

sofw journal

Home & Personal Care Ingredients & Formulations

powered by **SOFW**



Recommendation for the Quality Assessment of Paint Care Products for Motor Vehicles

Part 2: Paint Conditioners

The German Cosmetic, Toiletry, Perfumery
and Detergent Association (IKW), Home Care Department

Recommendation for the Quality Assessment of Paint Care Products for Motor Vehicles

Part 2: Paint Conditioners

Section Household Care in the German Cosmetic, Toiletry, Perfumery and Detergent Association (IKW), Frankfurt am Main

Translation / Original: German

1. Foreword

IKW member companies make their expert knowledge of the products they manufacture available to the general public; this is done in the form of quality assessment recommendations.

The recommendations for the quality assessment are elaborated in working groups and are intended to enable a qualified testing of the relevant products by the manufacturers and test institutes. Quality characteristics are described that need to be fulfilled by the products concerned in order to achieve the effects expected by consumers and manufacturers.

The companies working within the framework of IKW want optimal quality standards for their products. Their aim is a consistent orientation to sustainability as a guiding principle, preparing to successfully face the future in a constantly changing world.

This commitment to sustainability as a guiding principle is built up on experiences expressed in numerous exemplary initiatives. Taking as starting points the declarations of Rio 1992, "92 plus 10" of Johannesburg and the Agenda 21, sustainability is understood as a balanced linking of economic, social and ecological aspects, with a view to meeting the needs of the present without compromising the ability of future generations to meet their own needs.

The member companies of the German Cosmetic, Toiletry, Perfumery and Detergent Association (IKW) have long been committed to sustainability under the umbrella of the association and sister federations. This commitment has already resulted in several established industry-specific initiatives, such as:

- Dialogue platform FORUM WASCHEN [1],
- IKW Report on sustainability in the detergents, maintenance and cleaning products industry [2],
- A.I.S.E. Charter for Sustainable Cleaning ("Charter 2020+") of the International Association for Soaps, Detergents and Maintenance Products (A.I.S.E.), Brussels [3],
- voluntary agreements.

Furthermore, the member companies are also committed within initiatives of raw material and supplier industries, for example:

- The "Responsible Care" initiative of the chemical-pharmaceutical industry and the chemicals trade in Germany [4],
- "Chemie3", the sustainability initiative of the German Chemical Industry Association (VCI), the Mining, Chemical and Energy Industrial Union (IG BCE) and the German Federation of Chemical Employers' Associations (BAVC) [5]

The constant further development of initiatives and products with sustainability as the guiding principle ensures the future viability of the detergents, maintenance and cleaning products industry in a constantly changing world. The social and societal benefits of these products in terms of hygiene and value-preservation are undisputed. The products make a significant contribution to today's standard of living and health and to the conservation of resources, for example by extending the service life of objects such as motor vehicles.

With this in mind, quality assessment recommendations encourage company staff to act responsibly toward humans and the environment in product development and manufacture. They also serve consumers who can expect efficient, safe and environmentally sound products.

The recommendations describe which qualities are relevant to a given product and how such qualities can be measured. It should be noted that every finished product has a certain efficacy spectrum in its intended use; this spectrum is largely determined by consumer expectations as to each individual quality characteristic – so that in each product some characteristics are deliberately emphasised while others will be less important. Moreover, the desired combination of product properties is subject to constant change, depending on the latest technical possibilities and new consumer habits.

Quality assessment recommendations must not impair such developments. Consequently, for each product only one overall result is valid to determine whether the product meets the quality recommendations or not. Emphasis on isolated test criteria is not admissible and may be misleading.

2. Rules, Standards and Voluntary Agreements

With regard to composition, packaging and labelling, inter alia, the following statutory requirements must be observed in their existing versions or to the extent that they still apply, respectively:

- German Code on Foodstuffs, Consumer Items and Animal Feed (Lebensmittel-, Bedarfsgegenstände- und Futtermittelgesetzbuch – LFGB)
- German Chemicals Act (Chemikaliengesetz – ChemG)
- German Dangerous Substances Ordinance (Gefahrstoffverordnung – GefStoffV)
- Chemicals Prohibition Ordinance [Chemikalienverbotsverordnung – ChemVerbotsV)
- German Detergents and Cleaning Products Act (Wasch- und Reinigungsmittelgesetz – WRMG)
- German Ordinance on Pre-packaged Products (Fertigverpackungsverordnung – FPV)
- German Ordinance on the Transport of Dangerous Goods by Road (Gefahrgutverordnung Straße – GGVS)
- German Ordinance on the Transport of Dangerous Goods by Rail (Gefahrgutverordnung Eisenbahn – GGVE)
- as well as the following legislation by the European Union which serves as basis for the German ordinances or to which reference is made:
 - Detergents Regulation (EC) No 648/2004
 - REACH Regulation (EC) No 1907/2006
 - Regulation on Classification, Labelling and Packaging (EC) No 1272/2008 (“CLP Regulation”)
 - Biocidal Products Regulation (EU) No 528/2012
 - Regulation (EU) No 98/2013 on the Marketing and Use of Explosives Precursors

The following international standards were taken into account in respect of individual aspects:

- ASTM D3836-13 (USA): “Standard Practice for Evaluation of Automotive Polish”
- DIN 55660-1 2011-12 “Paints and varnishes – Wettability – Part 1: Terminology and general principles”
- DIN EN ISO 2813 (June 1999, updated 2015): “Paints and Varnishes – Determination of Gloss Value at 20°, 60° and 85°”

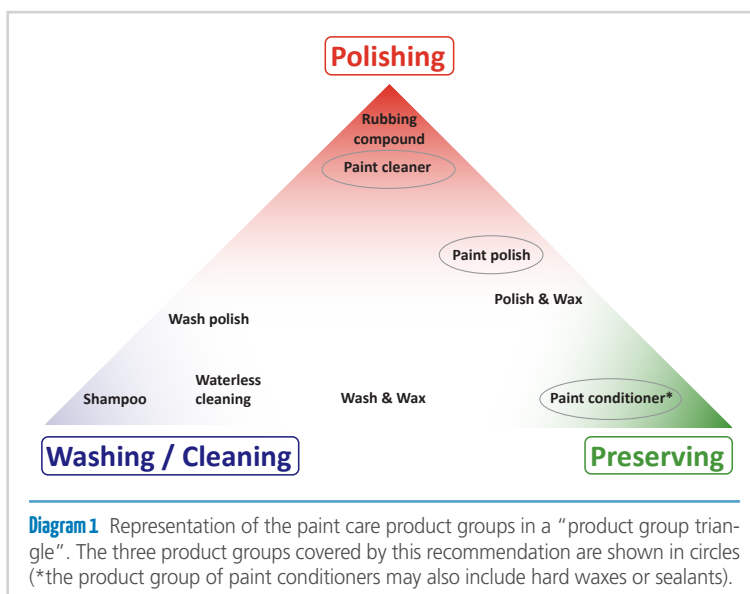
Moreover, the following voluntary agreements [6] apply, amongst others, to IKW member companies which can be relevant for paint care products:

- Ban on volatile chlorinated hydrocarbons (CHC) in Detergents and Cleaning Products (1987)
- Recommendation concerning the Packaging Imprint on Residual Emptying (1992)
- Ban of Musk Xylene (1993)
- Ban of the Use of Alkylphenol Ethoxylates (APEO) (1986)
- Ban on Ethylenediaminetetraacetic Acid (EDTA) (1991)
- Ban on Triclosan (2001)

3. Introduction

This Recommendation for the quality assessment includes test methods for the assessment of paint care products for motor vehicles. They are applied on larger, painted body components and can be classified in accordance with **Diagram 1** in respect of their polishing, paint conditioning and cleaning properties in a product group triangle. The considered product groups differ in terms of these properties. The boundaries between the product groups are fluid in accordance with the representation in **Diagram 1** and are partly only determined by the application concentration of certain ingredients.

