**BMW Group**

**Technologie Oberfläche**
**TK-3**

# Process specification 92049

# Pre-treatment and cataphoretic dip painting of aluminium and steel parts at the supplier

Motorrad

Supplier / all models

Development status: Series

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**TK-321:**
Mr. Dürr

**TK-321:**
Mr. Huber

**TK-32:**
Mr. Aeckerle

**TK-3:**
Mr. Wimmer

Change level [G]





## Caution:

**For powder-coated parts applies PV98021**

**For wet-painted parts applies PV96016**

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## Revision of process specification

**Technologie Oberfläche TK-3**

| Revision date | Revision index | Revision page | Description of revision | Issuer |
|---|---|---|---|---|
| 10.12.92 | [B] | | Revision of chromating | Ober |
| 14.02.94 | [C] | | Extension single layer powder silver + black | Ober |
| 06.07.99 | [D] | | Complete revision | Rutka |
| 24.01.04 | [E] | | Complete revision | Dr. Jaschke |
| 17.03.06 | [F] | | Complete revision | Dürr |
| 23.04.08 | [G] | | Complete revision | Dürr |

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**Revisions and extensions of the processes or of the materials shall be requested in writing.**

# Contents

## Fundamentals



### Purpose

This process specification shall ensure the even visual and functional product quality by specifying the processes and products to paint specified substrates of aluminium and steel components.

### Scope of application

It is integral part of the drawing and applies to coatings of all steel and aluminium components by the supplier.

### Requirements, referenced standards

The coated surfaces shall fulfil the corrosion protection value acc. to GS 90011.
The pre-treatment “phosphating” (refer to subsection 2.4) with subsequent powder-coating (see PV98021) is only permissible in combination with a cataphoretic dip painting (see subsection 3.1).
The testing departments of the supplier are responsible for documentation and archiving the test results (also for process support).

## 1 Substrate List



| Index | Substrate | Remark |
|---|---|---|
| A | *Steel in general* | |
| | e.g. St-37, St-52, DC 01 | |
| B | *Al cast alloys (free of Cu/ low in Cu content)* | |
| | EN AC-42000 [GK-AlSi7Mg] | e.g. monolever |
| | EN AC-43000 [GK-AlSi10Mg] | |
| | EN AC-43300 [GK-AlSi9Mg] | e.g. front frame |
| | EN AC-43400 [GD-AlSi10Mg] | e.g. instrument carrier |
| | EN AC-44300 [GD-AlSi12(Fe)] | |
| | EN AC-48000 [GK-Al Si12CuNiMg] | e.g. tail rack |
| | GD-AlSiMg0.3Fe | |
| | GD-ALSi9MgMn | |
| | GD-AlMg5Si2Mn | |
| | AlSiMg0.3 (Thixocasting) | |
| C | *Al cast alloys (containing Cu)* | |
| | EN AC-46200 [GK-AlSi8Cu3] | e.g. foot brake lever |
| | EN AC-46000 [GD-AlSi9Cu3(Fe)] | e.g. casing half |
| D | *Al wrought alloys* | |
| | EN AW-6060 [AlMgSi] | e.g. passenger footrest |
| | EN AW-6005 [AlSiMg] | |
| | EN AW 6082 [AlSi1MgMn] | e.g. handlebar bridge |
| | AlMgSiCu | e.g. longitudinal control arm |
| E | *Zn die cast alloys* | |
| | GD-ZnAl4Cu | e.g. grab handle K1200 LT mod. facelift |
| | GD-ZnAl4Cu2 | e.g. lock top case K1200 LT mod. facelift |
| F | Released substrates for SAM procedures | |
| | EN AC-42000 [GK-AlSi7Mg] | Aluminium cast wheels |
| | EN AC-43000 [GK-AlSi10Mg] | |
| | EN AC-43300 [GK-ALSi9Mg] | |
| | GK-AlSi11Mg | |
| | EN AC-47000 [GD-AlSi12(Cu)] | |
| | | Throttle body* |

