 7.2.		
Washing method	Method and sequence of introduction of soiled articles into the dishwashing solution	Wash soiled articles piece by piece and, when the soiled load includes different types of articles, wash them in the order: glassware, tableware and cooking utensils.	Although some consumers start by introducing the complete load of soiled articles into the washbasin and then wash them, this method cannot be recommended for comparative tests because of its inconvenience and effect on reproducibility.
	Energy input	a) manual	Work smoothly and evenly with as constant a motion as possible to maintain the mechanical energy input or time as constant as possible, or use a method which averages differences between operators.
		b) mechanical	The mechanical device works with a constant motion for a given time which is exactly defined.
	Time of washing	Wash each type of article for a specified time and control the time between articles. The use of a stop-watch is necessary.	In practice the consumer varies the time of washing according to the degree and type of soiling of the articles being washed and washes them until clean.
Additional operations	Rinsing	Keep the temperature of the rinse water and the time of rinsing constant whatever the method (whether in a separate basin or under the tap). Control water hardness and the degree of agitation.	The method depends on consumer habits.
	Draining and drying and/or wiping dry	Whatever the method used (draining and air drying, towel drying), control the speed of draining and the drying time, the position of articles during draining and air drying, and the cleanliness of towels.	All these variables may have a decisive influence on the final appearance of the dishes and they must therefore be controlled.