According to **Table 1**, the following typical ingredients and assessment criteria can be assigned to the three properties or corners of the product group triangle in **Diagram 1**.



	Property	Typical Ingredient Groups	Assessment Criteria
“Polishing”	Polishing	Abrasives	Gloss
“Preserving”	Paint conditioning	Functional silicones and waxes, polydimethylsiloxanes	Gloss, hydrophobing
“Washing / Cleaning”	Cleaning	Surfactants	Cleaning performance

Tab.1 Typical ingredient groups and assessment criteria for the properties of paint care products from **Diagram 1**.

The paint surfaces are usually two-component paint systems which are used in the automotive industry. The products are applied as a rule with an application medium (e.g. sponge, cloth).

The paint surfaces are heavily exposed to daily strains and soiling and are usually cleaned prior to the application of the above-mentioned three product groups (paint cleaner, paint conditioner, paint polish) e.g. by a car wash (car shampoo). The three product groups (paint cleaner, paint conditioner, paint polish) are as a rule used for value preservation and optical upgrading of the paint surfaces and differ in terms of composition of the ingredients and proper use. The products are commercially available in bottles, tubes or glass jars, tin cans or plastics boxes or other containers as well as in other presentations. They are available in a liquid, solid or pasty condition.

Paint cleaners for motor vehicles are used for older, already matt or scratched, pre-cleaned paint surfaces and prepare the paint for the subsequent application of paint conditioners or paint polish. Paint cleaners are products which contain a particularly high share of abrasives. They serve for the removal of weathered, loose pigment and paint particles as well as superficial scratches and scrapes on strongly affected already matt paint surfaces and paint layers. In accordance with their claim in conjunction with Article 2 of the Detergents Regulation (EC) No 648/2004, they are detergents and require labelling, inter alia, in accordance with Annex VII of the Detergents Regulation. In addition, a list of ingredients must be made available on the internet.

Paint conditioners for motor vehicles are usually abrasive-free and contain hydrophobing components such as waxes and silicones, for the conditioning and sealing of paint surfaces. After their application and subsequent polishing, they provide the paint with a high-gloss look. They protect and condition the paint. Paint conditioners are intended for the care of intact new paints as well as paints pre-cleaned with paint cleaner or paint polish and are, according to their intended use, not to be detached after the single cleaning with a detergent. Consequently, they come neither under the German Detergent and Cleaning Product Act (WRMG) nor under the Detergents Regulation (EC) No. 648/2004.

Paint conditioners, which are, however, mainly detached after a single cleaning with detergents and can then, based on experience, reach waters, come in accordance with § 2 Para 1 Sentence 2 No. 3 under WRMG. In this case, they do not need to be labelled in accordance with the Detergents Regulation but manufacturers must publish no later than from the placing on the market a list of ingredients on the internet in accordance with Annex VII Section D of the Detergents Regulation. Additionally, it makes sense to print the internet address that leads to the list of ingredients on the packaging.

Paint polishes for motor vehicles are combination products of paint cleaners and paint conditioners and include abrasives as well as paint protecting components. They serve for the optical improvement of already affected paint surfaces. After polishing they provide the paint again with high gloss and protection. Paint polishes, which are also claimed for cleaning, are detergents within the meaning of Article 2 of the Detergents Regulation (EC) No 648/2004.

Without a cleaning claim they represent as a rule products in accordance with § 2 Para 1 Sentence 2 No. 3 WRMG which are intended to be applied to surfaces and are primarily detached after a single cleaning with detergents and according to experience can then reach waters. In this case, they do not need to be labelled in accordance with the Detergents Regulation, but manufacturers must publish no later than from the placing on the market a list of ingredients on the internet in accordance with Annex VII Section D of the Detergents Regulation. Additionally, it makes sense to print the internet address that leads to the list of ingredients on the packaging.

4. Aim

In 2014 the Working Group "EQ Paint Care Products" was mandated by the IKW Expert Committee on Cleaning and Care Products to revise the "IKW Recommendations on the Quality Assessment for Car Care and Cleaning Products" of 1992. The work within the working group involved both experts from industrial companies and also from a test institute. The updated recommendation represents a collection of methods which are to permit in their non-binding form a qualified testing of the relevant products for the application at private end consumers by the companies themselves, by the consumers and by the test institutes. The recommendation makes available three separate test methods for the following three products groups (cf. **Diagram 1**):

1. **Paint cleaners** for motor vehicles (Part 1 of the Recommendation for the quality assessment of paint care products for motor vehicles)
2. **Paint conditioners** for motor vehicles (Part 2 of the Recommendation for the quality assessment of paint care products for motor vehicles)
3. **Paint polishes** for motor vehicles (Part 3 of the Recommendation for the quality assessment of paint care products for motor vehicles) [7]

PLEASE NOTE: Part 1 ("Paint cleaners for motor vehicles") was already published in the SOFW Journal 11/18, volume 144: https://www.ikw.org/fileadmin/IKW_Dateien/downloads/Haushaltspflege/1811_EQ_Lackreiniger_EN_final.pdf

Part 3 ("Paint polishes for motor vehicles") of the Recommendation for the quality assessment of paint care products for motor vehicles will be published separately in a later issue of the SOFW Journal.

The three test methods are to fulfil the following criteria:

- ✓ Practical relevance
- ✓ Precision and reproducibility
- ✓ Differentiability
- ✓ As simple conduct as possible

*In order to fulfil these criteria, the tests are to be conducted in blind studies additionally with reference products in respect of which the testers do not know whether they test a reference or a test product. The reference products can be manufactured based on the information in the **Appendix** to the test methods. **Neither the reference products nor the individual chemicals or test specimens, equipment or auxiliary materials can be obtained from the IKW office.***

5. Paint Cleaners, Paint Surfaces and Application Method

Paint conditioners are usually abrasive-free products and contain hydrophobing components such as waxes and silicones, for the conditioning of paint surfaces. After their application and subsequent polishing, they give the paint a high-gloss

look and protect it. Paint conditioners are intended for the care of intact new paints as well as paints pre-cleaned with paint cleaner or paint polish. The increase in gloss that is visible to the human eye after treatment with a paint conditioner cannot be proven in a high-gloss paint with conventional physical methods. In order to obtain reproducible measured values for a gloss increase, a slightly matted paint surface is therefore produced in the test method (**Figures 1 and 2**).

The working procedure stated in the test method for the application and/or polishing of the product is based on cross application and/or polishing of the product is based on cross application. The application and/or polishing is carried out in accordance with **Diagram 2** with 50% overlapping of the wiping paths and beyond the edge of the surface to be treated [8].



A video with instructions for crosswise application is available at the following web address: <https://www.youtube.com/watch?v=uyYTBKijI9c&feature=youtu.be>.

