German Commission For Paint And Bodywork Repair

Fading Out Painting Process In Case Of Repair

Basics For Professional Refinishing Of Components Without Clear Separation By Dividing Elements

The following document was translated by Allianz Center for Technology based on the German original text „Auslaufendes Lackierverfahren im Reparaturfall - Grundlagen für die fachgerechte Reparaturlackierung von Bauteilen ohne eindeutige Abgrenzung durch separierende Elemente“ by the German Commission for Paint and Bodywork Repair, dated March 7, 2023. In case of questions, the original German document is decisive, which can be accessed, for example, at https://www.azt-automotive.com/de/downloads → „Beschlüsse der Deutschen Kommission für Lack und Karosserieinstandsetzung“.

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Preliminary Note

In the case of damage to motor vehicles, especially passenger cars, the entire vehicle body, including all parts and components of the body and outer panels, is rarely affected. Rather, only individual sections or component areas are damaged. Depending on the extent of damage, the question then arises as to whether and to what extent the component surface(s) of the vehicle body to be painted can be divided and limited. This varies depending on the type and extent of the painting effort. Influencing factors in this context include:

- Extent and constellation of the painting job (single part / several components, exterior and / or interior parts, partial or overall painting, to be painted on the vehicle / painting rack...)
- Painting of a repaired component and / or new part
- Characteristics and properties of the production painting

as well as other aspects explained below in this document.

As a general rule, when repairing bodywork and paint damage, the paint specialist must carry out the repair paint to be applied in a proper and professional manner. The aim is always to achieve a repair that is as unnoticeable as possible to the average and untrained eye and can therefore be described as an "invisible repair". In addition to the visual aspects, the technical functions of a vehicle paint job must continue to be guaranteed without restriction. The visual, haptic and technical properties of the paint finish in conjunction with the respective body structure are thus co-decisive for the quality of a refinish.

A significant and determining influence for an optimal painting result is influenced by the choice of masking edges and the respective masking method, since unsuitable or unfavorable areas of the body lead to obvious repair marks. These can no longer be repaired directly, and then only at increased economic and ecological expense as a result of additional painting.

Depending on the type, location and extent of the damage, the geometry of the affected components, the way in which they are assembled, as well as the color shade, type of paint and paint system used and the resulting possibilities, different procedures and methods are required to carry out professional refinishing at the appropriate points in a visually and technically unremarkable manner. In general, it is advisable to dismantle close-fitting bodywork components such as trim strips, brackets, grommets, clips, sealings, etc., which touch the bodywork/component surface(s) to be painted without a gap or clearance, or to detach them in such a way that masking and painting can be carried out without leaving any traces and without any technical functional restrictions. It should also be noted that, particularly on older vehicles, trim strips, clips and sealings to be removed have already aged due to the effects of the weather, making non-destructive dismantling more difficult or, in some cases, damage cannot be avoided.

Especially in the case of body shapes and components that have no direct border and whose connecting surfaces merge directly into one another without separating elements, for example

- Side panel to roof
- Side panel to the side roof pillar
- Side panel at the transition from D-pillar to rear section
- Side panel at the transition to the sill panel
- A-pillar top outside to roof panel
- A-pillar top outside to side roof pillar or rear side panel
- A-pillar inside to A-pillar outside as well as to sill and entrance area
- B-pillar to the roof pillar as well as to the sill or entry area
- Sill to the A-, B-, C-pillars and to the rear side panel

in the context of a refinish, the question of the scope of the necessary paint work arises again and again: How can the scope of the paint work be carried out in a technically, professionally and sustainably flawless manner, as well as in an economically sensible manner, when the surfaces of the body parts merge into one another, taking into account any dismantling work that may be necessary?

Particularly after repairs to the rear side panel, there are sometimes controversial discussions about the need for continuous surface painting of the entire side roof rail and / or the non-dividable roof surface, which can be regarded as professional. The fading out painting process would be a possible option, insofar as this is justifiable from a technical point of view. The decision is up to the paint specialist carrying out the work, depending on the damage, the type of paint, the repair procedure and the color shade in conjunction with the repair paint system used.

