brief information

innovative and highly functional
surface designs
### Aalberts surface treatment processes

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- Color anodizing
- HART-COAT®
- HART-COAT® GLATT
- Anodizing

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- TempCote®

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#### Chrome and cadmium substitute
- NEDOX®

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- NANOFINISH®
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(*) pages in this brochure

(All technical values published in this brochure are subject to the test conditions specified. We therefore emphasise that the applications and operating conditions, along with the end user’s practical experience, will ultimately determine the level of performance achieved by the processes.)
CompCote®
aluminium oxide polymer composite layers
CompCote®

CompCote® refers to aluminium oxide polymer composite layers for aluminium alloys. The layers are formed by anodic oxidation of the base material and simultaneous molecular compounding of the aluminium oxide layer with polymers.

Excellent adhesion to the base material results from the fact that the layer partially merges into the base material. Due to the molecular polymer content, CompCote® offers chemical bond bridges with a coordinated choice of top-coats, providing very good adhesion results. In general, the cross-linked layer structure makes CompCote® a robust layer. CompCote® H, which is produced on the basis of a hard anodic oxidation (hard anodizing), is harder and more wear and corrosion resistant.

CompCote® is excellent for coloring. Accelerated weathering tests with 200 hours of UV exposure show only 1/3 of the reduction in color and brightness in CompCote® compared to that of conventionally anodized layers (both layers 10 μm, colored black and sealed). Standard colors: black, titanium grey, blue, red, gold, green. Other colors on request.

Corrosion resistance
CompCote® is corrosion resistant and outperforms normal anodic coatings due to the presence of molecular polymers.

<table>
<thead>
<tr>
<th>Salt-spray Test (ASTM B117):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>alloy 6061 T6, anodized (MIL Typ III) 10 μm / hard anodized (MIL Typ III) 37.5 μm / CompCote® 10 μm / CompCote®-H 37.5 μm</td>
<td></td>
</tr>
</tbody>
</table>

Component with blue colored CompCote® layer

### process details

<table>
<thead>
<tr>
<th><strong>Hardness</strong></th>
<th>As layer hardness there is measured – as usual with anodic oxidation layers – the so called apparent hardness. Depending on the alloy and process, it is between 300 and 600 HV.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wear resistance</strong></td>
<td>In the Taber Abraser test (MIL A 8625F), CompCote® shows excellent wear resistance which can be even better than that of conventional anodizing layers.</td>
</tr>
<tr>
<td><strong>Flexural strength</strong></td>
<td>CompCote® does not affect the flexural strength of the base material. This attribute makes the layer interesting for applications in aviation.</td>
</tr>
<tr>
<td><strong>Fracture properties</strong></td>
<td>CompCote® produces a fibre-like fracture pattern in notch impact tests. In contrast, conventional oxide layers, break in a brittle manner, like glass.</td>
</tr>
<tr>
<td><strong>Tribological properties</strong></td>
<td>CompCote® roughens up the surface comparatively little and possesses an optimized microstructure. CompCote® displays very good anti-scuffing properties in various friction pairings and friction tests. In some cases, the coefficient of friction in repeated tests even decreases (self-smoothing effect). Stick-slip effects are reduced.</td>
</tr>
<tr>
<td><strong>A selection of applications</strong></td>
<td>Architecture, automotive industry, aviation, defense technology, domestic appliances, electrical engineering, food industry, hunting firearms, hydraulics, information technology, mechanical engineering, medical technology, packaging machines, photo and video technology, pneumatics, sporting goods.</td>
</tr>
</tbody>
</table>
HART-COAT®
hard anodizing of aluminium alloys
The HART-COAT® process, also known as HC, is an electrolytic treatment for aluminium substrates during which a hard and thick aluminium oxide layer is formed. The essential purpose of this surface treatment is to provide protection against wear and corrosion as well as further functional improvements to components from almost all industrial sectors.

The process corresponds to ISO 100 74. HART-COAT® layers are built up by anodic oxidizing in a specially formulated, cold, acidic electrolyte. By means of electric current, a protecting aluminium oxide layer is produced on the surface of the workpiece being treated.

Compared to conventional anodized layers, HART-COAT® layers are thicker and provide better wear resistance.

HART-COAT® layers can be applied where properties like corrosion resistance, wear resistance, dimensional accuracy, anti-friction properties or insulation are required for aluminium substrates. HART-COAT® layers show a good adhesion to the base material. Nearly all wrought, cast and die-cast aluminium alloys destined for industrial use are suitable for treatment with HART-COAT®.

Wear behaviour of HART-COAT® layers compared to other materials (Taber Abrasion measurements, abrasive wheel CS 17, load 10 N).