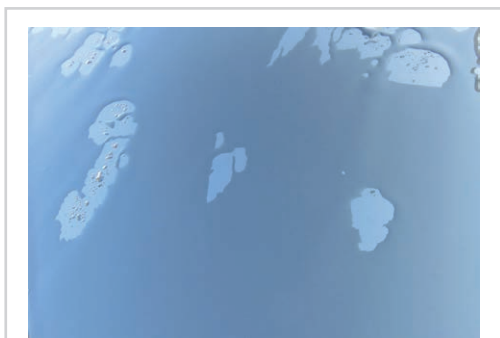


Fig.1 New, pre-treated paint surface wetted with water film
(Image source: Dr. O.K. Wack Chemie GmbH)

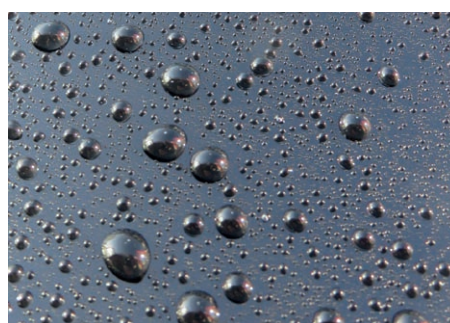


Fig.2 Paint surface treated with a paint conditioner on which water droplets roll off.
(Image source: Dr. O.K. Wack Chemie GmbH)

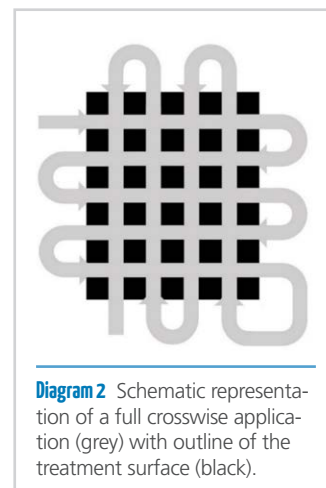


Diagram 2 Schematic representation of a full crosswise application (grey) with outline of the treatment surface (black).

SOFW www.sofw.com



Need a reference book?

Our SOFW books offer you **specific research** from the **home, personal care** and **fragrance** industry.

Are you looking for a cookbook for **formulations** or detailed information on **legal aspects** of your advertising claims? You'll get it here!

Just browse through our book shop, you're sure to find something!

www.sofw.com/shop



6. Test method for paint conditioners for motor vehicles

One or several paint conditioners (in the following “test paint conditioners”) are tested. For comparison and assessment of the test paint conditioners, a specified reference paint conditioner with a defined formulation is used for certain test parameters (see [Appendix](#)).

The setup (see section 4.3.2 in the test method procedure below) needed for determining the water run-off behaviour on the glossy sheets is shown in the [Diagram 3](#):

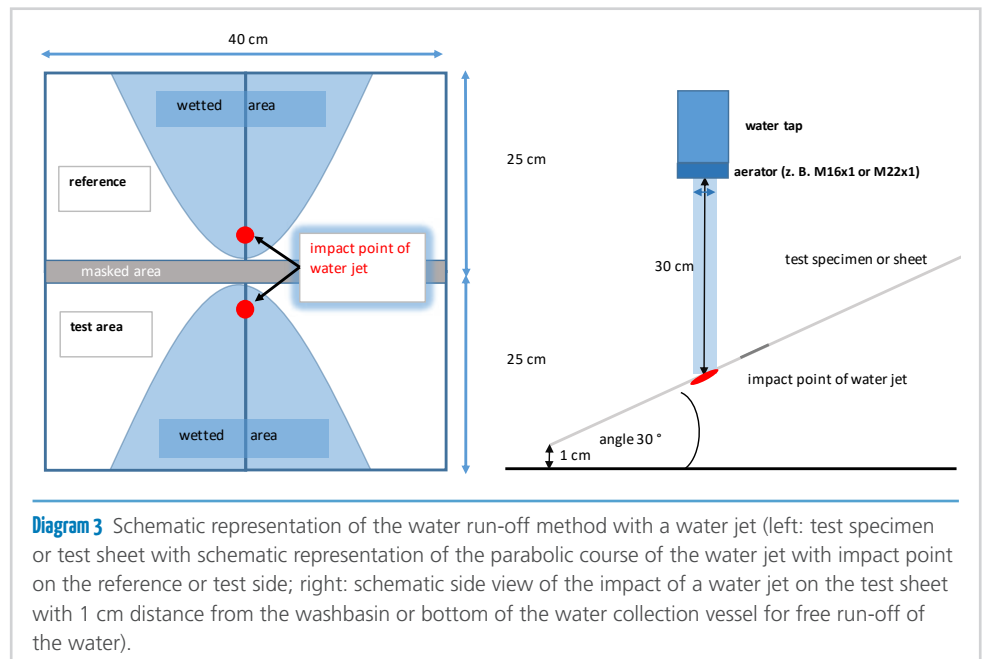


Diagram 3 Schematic representation of the water run-off method with a water jet (left: test specimen or test sheet with schematic representation of the parabolic course of the water jet with impact point on the reference or test side; right: schematic side view of the impact of a water jet on the test sheet with 1 cm distance from the washbasin or bottom of the water collection vessel for free run-off of the water).



Additionally, a video on the water run-off method using a water jet is available at the following web address: <https://www.youtube.com/watch?v=6jiliU4NJ70>

Further specifications and information on the test sheets, measuring instruments, equipment, setups, auxiliary materials, formulations, chemicals and supply sources are listed in the [Appendix](#).

Note:

In order to secure the results statistically, the tests according to 5.1.2, 5.1.4 to 5.1.7 and 5.2.2 to 5.2.7 should be performed ideally by three persons independently from one another. The manufacture of the matted and glossy test sheets (5.1.1 and 5.2.1, respectively) should be done by the same person for a test series.

The tests are carried out at a temperature between 20 and 25°C and a relative air humidity of 20 to 80%. However, due to the high time input, usually the tests cannot be performed on the same day. The test conditions should be kept constant for all tests in a test series (same temperature and same air humidity).

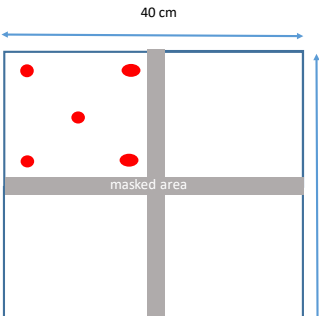
Paint conditioner is tested on two different types of sheets (matte and glossy). The sequence of tests on the two types of test sheet should be adhered to for efficient work!

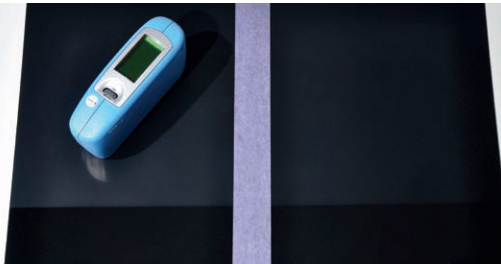
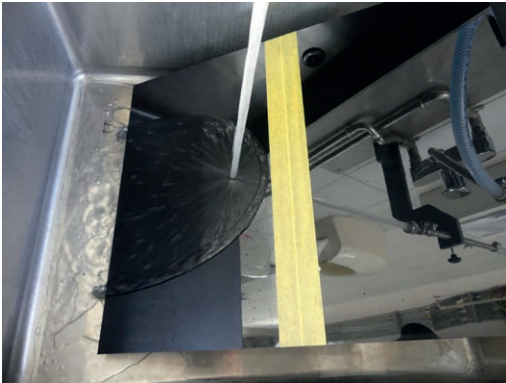
In the work procedure, it is essential to avoid material carry-over between the different test areas on one test sheet, as otherwise a falsification of the measurement results must be expected!