This document is intended as information and guidance for all those involved in the repair process in order to emphasize and explain the importance of proper and professional surface division of body components without clear boundaries through separating elements. The explanations refer primarily to the vehicle painting of road-bound passenger cars, as this is where the highest visual and qualitative demands are placed on the surface quality with regard to the uniformity of the repaired body surfaces.

1. The Fading Out Painting Process – Technology & Boundary Conditions

The technical term " fading out painting process" refers to a craftsman's repair method in which the paint surface is not painted over the entire surface and closed, but in which the repair painting ends up fading out on the surface of the body.

In order for this method to be used, special work steps must be taken into account. The body surfaces must be prepared appropriately for the fading out topcoat application using special techniques (cleaning, fine sanding, abrasive cleaning, etc.). The paint material must be adjusted according to the recommendations and technical guidelines of the refinish manufacturer used.

Realization / Technical Procedure

The topcoat layers are applied in the application process, becoming finer and finer and overlapping in the direction of the correspondingly finely sanded (old) coating. The final clearcoat layer is adjusted with a special thinner/additive designed for this purpose and applied to the abrasively cleaned paint surface in the transition zone using extremely fine spraying. According to the specifications of the repair paint manufacturer's system used, the transition area is finished by fine sanding and a final polishing process. This process can be used to produce a barely visible paint transition from the newly applied refinish to the existing old paint (see Figure 1).

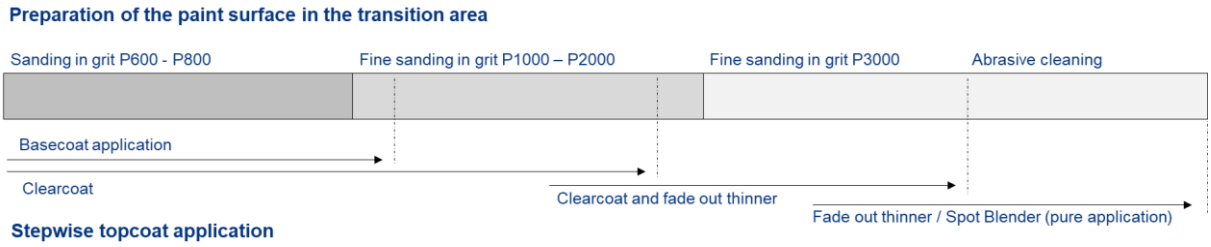

Figure 1: Schematic illustration of the preparation and application technique for the fading out paint process in the transition area.

To achieve the highest possible quality results, the following points must be observed:

- Only glossy vehicle finishes in at least 2-layer topcoat processes with smooth or unstructured surfaces are suitable for the finishing paint process.
- The existing vehicle finish to be applied must be finished with completely transparent and chemically crosslinked clearcoat layers.
- An appropriately extensive paint surface is required for the finish, which is largely determined by the following parameters:
  Type and location of the damage, quality of the repair, primer, filler and/or filler surface, the color shade (single / two / multi-layer), the painting process and the component geometry.
- The closer the paint damage is to an area without clear boundaries defined by separating elements, the more difficult it is to paint the clearcoat on the damaged component.
- If the transition area to be painted is oriented in several directions, the fading out painting process becomes more complex and risky.

- No basecoat layers and/or other pigmented paint material layers may be applied in the fading out zone of the transition area.
- Paint overspray must also be prevented from settling there, and appropriate masking work is required for this reason.
- No sharp paint masking edges must be allowed to form on the surface of the transition area that is being faded out, as these cannot be repaired by polishing.
- Directly visible and exposed body surfaces are considered more difficult in comparison with interior and partially covered component areas.

In summary, the possibilities for executing the fading out painting process depend on different parameters and boundary conditions and are not always given and applicable for every repair situation and constellation.