*s. page 14, coating anodic dip paint (ATL)

## 2 Pretreatment

**Following processes can be applied alternatively**

| Process | Sub-strate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **2.1 Chromat-ing** | B,C,D,E | **Clean**<br>mild alkaline | Treatment time: 2-3min at approx. 50°C | Chrome-containing pre-treatment is only permitted until 10/2008! |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Deoxidize**<br>acid | Treatment time: 0.5 – 1.0 min at RT | Laboratory tests:<br>In coordination with the supplier of chemicals. |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Chromate** | Treatment time: 0.5 – 1.0 min at approx. 40°C | At an interim storage prior to the painting process of > 6 hours, a tempering of the components is required for 2 h at max. 80 ℃ of the object temperature. |
| | | **Rinse**<br>Demineralised water | Rinsing time: 0.5 – 1,0 min at RT | |
| | | **Drying of parts** | Approx. 30-60 min at 70-90℃ of object temperature. | |

| Process | Substrate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **2.2 Ti/Zr and/or Ti processes (Immersion processes)** | B,C,D | **Clean**<br>Gardoclean T5378<br>(company Chemetall) | Treatment time: 5-6 min at 50-60°C | Laboratory tests:<br>In coordination with the supplier of chemicals.<br>Passivation bath:<br>regular check with regard to impurity ions. |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Deoxidize**<br>Framalite M3<br>(comp. Chemetall) | Treatment time: 0.5 – 1.0 min t RT | |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min ati RT | |
| | | **Conversion treatment**<br>Gardobond X 4707 and Gardolene D 6800/1M<br>(comp. Chemetall) | Treatment time: 1.0 – 2.0 min at 25-30°C | |
| | | **Rinse**<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Drying of parts** | approx. 30-60 min at 80℃ object temp. | |

| Process | Sub-strate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **Ti/Zr and/or Ti processes**<br><br>**(immersion process)**<br><br>continued | | **Clean**<br>Ridoline 1559<br>(comp. Henkel) | Treatment time: 5-6 min at 50-60°C | Laboratory tests:<br><br>In coordination with the supplier of chemicals<br><br>Passivation bath:<br>regular check with regard to impurity ions. |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min ati RT | |
| | | **Deoxidize**<br>(comp. Henkel) | Treatment time: 0.5 – 1.0 min ati RT<br>(sulphuric acid / fluoride) | |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Conversion treatment**<br>Alodine 2840 as Ti/Zr process or<br>Alodine 4850 as Zr process | Treatment time: 1.0 – 2.0 min at 25-30°C | |
| | | **Rinse**<br>VE-Wasser | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Drying of parts** | approx. 30-60 min at 80°C object temperature | |

| Process | Substrate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **2.3 Ti processes (spray process)** | B,C,D | **Clean**<br>Ridoline 1563<br>(comp. Henkel) | Treatment time: 2-4 min at 50-60°C | Laboratory tests:<br>In coordination with the supplier of the chemicals.<br>Passivation bath:<br>regular check with regard to impurity ions. |
| | | **2x rinsing**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Deoxidize**<br>Novaclean N<br>(comp. Henkel) | Treatment time: 2.0 – 3.0 min at RT | |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | Additional degreasing and rinsing zones are possible. |
| | | **Rinse**<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Conversion treatment**<br>Alodine 400<br>(comp. Henkel) | Treatment time: 1.0 – 2.0 min at 15-35°C | |
| | | **Rinse**<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT<br>(as spray ring at run-out) | |
| | | **Acid pickle degreasing** Nabuclean STI / 156 S-50 and Intens S<br>(comp. Nabu) | Treatment time: 2-4 min t 55-65°C | Laboratory tests::<br>In coordination with the supplier of the chemicals.<br>Passivation bath:<br>regular check with regard to impurity ions. |
| | | **Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Rinse**<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT | |
| | | **Conversion treatment**<br>Nabutan STI / 310<br>(comp. Nabu) | Treatment time: 0.5 – 1.0 min at 25-30°C | Additional degreasing and rinsing zones are possible. |
| | | **Rinse**<br>Demineralized water | Rinsing time: 0.5 – 1.0 min at RT<br>(as spray ring at run-out) | |