As a rule, there are no uniform starting conditions for paints on vehicles. In order to level out such different conditions for the testing of paint conditioners, the tests are carried out on uniformly pre-treated paint sheets.

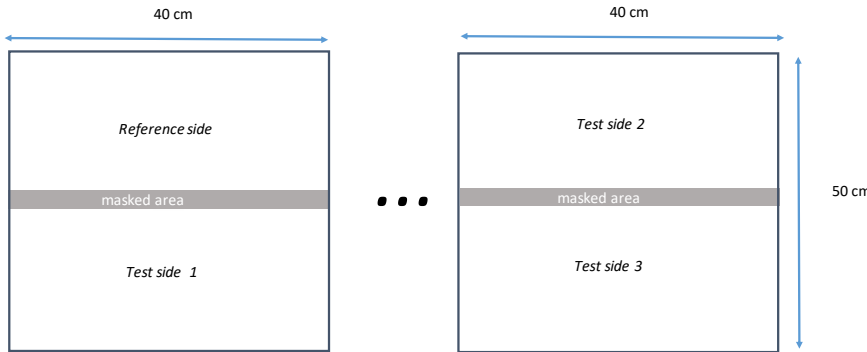
The test conditions are kept as close to practice as possible and are largely oriented to the average consumer behaviour.

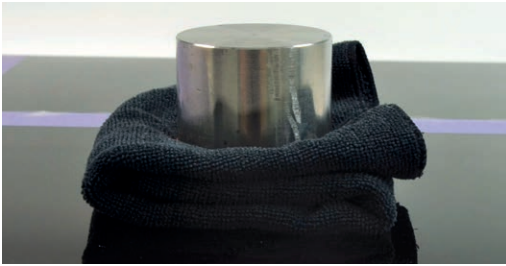
To facilitate matters and for automated evaluation, a table in Excel format in Chapter 7 can be used. For better understanding, the Excel table additionally includes a complete evaluation of the reference paint conditioner and, by way of example, that of another test paint conditioner.

Test Method for Paint Conditioner for Motor Vehicles		
1. General information on the test paint conditioner		
1.1	Product designation (including brand name) of the test paint conditioner	
1.2	Manufacturer and/or distribution	
1.3	Scope of application	
2. Documentation of the test conditions (temperature, air humidity) during the subsequent performance of tests		
	... °C	
	... % air humidity	
3. Properties of the test paint conditioner in the state as delivered		
3.1	Form of presentation (e.g. solid, liquid, pasty)	
3.2	Container (e.g. bottle, tube, can)	
3.3	Intended form of application (e.g. using a cloth, a sponge or as spray)	
4. Reference formulation; test sheet and special setups for preparation		
4.1	Reference paint conditioner	Reference paint conditioner with defined formulation (cf. Appendix "Test sheets, measuring instruments, equipment, setups, auxiliary materials, formulations, chemicals and supply sources")
4.2	Test specimens/sheet test panels	<p>In order to cover the paint qualities as they are found in practice, the test is carried out on absolutely flat [9], sufficiently stable and painted test sheets sized [10] 40 cm x 50 cm with original paint (OEM quality) [11] and paint colour „black uni“ (no metallic paint, specification see Appendix). For each subsequent test, a sheet of the same batch and the same history [12] should be used to avoid deviations within the test series.</p> <p>Two different types of test sheet are needed for the following tests:</p> <ul style="list-style-type: none"> – completely matted sheets: These are divided into four areas for parallel testing to assess the following test parameters for a maximum of 4 paint conditioners (cf. 5.1.1): <ul style="list-style-type: none"> ◦ change in gloss ◦ refreshment of colour – completely glossy sheets: These are divided into two areas for parallel testing to assess the following test parameters for a maximum of 2 paint conditioners (cf. 5.2.1): <ul style="list-style-type: none"> ◦ distributability ◦ polishability ◦ surface appearance ◦ touchability and smear resistance ◦ water run-off behaviour ◦ wash resistance
4.3	Setups for determining the gloss value measurement and the water run-off behaviour	
4.3.1	Gloss value measurement	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Gloss value measurements are carried out as single measurements on the maximum of four different areas evenly distributed in orientation to DIN EN ISO 2813, with a fixed measuring angle of 20 degrees at 5 measuring points (keeping a distance of at least 4 cm from the edge in each case). For each area, the mean value and the standard deviation [13] calculated from this are determined across all 5 measuring points.</p> <p>Diagram 4 Schematic representation of the test sheet with 5 measuring points in one area.</p> </div> </div>

		<p>The gloss values before and after treatment with the paint conditioners and after removal of the product residues are entered in the Excel table (cf. Chapter 7).</p>  <p>Fig. 3 Photo of two test areas of the test sheet with gloss meter (Image source: Chemische Fabrik Dr. Stöcker GmbH & Co.KG).</p>
4.3.2	Setup to measure the water run-off behaviour	<p>The hydrophobic properties of a glossy sheet treated with a paint conditioner are assessed using the water run-off method where the following applies: The faster the water runs off, the better the hydrophobic properties of the paint conditioner.</p> <p>A jet of water (e.g. tap water) is directed onto one side each of the test sheet, which is divided by an adhesive strip, according to the setup in Diagram 3 and the procedure shown in the video for Diagram 3.</p> <p>Measuring the average run-off time with 1/10-second accuracy is carried out by 5-fold measurement successively on the maximum two test areas of the test sheet.</p> <p>The 30° inclined sheet is placed on the shorter side (40 cm) in a holding device at a distance of 1 cm from the washbasin or the bottom of the water collection vessel for free water run-off, and the treated areas are exposed in the middle to a water jet from a tap with a flow rate of ca. 8 litres per minute (see Figure 4). The volume flow should ideally be adjusted with a flow meter. The water temperature is ideally 20°C. The distance between the water tap and the test sheet (impact surface) should be kept constant at ca. 30 cm; the diameter of the water jet should be kept constant at the aerator (see Appendix). The water jet is positioned so that the wetted parabola begins exactly at the lower end of the adhesive strip. Here, it is to ensure that the water can run off freely at the end of the sheet. As soon as a parabolic, constantly wet water body has formed on the sheet, the water jet is turned off and the time required until the water has completely run off the sheet surface is measured in tenths of a second (run-off time).</p> <p>All set parameters of the water run-off method must be checked and kept constant throughout the entire test series!</p>  <p>Fig. 4 Photo of the setup of a 30 degree inclined test sheet in the holding device at 1 cm distance from the bottom of the washbasin. (Image source: SONAX GmbH)</p>
5. Pre-treatment of test sheets and test instruction		
<p>The sequence of tests on the two types of test sheet (matte, glossy) should be adhered to for efficient work.</p>		
5.1 Testing on matted test sheet		
5.1.1	<p>Pre-treat the test sheet with matting agent</p> <p>(The required chemicals, materials, equipment / see Appendix: Basic car shampoo, demineralised water / DM water, isopropyl alcohol, matting agent, random orbit sander, PUR ether sponge, weight, gloss meter, if necessary: high-gloss polish, adhesive tape)</p>	<p>The test sheet is matted as follows:</p> <ul style="list-style-type: none"> – Clean with the basic car shampoo, rinse with demineralised water (DM water) and then treat with isopropanol and dry. Drying is done, for example, by blowing off with oil-free compressed air or using a wiper with a silicone lip [before this, degrease the pull-off lip with aromatics-free and paint-resistant white spirit (boiling point 80–110°C) and isopropanol]; – <u>Shake the matting agent well before use!</u> – Work on the test sheet with matting agent, random orbit sander in combination with an excenter pad or by hand [14] in combination with a PUR ether sponge with the same pressure (1.5 kilogramme weight) in crosswise application (see Diagram 2 / video).