Taking into account all the aspects already described, visually perceptible transition areas can occur in the short, medium or long term when the paint process is being faded out. Reasons for this can be, for example, the use of different series clearcoats by the vehicle manufacturers (OEMs), the material and surface properties of the vehicle bodies and the associated surface finishing options. The result of different aging processes and/or different stress characteristics of series and repair clearcoats can lead to paint chipping edges, loss of gloss or even paint delamination, as a result of which the repair area becomes noticeable and visible in the area of the faded out painted transition area. The decisive factor here is that there is no chemically closed clearcoat bond in the transition area of the fading out paint process, but it is merely a transparent overlay of the newly applied paint on the existing paint surface, which is subsequently levelled by polishing.

In particular, the fading out zones in the area of the side roof rail bear the risk that mechanical stresses, for example in car washes or during the use of high-pressure cleaners, as well as during vehicle preparation of the painted surfaces by means of polishing, can result in possible tear-off edges, paint peeling (delamination) or other damage patterns in the fading out zones of the clearcoat. In addition, these are in visible areas, which makes them more noticeable to untrained observers and ultimately does not represent a professional paint repair.

2. Decision Criteria Both For Or Against A Fading Out Painting Process

As described in Chapter 1, various factors influence the decision as to whether a fading out painting process or a continuous surface painting is preferable.

The decision for or against a fading out painting process of the clearcoat with final polishing of the transition zone is basically left to the paint specialist carrying out the work on the object. In addition to professional execution, economic and ecological aspects must also be taken into account. The technical and organizational workload for the finishing paint process can also be higher financially than for surface painting. This is due, for example, to the working time required for preparing the body surface and finishing the transition area, the paint and accessory materials required and possible additional energy costs resulting from this procedure.

In addition to all the technical aspects, it is also important to consider which method will ultimately enable an economical and safe repair based on the type and quality of the paint. This can be assessed differently from case to case. The decision for or against a fading out painting process is therefore up to the paint specialist carrying out the work, who may consult

with the customer, the expert or the insurance company on the basis of his professional assessment.

3. Examples

In the following, some frequently observed examples and constellations of components without clear boundaries through separating elements from repair practice are explained in more detail.

For all constellations, the vehicle manufacturer's repair instructions and the product-specific technical bulletins and information sheets of the refinish manufacturer's system used must be observed.

3.1. Rear Side Panel With Direct Transition Into The Roof Panel Without Separating Elements

Vehicles in which the roof panel without separating elements such as edges, trim strips or a roof rail merges directly into the side area of the roof pillar and thus also into the rear side panel or the A-pillar, present a challenge for technically flawless and economically reasonable paint repair in the area of the side panel due to its design. Since the separating elements normally used for unremarkable cover lines are missing, a decision must now be made between an fading out painting process or painting the entire roof.

The fadingout painting process is recommended if the transition area can be carried out in the narrowest possible area, for example on the C- or D-pillar of the vehicle, so that the area of the transition area is minimized.

If necessary, the roof panel, the opposite side panel, both A-pillar areas and both sills would also have to be painted in addition to the original side panel to be painted. Disassembly, dismantling and masking work could be the result.

It may also be possible to use appropriately shaped design edges to subdivide a side panel in terms of painting. Depending on the damage pattern, such a paint surface subdivision allows a section to be painted up to the design edge.

3.2. Roof Panel With Rear Side Panels Without Separating Elements

In comparison with Chapter 3.1, the opposite combination, in which the roof itself has to be repaired and painted, is somewhat different. Here, surface painting of the subsequent side walls without separating elements can be more economically and technically reasonable in comparison to the fading out painting process.

This is due to the challenges of topcoat application on horizontal component surfaces. In the case of the horizontally oriented roof skin, the production of a transparent fading out paint transition on the surfaces of the C-pillars or rear side panels, which tend to lie vertically, is not recommended in terms of painting technology. The paint spray sinking sideways from the roof skin cannot be controlled at the fading out paint transition areas and tends to concentrate in these zones. As a result, creating a transition area that is invisible from a painting standpoint presents a significant challenge to the paint specialist performing the work.

