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Recommendation for the Quality Assessment of Hand Dishwashing Detergents

Part B: Cleaning Performance
through Soak and Wipe (Scrub Tester)

The German Cosmetic, Toiletry, Perfumery and
Detergent Association (IKW), Home Care Department,
Frankfurt am Main, Germany

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1. Preamble

The companies active in the German Cosmetic, Toiletry, Perfumery and Detergent Association (IKW e. V.) provide their expertise on the products they manufacture in the form of recommendations for quality assessments to the public.

These recommendations for quality assessments are developed in working groups and are intended to enable qualified assessments of the relevant products carried out by manufacturers and testing institutes. They describe quality characteristics that the respective products achieve the effects expected by consumers and manufacturers.

1.1 Mandate and Objectives

Both consumers and manufacturers of hand dishwashing detergents are interested in reliable and practical testing methods for quality assessment, particularly regarding cleaning performance. In 1998, an IKW working group was first commissioned to develop a "Recommendation for the Quality Assessment of the Cleaning Performance of Hand Dishwashing Detergents." [1]

In 2018, IKW established another working group of experts from detergent manufacturers, raw material suppliers, and testing institutes to revise the testing method originally published in 2002. The updated recommendation now represents a collection of three testing methods, which in their non-binding form are intended to enable a qualified examination of hand dishwashing detergents by the companies themselves and by testing institutes. It may also serve as a contribution to the discussion on testing methods for hand dishwashing detergents at the European level and is divided into the following testing methods:

- **Part A:** Mileage through Plate Test, [2]
- **Part B:** Cleaning Performance through soak and wipe (scrub tester),
- **Part C:** Cleaning Performance through soak and rinse.

"Part C: Cleaning Performance through soak and rinse" will be published separately in a later issue of the SOFW-Journal.

Each of the three testing methods for the quality assessment of cleaning performance of hand dishwashing detergents must meet the following criteria:

- Consumer relevance,
- Reproducibility,
- Differentiation and
- A test execution that is as straightforward as possible.

To meet these criteria, each test should be conducted with an internal control. This internal control should be selected by the persons performing the test based on its suitability for verifying the reproducibility and validation of the test method. **Neither the internal control nor the individual chemicals or other devices mentioned here can be obtained from the IKW office.**

1.2 Sustainability

The companies active in IKW are committed to achieving optimal quality standards for their products. They aim to ensure their future viability in a constantly changing world by consistently aligning with the concept of sustainability. Sustainability is understood as the balanced integration of economic, social, and environmental aspects to meet today's needs while preserving all possibilities for future generations.

This commitment to the model of sustainability is based on experiences that are manifested in numerous exemplary initiatives. The member companies of IKW have been engaged in the field of sustainability for a long time under the umbrella of the association and sister associations. These commitments have led to a series of distinguished industry-specific initiatives, including the dialogue platform FORUM WASCHEN, the IKW report on sustainability in the laundry, care and cleaning product industry, the sustainability initiative „Sustainable Washing and Cleaning“ (Charter 2020+) of the International Association for Soaps, Detergents, and Maintenance Products (A.I.S.E., Brussels), as well as voluntary commitments. In addition, members are also involved in initiatives of the raw material and supplier industry, such as the „Responsible Care“ initiative of the chemical-pharmaceutical industry and chemical trade in Germany.

The societal benefit of laundry and homecare products in terms of hygiene and value-retention is undisputed. The products contribute significantly to today's standard of living and



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health and to resource conservation, for example, by extending the lifespan of items such as dishes and cutlery. In this sense, the recommendations for quality assessment serve to encourage company employees to act responsibly towards people and the environment when developing and manufacturing products. They also serve consumers who can expect effective, health-compatible, and environmentally friendly products.

The recommendations for the quality assessment must not hinder such developments and must therefore be updated as needed.

It can only be determined for a product as a whole whether it offers good cleaning performance in terms of recommendations for the quality assessment. Highlighting isolated test criteria is not permitted and may be misleading.

1.3 Evaluation of Results

The recommendations describe which test criteria are relevant for a certain product and how they should be measured. It should be noted that every finished product has an intended spectrum of effects, which is primarily based on consumers' expectations about each individual quality characteristic, resulting in some quality characteristics being more emphasized and other characteristics being less important for each product. The desired combination of the individual properties is also subject to constant change and dependent on new technical capabilities and consumer habits.