		<p>If the manufacturer does not recommend different materials for polishing or has enclosed a sufficient quantity of them, these should be used for polishing.</p> <p>For polishing, the microfibre cloth is moved over the surface crosswise (see Diagram 2 / video) at the same pressure with 1.5 kg weight and turned after three crosswise wiping paths. Polishing continues until no residues of the paint conditioner remain visible on the surface.</p>
5.1.4	Measuring of the change in gloss value (before product residue removal)	<p>After the maximum of four paint conditioners have been applied (a) and polished out (b) according to 5.1.3, a further gloss measurement of the conditioned areas is carried out according to 4.3.1 without removing the product residues of the paint conditioners (e.g. emulsifiers, auxiliaries). The assessment is made in each case via the difference of the average gloss value changes to the determined initial values in gloss units (ΔGU) according to 5.1.2 on the respective areas. The values for each area are entered into the Excel table for automated evaluation (see Chapter 7):</p> <p>5 Points = $\geq + 12 \Delta$GU 4 Points = $\geq + 9$ to $+ < 12 \Delta$GU 3 Points = $\geq + 6$ to $+ < 9 \Delta$GU 2 Points = $\geq + 3$ to $+ < 6 \Delta$GU 1 Point: > 0 to $+ < 3 \Delta$GU 0 Points: $\leq 0 \Delta$GU</p>
5.1.5	Colour refreshment (colour strength, intensification of the shade) (before product residue removal)	<p>For practical test reasons, the assessment of the color refreshment of the conditioned areas is carried out immediately after the measurement of the change in gloss value, without applying the paint conditioner and polishing it out again or removing the product residues of the paint conditioner.</p> <p>The assessment is made preferably in artificial light corresponding to daylight from different angles. The test paint conditioners should produce an intensification of the colour shade and the treated areas should thus appear darker. For better differentiation of the different areas, the adhesive tape should be removed before the assessment.</p> <p>The colour refreshment is assessed visually, compared to the reference paint conditioner (RPC). The values for each area are entered into the Excel table for automated evaluation (see Chapter 7):</p> <p>5 Points = significantly better (darker) than RPC 4 Points = better (darker) than RPC 3 Points = comparable (darker) to RPC 2 Points = worse (brighter) than RPC 1 Point = significantly worse (brighter) than RPC</p> <p>Intermediary marks in 0.5 increments are admissible (e.g. 1.5 etc.)</p>
5.1.6	Measuring the change in gloss value (after product residue removal)	<p>24 hours after polishing out the paint conditioner according to 5.1.3 b), the test sheet is completely rinsed with DM water to remove the product residues (e.g. emulsifiers, auxiliaries) for another measurement of the gloss value change. Drying is done by blowing off with oil-free compressed air or using a wiper with a silicone lip (before this, degrease the pull-off lip with aromatics-free and paint-resistant white spirit (boiling point 80-110°C) and isopropanol) and then dry, for example, with a paper tissue.</p> <p>After removal of the product residues, another gloss measurement of the conditioned areas is carried out according to 4.3.1.</p> <p>Once again, the assessment is made in each case via the difference of the average gloss value changes to the determined initial values in gloss units (ΔGU) according to 5.1.2 on the respective areas. Here, too, the values for each area are entered into the Excel table for automated evaluation (see Chapter 7):</p> <p>5 Points = $\geq + 12 \Delta$GU 4 Points = $\geq + 9$ to $+ < 12 \Delta$GU 3 Points = $\geq + 6$ to $+ < 9 \Delta$GU 2 Points = $\geq + 3$ to $+ < 6 \Delta$GU 1 Point: > 0 to $+ < 3 \Delta$GU 0 Points: $\leq 0 \Delta$GU</p>
5.1.7	Colour refreshment (colour strength, intensification of the shade) (after product residue removal)	<p>This is followed by another assessment of the colour refreshment according to 5.1.5 directly after measuring the change in gloss value, without reapplying and polishing out the paint conditioners.</p> <p>The colour refreshment is assessed visually, compared to the reference paint conditioner (RPC). The values for each area are entered into the Excel table for automated evaluation (see Chapter 7):</p> <p>5 Points = significantly better (darker) than RPC 4 Points = better (darker) than RPC 3 Points = comparable (darker) to RPC 2 Points = worse (brighter) than RPC 1 Point = significantly worse (brighter) than RPC</p> <p>Intermediary marks in 0.5 increments are admissible (e.g. 1.5 etc.).</p>