In the case of suitable subdivisions, such as design edges on the side panel, these can be used as a masking line for separating and, if technically justifiable and feasible, only the upper side panel sections can be painted (see Chapter 3.1).

3.3. Rear Side Panel With Side Roof Rail Separated From The Roof Panel

In this case, it can make both technical and economic sense to paint the entire side roof rail if it is divided from the roof panel by a separating element.

In such a constellation, the continuous painting of the side roof rail up to the A-pillar in the area of the front fender involves less preparatory and finishing work compared with the production of a transparent transition when the fading out painting process is being applied. At the same time, there is no remaining risk of any marks or repair traces in the transition area.

Depending on whether and how any roof rails are installed and are in contact with the paint surface on the roof rail, disassembly work may be necessary depending on the design and the painting process to be carried out. In the case of an fading out clearcoat, disassembly work may be required to ensure appropriate accessibility of the seams for the final polishing process. In the case of complete painting of the side panel and roof pillar, however, this disassembly work would not be necessary, as the inner seam areas, which are easily to access fort he paint spray but otherwise difficult to reach, do not have to be polished.

3.4. A-Pillar Top Outside

Due to its design, the A-pillar at the top outside of vehicle bodies is part of the rear side panel and is connected to it directly via the side roof rail/roof frame without any separating elements. If only the A-pillar is damaged, e.g. after a windshield replacement, or if surface painting is to be carried out to visually match the adjacent components to be painted, it is possible to limit the painting area by means of the fading out painting process in order to minimize the need to paint additional body surfaces if necessary. The extent of repair required depends on the type of paintwork and/or damage and the associated technical possibilities for professional repair.

If, due to the design, the A-pillar at the top outside, with the roof rail/roof frame separated from the roof panel by a separating element, the panel surface up to the height of the B-pillar is suitable for the fading out painting process. If this is not sufficient, it may be possible to produce the paint transition on areas further back up to the C-pillar. Particularly in the case of dark paint finishes, surface painting of the entire rear side panel or the upper side panel section may be necessary.

3.5. A- and B-Pillars, Entrance And Sill Areas

After repair work in the entrance and sill areas as well as the A- and B-pillars, the paint specialist should always decide on the basis of the individual case how the repair procedure is to be carried out. The type and location of the damage are decisive for the required scope of painting.

A wide variety of body shapes and areas, convex and concave folds and interior surfaces in the entrance area, as well as along the lower A-pillar and B-pillar, can make it necessary to

paint all connected components throughout. This can be done in the area of the sill or entrance areas at a suitable inner edge or along the inner seam by professional masking work.

In the area of the rear sill section to the rear side panel, it may be possible to complete the refinishing process by using the fading out painting process in the lower wheel arch area, depending on the body design and all the technical options mentioned so far. If the available area is not sufficient for this, painting of the rear side panel up to a suitable design line (edge, bead, strip, cover, ...) is required.

In contrast to the outer directly visible body surfaces, the paint process running out in the interior of the A- and B-pillars and in the entrance and sill areas must be evaluated separately.

It should be noted that in individual cases and depending on the vehicle manufacturer and model, exterior and interior surfaces may be painted and delivered with different surface finishes or textures. This must be taken into account in the refinishing process and in the choice of the scope of the refinish so that time-consuming additional work and costs can be avoided.

4. Challenges In The Calculation Of The Paint Scope

When estimating and invoicing with the widely used and established programs of various estimating data providers on the market, care must be taken to correctly select the component sections to be painted. This is not always self-explanatory and comprehensible in the case of components whose surfaces merge directly into adjacent components without separating elements.

The graphic representations of the vehicle body and the separation of the component surfaces in the estimating systems often deviate from the painting sections required in painting practice, since these are essentially based on the cutting sections of the body structure. Particularly when using vehicle manufacturer-independent paint calculation methods such as the AZT Paint Calculation System, the graphical representations do not match the component surfaces recorded for painting. In practice, this confusing display of surfaces in the damage calculation programs, which is not compatible with the AZT surface measurement method, leads to the selection of other adjacent components until finally all components and surfaces to be painted are color-coded in the calculation system.