1.4 Legal Requirements

Regarding formulation, packaging, and labelling, the following regulations (among others) must be followed, if applicable:

- German Food, Commodities and Feed Code (LFGB),
- German Dangerous Substances Ordinance (GefStoffV),
- German Detergents and Cleaning Products Act (WRMG),
- German Product Safety Act (ProdSG),
- German Prepackaged Products Ordinance (FPV),
- Dangerous Goods Ordinance on Roads, Railways and Inland Waterways (GGVSEB).

In addition, the following legal acts of the European Union apply, which form the basis of the German regulations or to which they refer to:

- Detergents Regulation (EC) No. 648/2004,
- Regulation on the Registration, Evaluation, Authorization and Restriction of Chemicals (EC) No. 1907/2006 („REACH Regulation“),
- Regulation on Classification, Labelling and Packaging (EC) No. 1272/2008 („CLP Regulation“),
- Biocidal Products Regulation (EU) No. 528/2012 and
- Regulation (EU) 2019/1148 on explosives precursors.

2. Introduction

Hand dishwashing detergents have a high importance on the market and are used daily by consumers. The products are aqueous solutions of different surfactant mixtures; some hand dishwashing detergents contain additives such as fragrances, colorants, and ingredients to adjust viscosity. Hand dishwashing detergents are specifically developed for cleaning dishes and cutlery in households to remove a variety of food residues containing fats, starches, or proteins. Consumers have a wide range of products with different profiles to choose from, including special formulations with unique claims (e.g., “suitable for sensitive skin”).

Ecological aspects of hand dishwashing detergents, as with other detergent, care, and cleaning products, are driven by the continuous (further) development of concentrated and innovative formulations. Performance has been further improved by innovative surfactant combinations and, in certain circumstances, enzymes. The products are classified as detergents as stated in Article 2 of the Detergents Regulation (EC) No. 648/2004 and must be labelled in accordance with Annex VII of this regulation. In addition, a list of ingredients must be made available on the Internet. Surfactants used in detergents must be completely biodegradable as per the Detergents Regulation. Environmental compatibility depends largely on the type of concentrate (e.g., ultra-concentrate) in which the product is purchased and the dosage applied by the end user.

To evaluate the quality of these products, a test procedure that is as simple, reproducible, and consumer relevant as possible is desired, both for external comparative tests and during product development. This should be based on consumer behavior and common types of soil. The development of the quality assessment of hand dishwashing detergents (including test methods) is based on the work of the IKW working group, consisting of experts from hand dishwashing detergent manufacturers and raw material suppliers, as well as testing institutes.

3. Working Group's Approach

The main focus of the working group is the mileage and cleaning performance of hand dishwashing detergents for private consumers. To achieve state-of-the-art, consumer and practice-relevant conditions, the existing recommendation for the quality assessment of hand dishwashing detergents is used as the basis. Certain aspects, such as the changed consumer behavior due to the increased use of dishwashing sponges and the significantly more powerful product formulations now available on the market, are addressed through the update and expansion of the method.

4. Method Description

This method is intended for determining the cleaning performance of hand dishwashing detergents in dilution on their ability to clean polymerized grease-based soil by using mechanical action. A video recording of the test method is available on the IKW YouTube channel. The video can be accessed via **QR code**.



4.1 Scope of this Test Method

This test method covers the evaluation of the cleaning performance of hand dishwashing liquids on tough polymerized grease baked on stainless steel plates. The grease test method simulates the removal of cooked or baked-on grease, particularly on pots and pans. Therefore, greasy soil is applied onto a stainless-steel tile and then baked and aged prior to the cleaning assessment. A scrubbing device is used to simulate the scrubbing process performed by the consumer at home during dishwashing. The number of strokes required to fully clean up the greasy baked soil indicates the performance of the dishwashing detergents. In order to determine significant differences among hand dishwashing detergents, a statistical analysis (e.g., Tukey's test) must be performed with a 95 percent confidence level.

Consumer-relevant cleaning habits include pre-soaking soiled items with diluted hand dishwashing detergents before scrubbing with a sponge ("soak and wipe") as well as immediately scrubbing the items with a sponge and hand dishwashing product ("instant cleaning"). These habits are reflected in the three parts of the quality assessment recommendation.