5.2	Testing on glossy test sheet	
<p>5.2.1 Pre-treat the test sheet with high-gloss polish.</p> <p>(The required chemicals, materials, equipment / see Appendix: Basic car shampoo, DM water, isopropanol, high-gloss polish, sponge, random orbit sander, microfibre cloth, tap water, water run-off structure, gloss meter)</p>		<p>The test sheet is treated as follows:</p> <ul style="list-style-type: none"> – Clean with the basic car shampoo, rinse with demineralised water (DM water) and then treat with isopropanol and dry. Drying is done, for example, by blowing off with oil-free compressed air or using a wiper with a silicone lip [before this, degrease the pull-off lip with aromatics-free and paint-resistant white spirit (boiling range 80 – 110°C) and isopropanol]; – Apply the high-gloss polish without waxes and silicones (e.g. SONAX Profiline Perfect Finish) with an excenter pad [e.g. SONAX Exzenter pad (medium)], polish with a random orbit sander (ca. 4,500 rotations per minute) in five crosswise applications and let dry. – Then polish out the residues with a soft microfibre cloth without leaving any residues. – Degrease the test sheet with aromatics-free and paint-resistant white spirit (boiling range 80-110°C) and isopropanol and then wash it with basic car shampoo. – Then thoroughly rinse off the basic car shampoo for five minutes with tap water. – Rinse off tap water residues with DM water, e.g. with spray bottle or beaker. – In order to standardise the test sheets and to remove the basic hydrophobic coating, the polishing process is repeated until the maximum gloss level on the dry test sheet according to 4.3.1 is at 86 ± 2 gloss units (GU) at a measuring angle of 20 degrees and the run-off time with the water run-off method according to 4.3.2 is 6 ± 1.5 seconds for all test areas (usually, 15 crosswise wiping paths are sufficient to bring about the desired removal of the basic hydrophobic coating). Further crosswise wiping does not result in a further increase of the gloss level. The exact initial values for the run-off time according to the water run-off method in 4.3.2 must be documented for all test areas. – Drying of the test sheet between the measurements and at the end of the pre-treatment is done with oil-free compressed air or using a wiper with a silicone lip [before this, degrease the pull-off lip with aromatics-free and paint-resistant white spirit (boiling range 80 – 110°C) and isopropanol]. – The glossy test sheet is divided in length (50 cm) with the help of an adhesive tape (48 mm wide) into a maximum of two equal-sized areas (a maximum of two paint conditioners including the reference paint conditioner can then be tested on one glossy test sheet). Additional test sheets for further test paint conditioners can be prepared analogously.  <p>Diagram 6 Schematic representation of two glossy test sheets with two test areas each.</p>
<p>5.2.2 Testing of the distributability</p>		<p>Before applying the paint conditioners, these should be thoroughly homogenised by shaking.</p> <p>The test paint conditioners should be applied as follows, the drying time (timespan between application and polishing out according to 5.2.3) is noted, and the distributability is compared against the reference paint conditioner.</p> <p>For applying the reference paint conditioner and the test paint conditioners, in each case a different unused, new straight from production and dry PUR ether sponge should be used (specification, see Appendix). If the manufacturer of the test paint conditioner recommends another application medium or has enclosed a sufficient quantity of it, that application medium should be used.</p> <p>If the manufacturer of the test paint conditioner does not give any instructions regarding dosage and application medium, then ca. 2 +/- 0.1 gramme (if necessary, the optimum quantity must be determined in a preliminary test) [15] of the paint conditioner is spread thinly and evenly over the entire area of the sponge.</p> <p>The test paint conditioner should be easily distributable.</p> <p>Distributability is assessed compared to the reference paint conditioner (RPC). The values are entered into the Excel table for automatic evaluation (see Chapter 7).</p> <p>5 Points = significantly easier than RPC 4 Points = easier than RPC 3 Points = comparable to RPC 2 Points = more difficult than RPC 1 Point = significantly more difficult than RPC</p> <p>Intermediary marks in increments of 0.5 are admissible (e.g. 1.5 etc).</p>

<p>5.2.3</p>	<p>Testing of polishability</p>	<p>Complete and residue-free polishing of the paint conditioner is carried out directly after the respective product no longer smears and appears to be dry, using a microfibre cloth (specification, see Appendix).</p> <p><i>(Information provided by the manufacturer on drying of the product has to be considered. The testing of the drying of the respective product can be carried out by careful polishing at the edge of the sheet. For the reference paint conditioner, experience has shown that at least 5 minutes drying time is necessary. The timespan between application and polishability is documented for the respective product.)</i></p> <p>For polishing the different reference paint conditioners, in each case unused microfibre clothes of the same specification must be used. If the manufacturers of the test paint conditioners recommend different materials for polishing or enclose a sufficient quantity of them, these should be used for polishing.</p> <p>For polishing, the microfibre cloth is applied in crosswise application (see Diagram 2 / video) with the same pressure of 1.5 kg weight over the area and turned after three crosswise wiping paths.</p> <p>The number of crosswise applications up to the full removal of the product (no residues of the paint conditioner visible on the surface any more) must be noted. If the paint conditioner can be polished completely with less than five crosswise applications, up to five crosswise applications are finished polishing. The test paint conditioner should be polishable without effort.</p> <p>Polishability is assessed compared with the reference paint conditioner (RPC). The values are entered into the Excel table for automatic evaluation (see Chapter 7).</p> <p>5 Points = two or more crosswise applications less than with RPC required 4 Points = one crosswise application less than with RPC required 3 Points = the same number of crosswise applications as with RPC required 2 Points = one crosswise application more than with RPC required 1 Point = two and more crosswise applications more than RPC required</p>  <p>Fig. 6 Photo of a microfibre cloth with 1.5 kg weight. (Image source: Wigo Chemie GmbH)</p>
<p>5.2.4</p>	<p>Surface appearance (clouds, veils, streaks) after product residue removal</p>	<p>After the paint conditioners were applied and polished out, the product residues (e.g. emulsifiers, auxiliaries) are removed after 24 hours:</p> <p>For removing the product residues, completely rinse the test sheet with DM water. Drying is done by blowing off with oil-free compressed air or using a wiper with a silicone lip (before this, degrease the pull-off lip with aromatics-free and paint-resistant white spirit (boiling point 80 – 110°C) and isopropanol) and then dry, for example, with a paper tissue.</p> <p>The test paint conditioner is assessed regarding cloud, veil and streak formation. There should be a uniform surface appearance.</p> <p>The surface appearance is assessed visually, compared to the reference paint conditioner (RPC). The values are entered into the Excel table for automated evaluation (see Chapter 7):</p> <p>5 Points = significantly better than RPC 4 Points = better than RPC 3 Points = comparable to RPC 2 Points = worse than RPC 1 Point = significantly worse than RPC</p> <p>Intermediary marks in 0.5 increments are admissible (e.g. 1.5 etc).</p>
<p>5.2.5</p>	<p>Touchability and smear resistance</p>	<p>Next, cotton swabs are applied under strong pressure on the areas treated with the product and it is assessed whether traces can be seen. Testing should be done on the edge of the respective areas, so as to not impair the subsequent assessment of the water run-off behaviour.</p> <p>Touchability and smear resistance are assessed visually. The values are entered into the Excel table for automated evaluation (see Chapter 7):</p> <p>5 Points = good (no traces to be seen) 3 Points = satisfactory (weak traces to be seen) 1 Point = bad (strong traces to be seen)</p>