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| Process | Sub-strate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **Ti processes**<br><br>**(spray process)** | B,C,D | **Clean**<br>Nabuclean STI / 105 S-2 and<br>Naburex STI / 106 S-2<br>(comp. Nabu) | Treatment time: 2-4 min at 55-65°C | Laboratory tests::<br><br>In coordination with the supplier of the chemicals. |
| | | **2x Rinse**<br>Tap water | Rinsing time: 0.5 – 1.0 min at RT | Passivation bath:<br>regular check with regard to impurity ions. |
| | | **Deoxidize**<br>Nabudur STI / 156 S<br>(comp. Nabu) | Treatment time: 2.0 – 3.0 min at RT | |
| | | **2x rinsing**<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT | Additional degreasing and rinsing zones are possible. |
| | | **Conversion treatment**<br>Nabutan STI / 310<br>(comp. Nabu) | Treatment time: 0.5 – 1.0 min at 25-30°C | |
| | | Rinse<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT<br>(as spray ring at run-out) | |

| Process | Sub-strate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **2.4 Zinc phos-phating** | A, B,C,D | **Systems:**<br>**- Chemetall Bonder 26S**<br>**- Henkel Granodine 958**<br>**- Kluthe Decordal 306A** | | Laboratory tests:<br>In coordination with the supplier of the chemicals.<br>Min. coating weight 1.5 – 5 g/m² |
| | | **2x degreasing** | Treatment time: 2-4 min at 50-60°C | |
| | | **Rinse at least once** | Conductance < 800 µS/cm | |
| | | **Activate** | Treatment time: 0.5 min at RT | |
| | | **Phosphate**<br>(for Al with free fluoride) | Treatment time: ca. 3min at 50°C | |
| | | **Rinse at least once** | Conductance < 500 µS/cm | |
| | | **Passivate**<br>(Zr base) | Treatment time: 0.5 min at RT | |
| | | **Rinse**<br>Demineralised water | Conductance < 50 µS/cm | |

| Process | Sub-strate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **2.5 SAM** | F | **2x cleaning**<br>Gardoclean T5374<br>(comp. Chemetall) | Treatment time: 5-6 min at 50-60°C | Laboratory tests:<br>In coordination with the suppliers of the chemicals.<br>Passivation bath:<br>regular check with regard to impurity ions.<br>Additional degreasing and rinsing zones are possible. |
| | | **2x rinsing**<br>Process water | Rinse time: 0.5 – 1.0 min at RT<br>Conductance < 800 µS/cm | |
| | | **Deoxidieren**<br>Gardacid P 4325 and<br>Gardobond Additiv H7275<br>(comp. Chemetall) | Treatment time: 1.0 – 2.0 min at RT | |
| | | **2x Rinsing**<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT<br>Conductance last rinsing process < 20 µS/cm | |
| | | **Conversion treatment**<br>Gardobond X4661<br>(comp. Chemetall) | Treatment time: 1.0 – 1.5 min at 55-60°C | |
| | | **Rinsing**<br>Demineralised water | Rinsing time: 0.5 – 1.0 min at RT<br>Conductance < 20 µS/cm | |
| **2.6 Intermediate treatment (only at external procurement)** | | | At the separation of pre-treatment and painting process a suitable packaging shall be chosen for the transport. | Parts shall be protected against damages and climatic influences (no falling below the dew point). Pre-treated parts shall only be handled with appropriate gloves. |