4.2 Equipment, Materials and Ingredients

4.2.1 Equipment and Materials used for Testing

- Analytical balance (required accuracy: 0.01 grams)
- Beakers (required volume: 1 liter)
- Cellulose sponges (e.g., "Spontex Viskoseschwämme feinporig" [Viscose-Sponges, fine pored], EAN-No.: 4 0085 0846 3002, cut into pieces of 90 mm x 40 mm x 40 mm)
- Laundry washing machine
- Magnetic stirrer
- Measuring cylinder (required volume: 25 milliliters)
- Measuring glass (required volume: 200 milliliters)
- Oven (e.g., Binder FD155 or MEMMERT UF 260 plus Twin Display)
- Painting roller (e.g., "LUX Schaumroller", 11 cm, EAN-No.: 4 0078 7225 7392)
- Pipettes (volume range: 1-10 milliliters)
- Plastic basin (required volume: 1 liter, recommended size: at least 31 cm x 31 cm x 15 cm)
- Scrub tester with sponge holder (e.g., Sheen PG 903 – see **Fig. 1**)



Fig. 1 Multi-track scrub tester with sponge brackets, shown here is the Sheen PG 903 model, for use in wiping and scrubbing tests.

- Stainless-steel tiles (required size: 25 cm x 8 cm, e.g. custom fabrication by a locksmith)
- Syringe (required volume: 10 milliliters)
- Timer
- Water bath (required temperature: min. 60 °C)



Fig. 2 Extract of the required items for the test method: stainless-steel plates, pipette, syringes, paint roller, timer and plastic tub.

4.2.2 Ingredients and Recipe for the Test Soil

Ingredient	Specification	Source	Percentage by weight
Albumin powder	Sigma Aldrich	VWR	25 %
Maize germ oil	e.g., Mazola	Local / supermarket	25 %
Peanut oil	e.g., Mazola or Brändle	Local / supermarket	25 %
Sunflower oil	e.g., Thomy	Local / supermarket	25 %
Colourant	Lumogen F Rot 305	BASF	A pinch is sufficient*

* The required amount should be selected as needed until the soil is sufficiently colored.

Tab. 1 Formulation for the fat-based soil of this test method.

4.3 Test Soil

The maximum shelf life of the food procedure in stock corresponds to the best-before date recommended by the manufacturer. The production and storage of the soiling materials for this test method are carried out in accordance with the following descriptions.

4.3.1 Preparation of the Test Soil

The soil ingredients are weighed in a glass beaker. To minimize the weighing error, it is recommended to prepare **at least 40 grams of soil per batch** (10 grams per ingredient). The soil ingredients are mixed using a magnetic stirrer for at least 15 minutes at 600 rpm before the soiling can be used. It must be ensured that **all components are dissolved**, and the test soil is homogeneous. 12 stainless-steel tiles can be soiled per batch of test soil.

4.3.2 Storage of the Test Soil

The fat-based test soil can be stored in the refrigerator for a **maximum of 48 hours** after preparation. **Before use in the test run, the test soil must be re-homogenized.**

4.4 Preparation of the Cleaning Solution and Cleaning Utensils

4.4.1 Pre-treatment of the Sponges

The cellulose sponges must be washed **once** in a household washing machine at 40 °C and spun at 600 rpm **prior to use**. No detergent is required. An "easy care" / "synthetics" cycle (approx. 90 minutes) is recommended.

4.4.2 Preparation of the Soaking and Cleaning Solution

4.4.2.1 Soak and Wipe: Preparation of the Soaking Solution

Water with a respective hardness of 16 ± 2 °dH is heated to 60 °C. Tap water, hardened tap water or synthetic water can be used. Using a syringe, 10 milliliters of the test product – **independent from the manufacturer's instructions** – is dosed into a plastic basin. Afterwards, 1 liter of the 60 °C-hot water is poured **immediately** into the plastic basin containing the test product. It must be ensured that the product is completely dissolved during the process by pouring the water **directly** onto the product. To enable a complete dissolving of the product, do not dose the product far in advance prior to adding the water, as it can dry out and affect the dissolving ability of the product.

4.4.2.2 Soak and Wipe: Preparation of the Cleaning Solution

For the test, ten milliliters of a 20-percent solution – **independent from the manufacturer's instructions** – of the respective hand dishwashing detergent are used. The cleaning solution is prepared at room temperature and should be stirred to ensure complete dissolution of the dishwashing detergent.

4.4.3 Dosage of the Hand Dishwashing Detergent

The dosing of the hand dishwashing detergent is carried out in accordance with **sections 4.4.2.1 and 4.4.2.2** with an accuracy of 0.1 grams. The dosing can be performed either gravimetrically or volumetrically, considering the density of the hand dishwashing detergent.