5.2.6	Assessment of the water run-off behaviour	<p>Next, the water run-off behaviour of the treated sheets is assessed with the setup in 4.3.2. The initial value of the run-off time for an untreated test side has already been determined according to 5.2.1 and is entered in the Excel table (see Chapter 7). For the subsequent tests after treatment with a paint conditioner, the initial value only serve to check whether there are still hydrophobic properties on the test side.</p> <p>For the assessment and automated scoring, the water run-off time is determined according to 4.3.2. in a 5-fold measurement and is applied to a linear equation[#] according to the spreadsheet "Assessment run-off time" in the Excel table (see Chapter 7) using the following scoring scheme:</p> <p>5.4 to 4 Points: ≤ 0.5 to $< 1,6$ Seconds* 4 to 3 Points: > 1.6 to < 2.7 Seconds 3 to 2 Points: ≥ 2.7 to < 3.8 Seconds 2 to 1 Points: ≥ 3.8 to < 4.9 Seconds 1 to 0 Points: ≥ 4.9 to < 5.9 Seconds 0 Points: ≥ 6 Seconds</p> <p>The values of the run-off time are entered in the Excel table for automated evaluation. [#] $y = -0.909 * t + 5.4545$ (y: Points; t: Run-off time in seconds)</p> <p><i>* Because of the y-axis intercept of the linear equation used in the Excel table, a maximum of 5.4 points can be achieved with a theoretical minimum run-off time of 0.1 seconds!</i></p>
5.2.7	Wash resistance (paint preservation / long-term effect)	<p>Wash resistance of the dried, polished and product residue-free test paint conditioner should be given over as many wash cycles as possible. One wash resistance cycle consists of washing according to 5.2.7.1 and the subsequent assessment of the water run-off behaviour according to 5.2.7.2. The wash and the assessment of the water run-off behaviour are repeated on one test side until the initial value of the run-off time before treatment with the paint conditioner, as documented under 5.2.1, is reached or a maximum of 25 washes have been carried out. Here, the water run-off behaviour is assessed up to and including the fifth wash after each wash. From the fifth wash, assessments are made only after all five washes.</p>
5.2.7.1	Washing of the test specimen	<p>The areas for the paint conditioners on a test sheet need to be washed separately to avoid carry-over of the paint conditioners. In addition, separate sponges and separate containers of basic car shampoo should be used (see Appendix).</p> <p>Wash the test sheet with basic car shampoo: Completely soak the PUR sponge for treatment in five crosswise applications (see Diagram 2 / video) at the same pressure (ca. 1.5 kg) (corresponds to one wash). After each crosswise application, squeeze out the sponge and completely soak it anew with shampoo.</p> <p>Before the assessment, the test sheet is rinsed completely with DM water to remove the shampoo residues. Drying is done, for example, by blowing off with oil-free compressed air or using a wiper with a silicone lip [before this, degrease the pull-off lip with aromatics-free and paint-resistant white spirit (boiling point 80 – 110°C) and isopropanol].</p>
5.2.7.2	Assessment of the water run-off behaviour after the wash ("wash resistance")	<p>The water run-off behaviour of the test paint conditioner is assessed each in a 5-fold measurement after 1, 2, 3, 4, 5, 10, 15, 20 and 25 washes or until complete removal of the paint conditioner (run-off time usually ≥ 6 seconds) according to the setup in 4.3.2. The initial value of the run-off time for an untreated test side has already been determined according to 5.2.1 and entered into the Excel table (see Chapter 7).</p> <p>The measurement of the run-off time is stated in tenths of a second and in each case separately, e.g. on the test and reference sides.</p> <p>For the assessment of the run-off behaviour and automated scoring, a linear equation[#] according to the spreadsheet "Assessment of run-off time" in the Excel table (see Chapter 7) is used with the following scoring scheme:</p> <p>5.4 to 4 Points: ≤ 0.5 to $< 1,6$ Seconds* 4 to 3 Points: > 1.6 to < 2.7 Seconds 3 to 2 Points: ≥ 2.7 to < 3.8 Seconds 2 to 1 Points: ≥ 3.8 to < 4.9 Seconds 1 to 0 Points: ≥ 4.9 to < 5.9 Seconds 0 Points: ≥ 6 Seconds</p> <p>The values of the run-off time are entered in the Excel table for automated evaluation (if the paint conditioner has already been completely removed before the 25th wash and a water run-off time of ≥ 6 seconds has been achieved, "6" seconds is entered in each of the subsequent Excel fields „Run-off time after treatment"!) and a mean value between 0 and 5.4 points is determined for the entire test item „Wash resistance" (see Chapter 7).</p> <p>[#] $y = -0.909 * t + 5.4545$ (y: Points; t: Run-off time in seconds)</p> <p><i>* Because of the y-axis intercept of the straight-line equation used in the Excel table, a maximum of 5.4 points can be achieved with a theoretical minimum run-off time of 0.1 seconds!</i></p>

7. Assessment of the Test Results

The assessment of the test results of the product group is carried out in a weighted point system. The total score can be calculated automatically using an Excel table. The assessment of the average wash resistance of the paint conditioners is made by assessing the water run-off behaviour in each case after 1, 2, 3, 4, 5, 10, 15, 20 and 25 washes or until the paint conditioner is completely removed (run-off time > 6 seconds). The test procedure for wash resistance ends after a maximum of 25 washes. Evaluation and scoring for wash resistance are done using a linear equation provided in the spreadsheet "Assessment of run-off time" in the Excel table.

Under the following internet address an Excel table can be downloaded for the assessment of the test method for a paint conditioner (assessment scheme), including the following assessment table (Table 2) and calculation of the overall result:



https://www.ikw.org/fileadmin/IKW_Dateien/downloads/Haushaltspflege/2022_01_24_Scheme_Paint_Conditioner.xlsx

Test Criterion	Points from the assessment scheme of the test method	Weighting (%)	Weighted Score
5.1.4 Change in gloss value (before product residue removal)	0 to 5	5%	
5.1.5 Colour refreshment (before product residue removal)	1 to 5	5%	
5.1.6 Change in gloss value (after product residue removal)	0 to 5	5%	
5.1.7 Colour refreshment (after product residue removal)	1 to 5	5%	
5.2.2 Testing of the distributability	1 to 5	5%	
5.2.3 Testing of polishability	1 to 5	15%	
5.2.4 Surface appearance	1 to 5	10%	
5.2.5 Touchability and smear resistance	1 to 5	5%	
5.2.6 Assessment of the water run-off behaviour (before the wash)	0 to 5.4	10%	
5.2.7 Wash resistance (water run-off behaviour after the wash)	0 to 5.4	35%	
Total score	6 to 50.8	100%	0.45 to 5.18

Tab.2 Assessment table of the weighted test results of a paint conditioner for motor vehicles.

References

- <https://www.forum-waschen.de/>
- <https://www.ikw.org/haushaltspflege/themen/detail/ikw-nachhaltigkeitsbericht-aktuell/>
- <https://www.charter2020.eu/>
- <https://www.vci.de/themen/nachhaltigkeit/responsible-care/uebersicht.jsp>
- <https://www.chemiehoch3.de/>
- https://www.ikw.org/fileadmin/IKW_Dateien/downloads/Schoenheitspflege/SP_HP_Freiwillige-Selbstverpflichtungen.pdf
- At the time of publication of the test method for the Recommendation for the quality assessment of paint conditioners for motor vehicles (part 2): still under preparation.
- Applying or polishing beyond the edge of the area to be treated is intended to ensure an even treatment of the area.
- Measurement on curved vehicle surfaces does not make sense, as this does not provide correct measuring results in gloss measuring.
- The size of the test sheets is crucial for the correct evaluation of the water run-off method on the glossy test sheets, using the Excel table in Chapter 7.
- Original Equipment Manufacturer – OEM
- Unless no new sheets are used, the sheets should be in a comparable condition with regard to preparation and treatment. The history of the sheet can be noted down e.g. on its back.
- For a homogeneously matted area, the standard deviation should be < 1 gloss unit. DIN EN ISO 2813 (June 1999, updated in 2015) "Paints and varnishes – determination of the gloss value at 20°, 60° and 85°".
- When applying by hand, up to 20 crosswise applications might become necessary. Ideally, do not replace the sponge and add matting agent if needed. Too little matting agent can make matting more difficult.
- If necessary, the ideal application quantity should be determined in a pre-test. The application quantity should completely wet the test areas. If the application quantity is not sufficient for this, the areas must be completely cleaned with isopropanol and the process must be repeated.

published by

The German Cosmetic, Toiletry, Perfumery and Detergent Association (IKW)
Home Care Department
Mainzer Landstraße 55, 60329 Frankfurt am Main | Germany
www.haushaltspflege.org

Appendix

Test sheets, measuring instruments, equipment, setups, auxiliary materials, formulations, chemicals and supply sources

Test sheets (test specimens)

- For example, plain steel or aluminium sheet
- Original paint layering in OEM quality (no repair and special paint) [11], base paint plain black, e.g. clear paint PPG APO 1.2 (e.g. Thierry GmbH, Motorstraße 30, 70499 Stuttgart, Germany)
- Size of the test sheet: [10] 500 mm x 400 mm x 1 mm
- Use of the test sheets three weeks after manufacturing at the earliest or expose test sheets to accelerated ageing: e.g. 16 hours at 60°C including at least one day at ambient temperature for conditioning. The relative air humidity should amount to ca. 30 to 80%.