## 3 Coating

**In case of a cataphoretic dip painting and/or an anodic dip painting the following procedure applies:**

| Process | Sub-strate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **3.1 Cataphoretic paint coat** | A,B,C,D,E | The use of the following systems, released by BMW, is recommended:<br>- PPG Powercron 935 *)<br>- PPG EV2x ; Powercron 6x, 8x<br>- DuPont AEC3000<br>- BASF CG3x, 5x<br><br>(or respective industrial name, high build variant or edge protector variants)<br><br>*) = UV stable | KTL – Tauchen<br><br>Spray rinsing / recirculation from ultrafiltrate<br><br>Immersion rinsing (spray rinsing) / Ultrafiltrate<br><br>Immersion rinsing (spray rinsing) / Ultrafiltrate, pure<br><br>Spray ring/ Demineralised water | Corrosion testing acc. to BMW GS 90011<br><br>Coating criteria::<br>- adhesion, stone-chipping and corrosion protection testing<br>- even course<br>- no external influences (e.g. condensate, dirt, etc.)<br>- no drain marks<br>- no dripping marks from the rinsing zones<br>- dry coat thickness:<br>all substrates (only cataph.dip painting)<br>exterior: 20 ± 3 µm,<br>cavity: > 10 µm |
| **3.2 Cataphoretic dip paint - drying** | A,B,C,D,E | | Object temperature:<br><br>Min. 165°C, 15 min<br>Max. 200°C, 5 min | Cataphoretic paint shall be completely hardened. |

| Process | Sub-strate | Product | Process parameter /procedure | Quality requirements |
|---|---|---|---|---|
| **3.3 ATL with pre-treatment SAM (s. 2.5)** | Only for "housing silver" of the DKS/ throttle valve nozzle K25 BMW part no.: 7672731.9 7672732.9 (lh./rh.) GD-AlSi12 | **SAM-pre-treatment** (s. 2.5)<br><br>**ATL-immersion**<br>ATL silver cortex A3000 (UV-stable) (comp. Akzo Nobel)<br><br>UF-rinse 1<br>UF-rinse 2<br>UF-rinse 3<br>demineralised rinsing<br>Blow zone room temperature<br><br>ATL drying<br>(25 min / 190 – 220°C) | Process parameter acc. to process procedure comp. Collini, AT from Nov 18th, 2004 | As cataphoretic dip paint coat.<br><br>Exception:<br>LASI 2 (5 cycles of VDA-W.-Test) for this component confirmed by TK-L-15, UX-T-55, UX-EA-3 (drawing change is made by UX-EA-3 from LASI 3 to LASI 2.)<br><br>Objective: To achieve LASI 3 (10 cycles of VDA-W test – currently approx. 8 cycles are achieved). |

## General information



The processes described in this process specification meet the corrosion requirements acc. to BMW GS 90011 including the respective paint structures (refer toPV98021 and/or PV 96016).

Each deviation from the tested and released process procedure shall be declared to the BMW engineer and TK-321 in due time (6 months prior to the introduction into the series) and shall then be tested in compliance with GS 90011 by TK-321.

The use of deviating processes is only permissible with the approved release by TK-321. (Example: Change of pre-treatment, new suppliers).

The following test sample volume shall be presented:

- Detailed documentation of pre-treatment / cataphoretic dip paint and coating processes incl. all safety data sheets to TK-321.
- Components (quantity shall be coordinated in advance with TK-321), pre-treated and coated in the planned process.
- Test report regarding tests already conducted by supplier in compliance with GS 90011.

At incomplete documentation or not unambiguously marked test samples the specimens are rejected.

When samples from the laboratory or pilot plant are presented, the test shall be repeated after the series introduction of the processes.

To monitor the manufacturing quality the adhesion and corrosion protection is checked quarterly by the supplier in compliance with GS 90011.

The results shall be documented by the supplier and shall be presented to BMW, upon request.

On principle rework is not permissible, since rework may cause quality risks. In established individual cases these risks have to be assessed between the engineering departments, quality departments and TK-321. Depending on the risk assessment partial repair solutions shall be tested and approved by TK-321.

Cataphoretic dip painted parts without a further structure painting, subject to solar radiation (UV radiation) shall be resistant to light and/or UV. Epoxy cataphoretic dip paint systems are, compared to Acrylate cataphoretic dip paint systems, not UV resistant, they chalk and thus require a top coat structure (refer to page 13).