4.4.4 Water Temperature

The temperature of the prepared **soaking solution** should be **60 ± 1 °C**. The temperature must be documented **before** and **after the test**.

The **cleaning solution** should be at **room temperature**.

4.4.5 Water Hardness

The water used to prepare the soak and cleaning solution must have a **hardness of 16 ± 2 °dH** at test start. For this purpose, suitable tap water, hardened tap water, or synthetic hard water may be used. **Before conducting the test**, the water hardness must be determined and documented.

4.5 Pre-Treatment of the Stainless-Steel Tiles and Application of the Test Soil

Each new stainless-steel tile must be pre-treated to remove all processing or any other residues from the test surface. Pre-treatment involves multiple soiling and baking steps before the stainless-steel tiles can be used for testing.

4.5.1 Pre-Treatment of the Stainless-Steel Tiles

1. The plastic foil is removed from the stainless-steel plate that will be used for the test. To ensure differentiation between the two surfaces, it is recommended to mark the backside of the tile **prior to removal of the foil**. The marking must be **permanent**, for instance by scratching the backside.

2. New and marked stainless-steel tiles are soiled and baked as described as follows in **section 4.5.2**.

3. Soiled stainless-steel tiles are manually cleaned **right after** the baking process with a diluted hand dishwashing detergent after they have cooled down. The stainless-steel tiles are soaked for **at least 30 minutes** in the solution before being gently manually rubbed with a sponge.

4. Directly prior to soiling, the stainless-steel tiles are wiped with ethanol (ethanol absolute, VWR-article number 202.821.321) to remove all residues. The stainless-steel tiles must not be touched on the test surface afterwards.

5. Steps 2) and 3) are repeated **three times**, so that a total of four soiling and baking steps are carried out on each stainless-steel tile.

6. The stainless-steel tiles are rinsed with **demineralized water** and dried with a clean and soft (paper) tissue.



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Note: Stainless-steel tiles are recommended to be used **no more than four times** (excluding the pre-treatment cycles) for testing as any scratches can cause local spots of stronger polymerization and influence the variance of the testing. The discharged stainless-steel tiles can be used to test degreasing power cleaners.

In total, the stainless-steel tiles can be used an additional five times when testing according to the IKW recommendation for the quality assessment of the product performance of degreasing power cleaners (2017) [3].

4.5.2 Test Soil Application

The 12 stainless-steel tiles are placed "edge to edge" on top of aluminum foil and cleaned with ethanol (ethanol abs., VWR-article number 202821.321) (e.g., via spray and wipe). The application of the soil is shown in Fig. 3. Each stainless-steel tile is weighed, and the initial weight (t_0) is documented.

The painting roller needs to be pre-soaked with the soil by rolling it on a surface with approximately 10 milliliters of test soil. Additionally, two milliliters of the test soil is applied to each stainless-steel tile by using a pipette. The test soil is then evenly rolled out lengthwise over the 12 stainless-steel tiles (25 cm x 8 cm) using the paint roller and finally distributed widthwise with strokes.

Each tile is weighed again to check the soil deposit. **The total weight of soil per tile should be equal to 0.7 ± 0.1 grams.**

If the soil weight of a stainless-steel plate is **not** in this range, the rolling process for this specific stainless-steel plate must be repeated until the correct weight is achieved.

Additional soil can be added to increase the amount of soil. To reduce the amount of soil per stainless-steel tile, additional force can be applied during the rolling process.

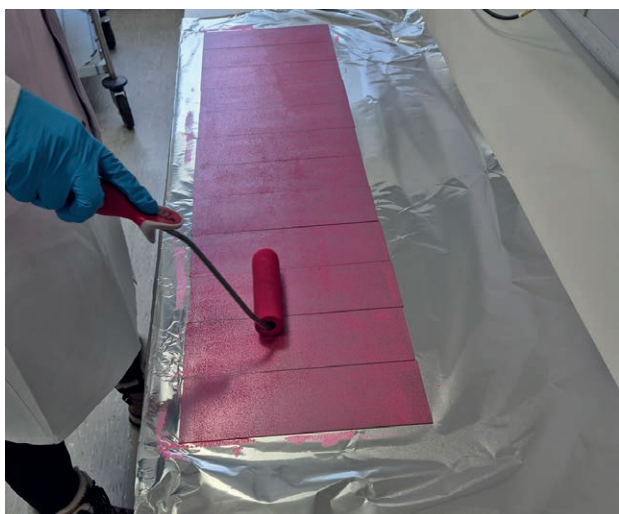


Fig. 3 Application of the fat-based test soil using a paint roller on edge-to-edge laid stainless-steel tiles.