Measuring instruments, equipment and setups

- Gloss meter (e.g. company Byk-Gardner GmbH, Lausitzer Strasse 8, 82538 Geretsried, Germany, phone: +49 8171 3493-0, fax +49 8171 3493-140, email: info.BYK.Gardner@altana.com, www.byk.com or ERICHSEN GmbH & Co. KG, Am Iserbach 14, 58675 Hemer, Germany, phone: +49 (0) 2372 – 9683-0, fax: +49 (0) 2372 – 6430, email: info@erichsen.de, https://www.erichsen.de/erichsen-de) with measurement geometry and measurement conditions based on DIN EN ISO 2813.
- Setup for the water run-off method with water jet according to **Diagram 3**:
 - Rack for 30 °C installation, so that the sheet at the underside is at least 10 mm above the bottom of the washbasin (free run-off)
 - Water tap
 - Aerator [e.g. Neoperl Strahlregler Perlator (TT, IG M16x1 V, Art. No.: 1562145 or M22x1 DL, Art. No.: 40460395, Neoperl GmbH, Klosterrensstraße 9-11, DE-79379 Müllheim, Germany, phone: +49 (0)7631-188-0, fax: +49 (0)76 31-188-287, email: info@neoperl.de]
 - Flow meter 60 - 600 l/h: e.g. PVC-U flow indicator with 2fold bonded socket 20 mm (Art. No.: AA461; https://www.pvc-welt.de/PVC-U-Durchflussmessgeraet-2fach-Klebemuffe)
 - Stopwatch for measuring the water run-off with a 1/10 second measuring accuracy
 - Thermostat
 - Washbasin or water collection vessel
- Balance for weighing the paint conditioner samples with a 0.1 gramme measuring accuracy
- Random orbit sander: free-wheeling or forced rotation excentric polisher for matting and polishing: e.g. ECCENTRIC POLISHER - BIGFOOT LHR15 MARK III (Rupes S.p.A. a socio unico, Via Marconi 3A loc. Vermezzo, 20071 Vermezzo con Zelo (MI) – Italy, phone: +39 02946941, fax: +39 0294941040, email: info_rupes@rupes.it, https://www.rupes.com)

Auxiliary materials

- Adhesive tape (residue-free): e.g. adhesive tape 5959, width 48 mm (3M Deutschland GmbH, Carl-Schurz-Str. 1, 41453 Neuss, Germany)
- Felt pad for matting (e.g. SONAX Felt Pad Art. No. 493 300, SONAX GmbH, Münchener Str. 75, 86633 Neuburg, Germany, phone: +49 (0)84 31 53-0, email: info@sonax.de, www.sonax.de)
- Sponge for excentric polisher for polishing and matting: [e.g. Eccentric pad (medium) 143 (Art. No. 04933410), SONAX GmbH, Münchener Str. 75, 86633 Neuburg, Germany, phone: +49 (0)84 31 53-0, email: info@sonax.de, www.sonax.de]
- Wiper with silicon lip: e.g. Flexiblade (Art. No. 04174000, SONAX GmbH, Münchener Str. 75, 86633 Neuburg, Germany, phone: +49 (0)84 31 53-0, email: info@sonax.de, www.sonax.de)

- PUR sponge, round, for applying and matting; 7.5 cm diameter and 2 cm thick (e.g. T28065, Oskar Pahlke GmbH, Linzer Straße 95, 53562 St Katharinen, Germany, phone: +49 (0)2645 9523-0, fax: +49 (0)2645 9523-40, info@pahlke-schaumstoffe.de, http://www.pahlke-schaumstoffe.de/)
- Microfibre cloth for polishing, e.g. microfibre cloth black (weight: 300 g/m², dimensions 40 x 40 cm, Art. No. 615.900.337, De Witte SA, Kluizenmeersen 7, B-9170 Sint-Gillis-Waas, Belgium, phone: +32 (0)3 766 46 83, fax: +32 (0)3 766 46 84, email: info@dewitte.biz, http://www.dewitte.biz/Dewitte/index.html)
- Cotton swabs (e.g. CLASSIQSwabs™, Copan Flock Technologies Srl, Via Perotti 18, 25125 Brescia, Italy, phone +39 030 3666100, fax: +39 030 2659932, email: info@copanflock.com, www.copanflock.com)
- Metal weight to be placed on sponge and/or microfibre cloth: ca. 1.5 kg (cf. **Figures 5 and 6**)
- Containers with basic car shampoo for the testing of wash resistance

Formulations and chemicals

- Reference paint conditioner (start with the liquid components and then stir in the soaked xanthan gum):
 - 4% by weight paraffin hydrocarbon (e.g. Exxsol D80) / Exxon
 - 3% by weight 350 silicone oil emulsion (e.g. Korasilon NPF 60 ED / Obermeier-Spezialchemikalien)
 - 1% by weight paraffin wax emulsion 40% (e.g. Hansa Care 4670 / CHT Beitlich)
 - 0.2% by weight preservative
 - 0.2% by weight xanthan gum (e.g. Kelzan ST Plus / CP Kelco), let soak in water while stirring
 - Ad 100% by weight water (DM)
- Matting agent (start with the liquid components and then stir in the abrasive):
 - 20% by weight abrasive (e.g. Silitin V 85)
 - 15% by weight of 28% sodium lauryl ether sulphate (2.5 EO) solution (e.g. Emal 228D / KAO or Texapon® NSO / BASF SE)
 - 15% by weight complexing agent (e.g. Trilon® M liquid (40%) BASF SE)
 - 8% by weight glycerine
 - 0.2% by weight preservative
 - Ad 100% by weight water (DM)
- Basic car shampoo:
 - 0.5% solution of 28% sodium lauryl ether sulphate (2.5 EO) solution (e.g. Emal 228D / KAO Chemicals Global or Texapon® NSO / BASF SE)
 - Ad 100% by weight water (DM)
- Demineralised water (DM water)
- Degreaser: Isopropanol (isopropanol alcohol, propanol-2), ≥99.8% purity
- White spirit: aromatics-free and paint-resistant (boiling range 80-110°C)
- Abrasive: e.g. Silitin V 85 [HOFFMANN MINERAL GmbH, Postfach 14 60, 86619 Neuburg (Donau), Germany, phone: +49 (0) 8431 53-0, fax: +49 (0) 8431 53-3 30, www.hoffmann-mineral.com, email: info@hoffmann-mineral.com]
- High-gloss polish without waxes and silicones [e.g. SONAX Profiline Perfect Finish (Art. No.: 224 141, SONAX GmbH, Münchener Str. 75, 86633 Neuburg, Germany, phone: +49 (0)84 31 53-0, email: info@sonax.de, www.sonax.de)]

SUBSCRIPTION Scientific articles, market research, formulations, news from the industry, and much more, Subscribe to SOFW Journal. ✉ subscription@sowf.com