As a general rule, the damaged component to be repaired is itself calculated at the required paint level. All other components that also have to be painted without separating elements must be selected in the appropriate paint stage. The connection points of welded-in new parts must generally be restored by means of sanding, corrosion protection, filler and primer application and thus prepared for topcoat application. In the AZT Paint Calculation System, this work at the connection points of welded-in new parts is taken into account in the respective replaced part. All other directly adjacent parts that are also painted are then to be calculated as surface painting, provided that these are not to be included in the damaged repair scope.

It must also be taken into account that the necessary labor time and material values for the fading out painting process are not included in the painting times for the damaged component. Thus, the additional time and cost of the discontinued painting process must always be weighed up against the cost of continuous surface painting of the entire component.

5. Example Photos

Figure 2: Vehicle prepared for topcoat with repair painting of the rear side panel and supplementary painting of the A-pillar at the top outside to achieve a closed clearcoat.

Figure 3: Vehicle prepared for topcoat with repair paint on rear side panel and fading out painting process on roof rail and rear entrance sill area.

Figure 4: Vehicle prepared for topcoat with repair painting of the rear inner sill section by the fading out painting process on the lower entry sill and along the inner C-pillar.

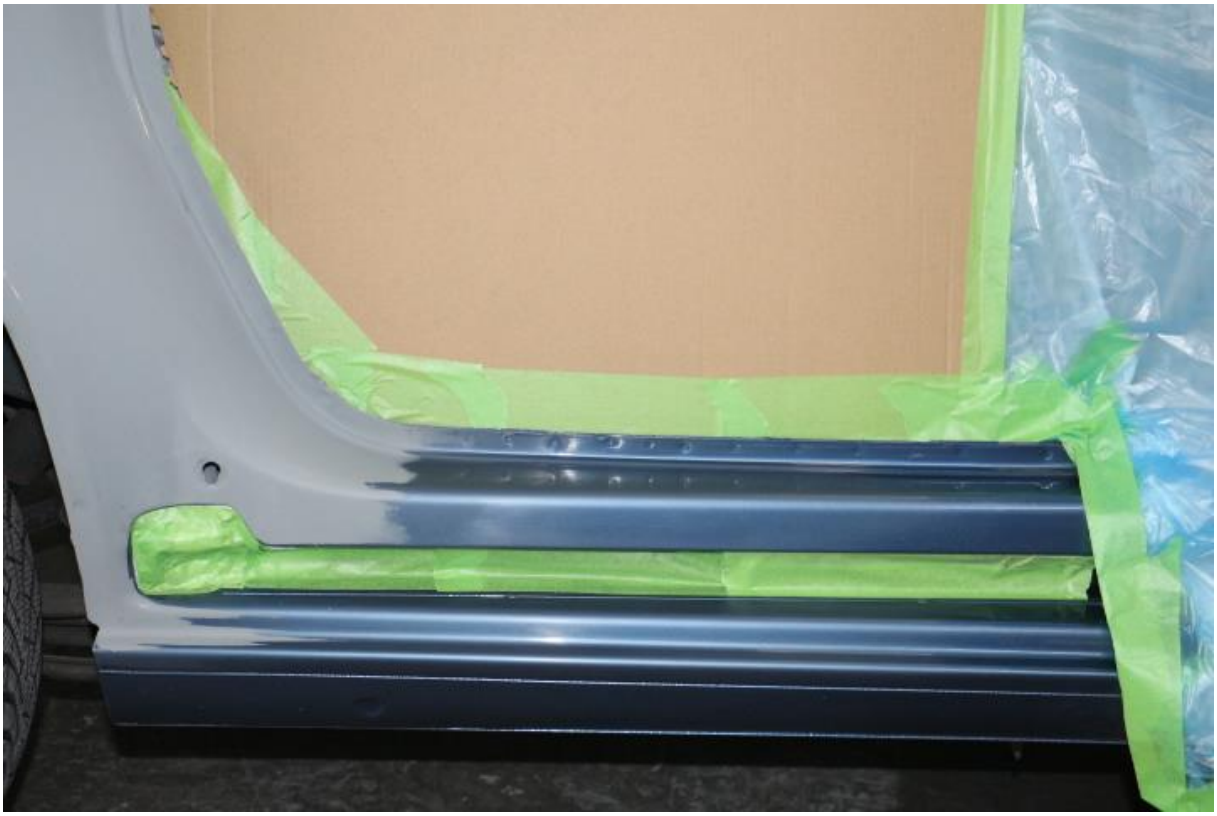

Figure 5: Detailed view of the rear sill section prepared for topcoating using the fading out painting process.

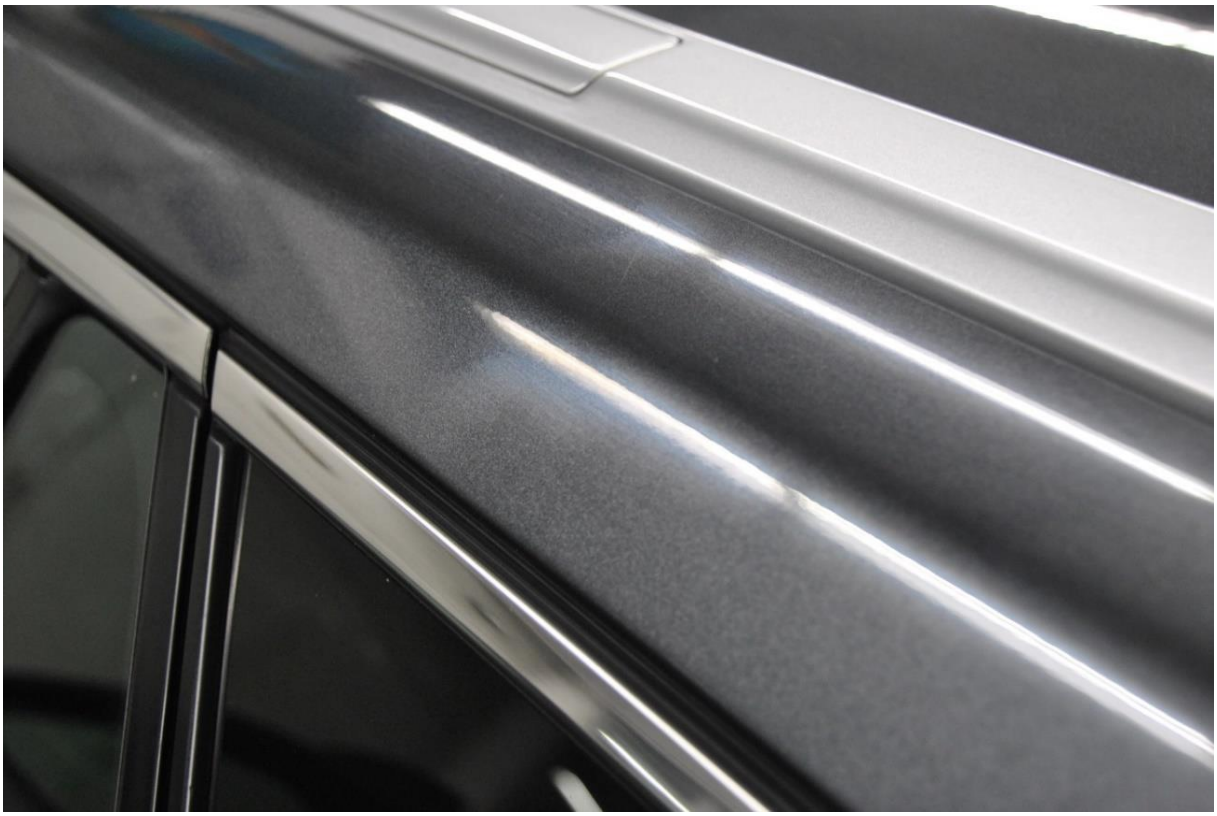

Figure 6: Potential long-term consequence of a fading out painting process in the area of the roof rail - gloss level reduction / matting due to continuous weathering and aging.