The paint roller can be stored in a humidity-free environment, e.g., in a plastic bag and re-used the next day, **at the latest within a week**, without intermediate washing.

4.5.3 Baking and Aging of the Test Soil

There are two possibilities of baking the soil. **Within one test run, the baking of soil must be consistent for all stainless-steel tiles.**

4.5.3.1 Option 1: Baking and Aging in Pre-Heated Oven

Prior to baking the stainless-steel tiles, the oven is pre-heated to 140 °C. It must be ensured that the fan of the oven (e.g., BINDER FD 115 E2) is set to its maximum position. When the pre-heating target temperature is reached, the oven is switched off, the doors are opened, and the stainless-steel tiles are placed **one by one** in the oven, preferably directly on the racks, without a tray (see Fig. 4). The oven's door is closed, the oven switched on again, and the baking temperature is set to 135 °C for 2 hours and 45 minutes. The time starts once the required temperature of 135 °C is reached.

Depending on the oven, it must be determined in **pre-tests** which pre-heating temperature is recommended to achieve 135 °C after loading the stainless-steel tiles. After baking time, the stainless-steel tiles are removed **immediately** from the oven and left to cool overnight.

Note: Since the time required to reach the necessary temperatures can vary depending on the type of oven (e.g., due to the size of the baking chamber) and other influencing factors, it is advisable to conduct a pre-test to determine the actual times before the main test run.

4.5.3.2 Option 2: Baking and Aging with Temperature program – start from cold oven

Alternatively, a programmable oven can be used. **Prior to baking the stainless-steel tiles, the oven must be at room temperature**, and it must be ensured that **no residual heat** from previous baking is present. The stainless-steel tiles are placed **one by one** into the switched off oven, preferably directly on the racks, without a tray (see Fig. 4).

Then, the oven door is closed, and the oven is switched on. The temperature program is selected and started. Once the temperature program is finished, the stainless-steel tiles are removed **immediately** from the oven and left to cool overnight.

An example of a temperature program in the oven type Memmert UF260 Twin Display could look like as followed:

- Ramp 1: from room temperature to 135 °C for 40 minutes.
- Ramp 2: 135 °C for 3 hours and 35 minutes. The alarm rings at the end of ramp 2.
- Fan set at maximum speed throughout the program.
- Flap (air recirculation) with 10 percent aperture throughout the program.

Note: Since the time required to reach the necessary temperatures can vary depending on the type of oven (e.g., due to the size of the baking chamber) and other influencing factors, it is advisable to conduct a pre-test to determine the actual times before the main test run.

4.5.4 Storage of the Soiled Stainless-Steel Tiles

The stainless-steel tiles must cool and age **at least overnight**, preferably in a controlled temperature and humidity environment (relative humidity of 50 ± 10 percent at $21 \text{ °C} \pm 2 \text{ °C}$). If the relative humidity is not within this range, at least the actual humidity and temperature must be recorded. After baking, the stainless-steel tiles can be stored **vertically** in a rack. The stainless-steel tiles must be stored away from direct sunlight or any source of heat. **The maximum storing temperature of the stainless-steel tiles must not exceed 25 °C .**

Within one test run, all stainless-steel tiles must be stored under the same conditions. Additionally, it must be ensured that the total number of times the stainless-steel tiles have been used are comparable within one test run.

The stainless-steel tiles must age for a minimum of 18 hours before performing the cleaning test. Stainless-steel tiles can be used **within an additional 48 hours** after preparation if kept under controlled conditions as described above.

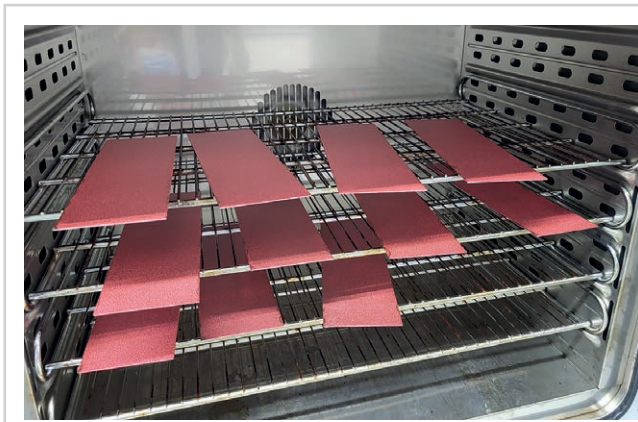


Fig. 4 Placed pre-treated stainless-steel tiles directly on the oven racks.

4.6 Test Procedure – Soak and Wipe

On each stainless-steel tile, **only one test product** is tested at the same time. For each test product, 12 repetitions per product on a total of three stainless-steel tiles are performed (4 tracks per stainless-steel tile x 3 stainless-steel tiles = 12 repetitions per product).

4.6.1 Preparation of the Sponges

Prior to test start, the sponges are pre-soaked in water (room temperature) for **at least 15 minutes**. Afterwards, the sponges are wrung out. **Water with a respective hardness of $16 \pm 2 \text{ °dH}$ is used. Tap water, hardened tap water or synthetic water can be used.** The sponges are wrung out

to ensure that the total weight of the pre-soaked sponges is **22 ± 2 grams**.

Due to different elasticities of the sponges, always the same side of the sponge should be used for all cleaning tests. To reduce the mechanical action during the cleaning process, it is recommended to use the soft side of the sponge for wiping (see Fig. 5).

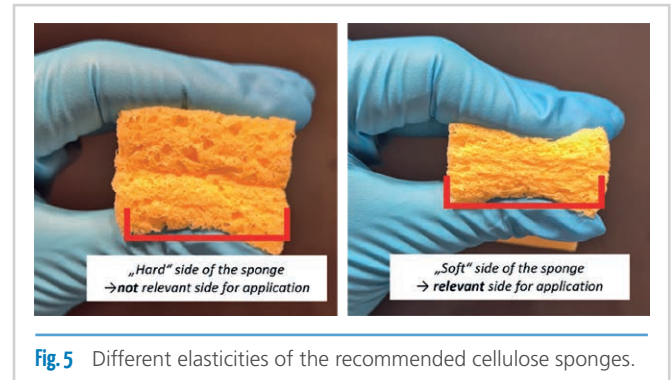


Fig. 5 Different elasticities of the recommended cellulose sponges.

4.6.2 Soak and Wipe

The tests must be carried out by trained personnel to ensure consistent execution. The personnel conducting the tests should generally wear dishwashing gloves. In addition, particular attention must be paid to the precise adherence to the specified times.

4.6.2.1 Step 1: Soaking

After preparation of the soaking solution, the soiled tile must be **immediately and completely immersed** in the soaking solution (soiled surface facing up), and the timer is set for ten minutes (see Fig. 6). During the process the temperature of 60 °C is not maintained, so the temperature will decrease during the ten-minutes soaking time.



Fig. 6 Soaking of a soiled stainless-steel tile in the soaking solution for 10 Minutes.

4.6.2.2 Step 2: Wiping

The prepared sponges are placed on the Sheen Scrub Tester with an additional 200 grams bearing weight per track. The cleaning solution is **either** dosed using a syringe **or** measuring cylinder, applying the respective volume **directly** onto each sponge (Fig. 7). The scrub tester is set to 20 cycles per minute.

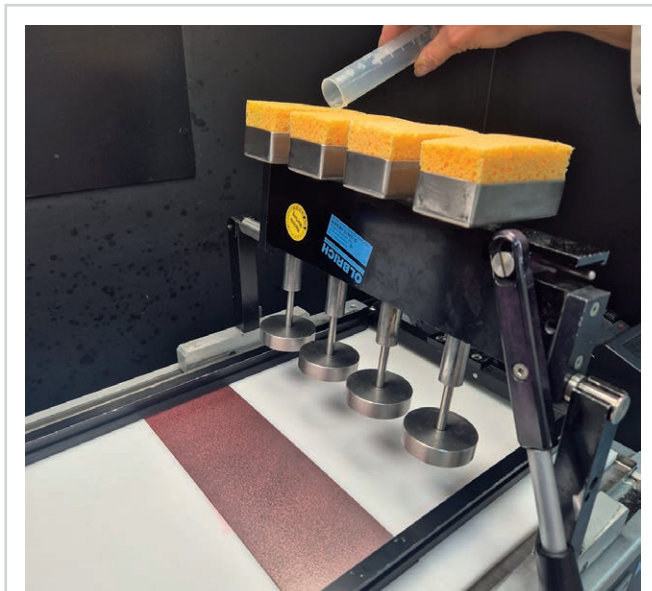


Fig. 7 Direct dosing of the cleaning solution onto the sponges using a measuring cylinder.