Figure 7: Example of a sharp paint edge due to improper performance of the fading out painting process - transition area not sufficiently dimensioned and subdivided.

6. Conclusion

The decision against or for an fading out painting process must be assessed individually by the paint specialist on the object on the basis of his technical expertise. If necessary, the further procedure including the repair method must be coordinated with the customer, the expert or the insurance company.

In addition to the technical aspects, continuous surface painting can also make more economic sense compared with the fading out painting process with final polishing. The risk of the painted transition area cracking during the final polishing process, visually noticeable signs of tearing, or any late effects in which the polished paint transition changes significantly over time and thus becomes visible, must always be taken into account when deciding whether or not to carry out the repair method. On all visible areas which are considered as direct visible surfaces in vehicle painting (corresponds to the so-called zone "A" in the car body classification for paint surface assessment, see e.g. chapter 2.6 of the system description for AZT Paint Calculation System[1]), continuous surface painting is the method to be favored. The situation is different for zones and component surfaces that are not in direct view (e.g. sill areas, interior areas, covered areas and body surfaces that are high up or well above eye level). In such areas, limiting the scope of the paint job by means of the paint process that is being faded out may be an appropriate solution in the event of a repair.

Ultimately, the paint specialist on the object decides on the basis of the actual damage and the repair paint manufacturer's system used in the case of damage, including the type of paint and the technical possibilities directly related to it, on the execution of the professional repair painting.

Correct estimating and invoicing is made more difficult by the graphic representations in the estimating programs, which are based on the body panel separations. These are often not compatible with the component surfaces taken into account for painting. This can lead to system-related misunderstandings and discussions.

The fading out painting process is a possible repair method, but as described, it cannot be compared with continuous surface painting. For components without separating elements, the fading out painting process can be regarded as a generally accepted repair method in repair practice. However, the relevant restrictions must be observed.

Economic and ecological considerations must be taken into account when weighing up the most suitable procedure for the individual case. The aim should be to use a sustainable repair process in order to conserve resources.

[1] Available free of charge in the download area of the AZT homepage at https://www.azt-automotive.com/en/downloads → "Paint".

This document was decided unanimously on March 07, 2023 by the members of the German Commission for Paint and Bodywork Repair:

- Bundesverband der freiberuflichen und unabhängigen Sachverständigen für das Kraftfahrzeugwesen e.V. (BVSK)
- Bundesverband der Partnerwerkstätten e.V. (BVdP)
- Bundesverband Farbe, Bundesfachgruppe Fahrzeuglackierer (BFL)
- Gesamtverband der Deutschen Versicherungswirtschaft e.V. (GDV) sowie:
  Allianz Versicherungs-AG, Generali Deutschland AG
- Verband der Deutschen Lack- und Druckfarbenindustrie e.V. (VdL) – Arbeitskreis Autoreparaturlacke
- Verband der Automobilindustrie e.V. (VDA), vertreten durch:
  Bayerische Motoren Werke AG (BMW), MAN Truck & Bus SE, Opel Automobile GmbH, Volkswagen AG
- Verband der Internationalen Kraftfahrzeughersteller e.V. (VDIK) sowie:
  Honda Motor Europe Ltd, Renault Deutschland AG
- Verband der Technischen Überwachungs-Vereine e.V. (VdTÜV), vertreten durch:
  TÜV Süd AG
- Zentralverband Deutsches Kraftfahrzeuggewerbe e. V. (ZDK)
- Zentralverband Karosserie- und Fahrzeugtechnik e.V. (ZKF)
- AZT Automotive GmbH
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