Once the soaking time is over, the stainless-steel tile is **immediately** removed from the soaking solution and placed on the Sheen scrub tester. The sponge holders with the sponges are turned around into the starting position, the counter is set to zero, and the cleaning process is started. Each sponge can only be used **once** and must be disposed **after each test**.

4.6.2.3 Endpoint Determination

The endpoint for each product is determined when the respective track is 100 percent clean (complete soil removal). The number of wiping strokes (1 wiping stroke = forward and backward motion) required to fully remove the test soil is documented for each product / track and considered as the endpoint for the respective product.

The endpoint is evaluated both visually and tactilely by gently touching the soiled surface to ensure that no greasy residues remain on the track. **Optionally**, a clean, dry, and soft white paper cloth may be used. Red residues on the paper cloth indicate remaining test soil. **During the evaluation of the cleaning performance of the hand dishwashing detergent, the wiping process should be paused.**

Note: It is recommended to perform a preliminary test using a cleaning agent with known results. This allows verification of the consistency and validation of the baking process for the batch of soil used.

If the endpoint is not reached on any track after the cleaning process, then the wiping procedure is stopped, and the cleaning performance is evaluated visually. **The standard recommendation is to use 100 strokes for this test;** however, performing test personnel may opt for a larger number of strokes if further evaluation is deemed necessary. The presence of soil is checked using a clean, dry, and soft tissue. Any red deposits left on the tissue indicate the remaining soil. The cleaning performance is assessed visually on a scale from zero to ten, where zero is equal to no soil removal and 10 equal to complete soil removal (100 percent clean).

Note: A higher number of wiping strokes may be used if further evaluation is deemed necessary.

4.6.3 Instant Cleaning

Up to four different detergents can be tested on the same stainless-steel tile at once. **For each test product, ten repetitions per product are performed.** The position of the detergents must be randomized across the stainless-steel tiles, so each product is tested equally in each position on the cleaning machine. It is recommended to carry out a pre-test using a detergent of choice whose results are well known. This enables checking the persistence and validating the batch's baking process.

4.6.3.1 Cleaning Procedure

The pre-soaked sponges, prepared according to [section 4.6.1](#), are placed on the Sheen scrub tester, and ten milliliters of the cleaning solution (see [section 4.4.2.2](#)) are applied **directly** on each sponge. Afterwards, the soiled stainless-steel tile is placed on the Sheen Scrub tester, and the sponge holders with the sponges are turned into the starting position. The counter is set to zero, and the cleaning process is started. Each sponge can only be used **once** and must be disposed **after each test**.

4.6.3.2 Endpoint Determination

The endpoint for each product is determined when the respective track is 100 percent clean (complete soil removal). The number of wiping strokes (1 wiping stroke = forward and backward motion) required to fully remove the test soil is documented for each product / track and considered as the endpoint for the respective product.

The endpoint is evaluated both visually and tactilely by gently touching the soiled surface to ensure that no greasy residues remain on the track. **Optionally**, a clean, dry, and soft white paper cloth may be used.

The cleaning performance after each specified number of wiping strokes is evaluated visually (see chapter 4.6.3.2). The standard recommendation is to use a maximum of 100 wiping strokes for this test.

Note: A higher number of wiping strokes may be used if further evaluation is considered necessary.

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4.7 Cleaning of the stainless-steel Tiles after Testing

Once the cleaning testing is completed, soiled stainless-steel tiles are soaked for at least 30 minutes in diluted hand dishwashing detergents **before** being gently manually rubbed with a sponge.

4.8 Evaluation, Validation and Documentation

The results are to be described only in connection with the relevant test conditions. Cross comparison of products from tests conducted at different time points is **not permissible**.

4.8.1 Evaluation

The cleaning performance of a hand dishwashing detergent is determined by the endpoint evaluation described in **section 4.6.2.3** and **4.6.3.2**. It is expressed as the number of strokes required to gain 100 percent soil removal respectively in case of incomplete soil removal as the percentage of the cleaned surface area.

4.8.2 Validation and Documentation

For a meaningful presentation of the results, a significance test is required. This must be conducted using a recognized statistical method, such as the analysis with ANOVA (Analysis Of Variance) based e.g. on the Tukey's Test with a 95% confidence level (see **Annex**). **The results of the independently chosen internal control are not included in the significance test.**

The total test duration (from the preparation of the test soil to the end of the dishwashing process) must be documented **for each test**. The sequence of dishwashing tests for the test products in a study must be **randomized**. In the case of a large number of test products, it may be advisable to change the test personnel within a single dishwashing test.

Members of the Working Group

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Supplier Directory for Used Chemicals

- **BASF SE**, D-67056 Ludwigshafen, Tel. +49 621 60-0
- **VWR International**, D-64295 Darmstadt, Tel. +49 6151 39 72 -450

References

The pictures shown in this document and the video for this test method were kindly provided by SGS INSTITUT FRESENIUS GmbH.

[1] This recommendation was published in SOFW-Journal Issue 5, 2002, Edition 128, pages 11 to 15.

[2] Part A of the amended recommendation was published in SOFW-Journal Issue 11, 2024, Edition 150, pages 44 to 54.

[3] The IKW Recommendation for the Quality Assessment of the Product Performance of Degreasing Power Cleaners was published in SOFW-Journal Issue 7/8, 2018, edition 144, pages 22 to 28.

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Annex

Example of a significance test using factor analysis of variance (ANOVA) and Tukey's Multiple Comparison Test

Values obtained (Number of strokes required until cleaning performance = 100 %) for Soak & Wipe

Number of repetitions per product	Track No.	Product A	Product B	Product C	Product D	Product E
1	1	>100	28	90	49	100
	2	>100	25	96	46	98
	3	>100	26	88	48	95
	4	>100	26	91	44	100
2	1	>100	30	86	50	100
	2	>100	29	94	47	100
	3	>100	27	100	44	94
	4	>100	29	98	46	98
3	1	>100	24	92	52	96
	2	>100	23	99	50	95
	3	>100	25	90	49	99
	4	>100	26	89	54	95

Single factor analysis of variance (ANOVA)

ANOVA (calculated using the software GraphPad Prism 5.04): selected significance level: 95 % ($\alpha = 0.05$)

Summary: Column Statistics	Product A	Product B	Product C	Product D	Product E
Number of values	12	12	12	12	12
Mean	100	26.5	92.75	48.25	97.5
Std. Deviation	0	2.153	4.595	3.049	2.355
Std. Error	0	0.6216	1.326	0.8801	0.6798
Lower 95% KI of the average	100	25.13	89.83	46.31	96
Upper 95% KI of the average	100	27.87	95.67	50.19	99

Normality test

P value

Passed normality test? ($\alpha = 0.05$)	-	Yes	Yes	Yes	Yes
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One-way analysis of variance

P value	< 0.0001
P value summary	****
Are means signif. different? ($P < 0.05$)	Yes
Number of groups	5
F	1661
R square	0.9918

Bartlett's test for equal variances

Bartlett's statistic (corrected)

P value

P value summary	ns
Do the variances differ signif. ($P < 0.05$)?	No

ANOVA Table	Sum of Squares (SS)	Degree of Freedom (df)	Mean Sum of Squares (MS)
Treatment (between columns)	53930	4	13482
Residual (within columns)	446.5	55	8.118
Total	54376	59	

Tukey's Multiple Comparison Test	Mean Diff.	q	Significant? $P < 0.05$?	Summary	95% CI of diff
A vs B	73.5	89.36	Yes	***	70.22 to 76.78
A vs C	7.25	8.815	Yes	***	3.966 to 10.53
A vs D	51.75	62.92	Yes	***	48.47 to 55.03
A vs E	2.5	3.039	No	n. s.	-0.7839 to 5.784
B vs C	-66.25	80.55	Yes	***	-69.53 to -62.97
B vs D	-21.75	26.44	Yes	***	-25.03 to -18.47
B vs E	-71	86.32	Yes	***	-74.28 to -67.72
C vs D	44.5	54.1	Yes	***	41.22 to 47.78
C vs E	-4.75	5.775	Yes	**	-8.034 to -1.466
D vs E	-49.25	59.88	Yes	***	-52.53 to -45.97

***: $p \leq 0.001$ (very very significant) **: $p \leq 0.01$ (very significant) *: $p \leq 0.05$ (significant) ns: not significant