<table>
<thead>
<tr>
<th>Suitable materials</th>
<th>HC</th>
<th>HC-CU</th>
<th>HC-GD</th>
<th>HC-GL</th>
</tr>
</thead>
<tbody>
<tr>
<td>for wrought aluminium alloys as well as sand and permanent mold cast</td>
<td>for aluminium alloys with a high copper content (2 % to 6 %)</td>
<td>for die-cast aluminium alloys with high copper and/or silicon content</td>
<td>for wrought, cast and die-cast aluminium alloys with limited copper, silicon and lead content</td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>pneumatic and hydraulic cylinders, compressor wheels, lifting gear, insulator spacers, hot-plates, screw conveyors, spacers, clamping and retaining mechanisms, cylindrical tubes, rocker arms, surgical instruments</td>
<td>guide pulleys, pistons, nozzles, valves, roller bearings, centrifuges, camera components, bearing shells, cam plates, levers, pulleys, coils</td>
<td>housings, guide cylinders, guide plates, mounting plates, clothes iron plates, damping chambers, gears and rack drives, clutch components, cylinder heads</td>
<td>for components requiring an especially smooth and wear-resistant surface</td>
</tr>
<tr>
<td>Layer properties depending on alloy</td>
<td>high wear resistance, improved corrosion resistance, improved hardness, optimum anti-friction properties, optimum adhesion, high thermal insulation, high electrical insulation, good dimensional accuracy, resistant to temperature, suitable for consumer goods, food compatible</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HART-COAT® GLATT
hard anodizing of aluminium alloys especially smooth and wear resistant
The process:
HART-COAT® or HC to be short is an hard anodic oxidation which protects aluminium materials against wear and corrosion with a hard ceramic-like layer. HC-GL is a process variant of HART-COAT® whose result is the forming of very smooth and very wear-resistant layers onto aluminium materials. HC-GL coatings are obtained through anodic oxidation in a specially formulated cooled, acid electrolyte. This type of coating has an extremely low pore volume and pore diameter compared to the protective coatings obtained with conventional anodizing processes.

The designer has to bear in mind, that the dimensions of a component only change by 1/3 of the total layer thickness.

Base materials for the HC-GL coating:
HC-GL surface coatings can be used wherever corrosion protection, wear resistance, dimensional accuracy, anti-friction properties or insulation is required for aluminium materials. HC-GL layers distinguish themselves for a good adhesion on the base material. Nearly all wrought, cast and die-cast aluminium alloys destined for industrial use are suitable for treatment with HC-GL, but the content of copper, silicon and lead has to be limited.

Color of the HC-GL layer:
The color of the HC-GL layer depends of the alloy of the base material. With pure aluminium (Al 99.5) it is golden yellow. The more alloying elements are added the more changes the colour into grey yellow.

Layer thickness and tolerances:
Typical layer thickness: 10 µm up to maximum 25 µm. Layer thickness and layer thickness tolerance depend on the alloy, bath capacity and other parameters.

Roughening:
In comparison to conventional hard anodizing, the HC-GL process stands out with respect to its very low rate of roughness, which according to the substrate used varies between $R_a = 0.1$–$0.2$ µm. The increase is less if there is considerable surface roughness to begin with.

Hardness:
The hardness of the HC-GL layer depends on the alloy and amounts at least to 400 HV0.025.

Anti-friction characteristics:
The coefficient of friction of HC-GL determined in an anti-friction test carried out with a pin-disc-tribometer had an average value of 0.73 ($F_N = 5$ N; $v = 6$ m/min; 9,000 revolutions).

Wear resistance:
Performance with regard to abrasive wear is especially good. Results of the Taber Abraser measurements can be seen in the diagram on page 6 (brief information HART-COAT®).

Electric strength:
The electric strength depends on the type of alloy and amounts to about 30 V/µm.

Surface impregnation:
Depending on the surface roughness to begin with and on the application cases an impregnation of the layer with PTFE can be useful in order to reduce friction (e.g. stick-slip effect) and wear additionally.

Corrosion resistance:
Even without sealing, the corrosion resistance of an HC-GL-treated surface is excellent. It can withstand a test period of well over 2,000 hours in the DIN EN ISO 9227 salt spray chamber test (e.g. 0–2 spots of corrosion on 25 µm HC-GL applied to EN AW-6082 (AlSi1MgMn)).

Consultation with Aalberts surface treatment:
It is recommended to make decisions on construction and material selection in consultation with Aalberts surface treatment in an early stage of the planning phase.

HART-COAT®-GL coated (25 µm) lever and knife carrier for asparagus peeling machine. The layer protects here against corrosion and provides improved cleaning and wear properties.

HART-COAT®-GL coated (25 µm) lever and knife carrier for asparagus peeling machine. The layer protects here against corrosion and provides improved cleaning and wear properties.
anodizing

functional and decorative refinement of aluminium parts
Sulphuric acid anodizing, better known as anodizing is a coating developed for the functional and decorative improvement of aluminium parts. The coating is performed in an acid electrolyte at temperatures slightly below room temperature. The parts are connected with the anode and, in the course of the treatment, the parts surface is converted into an aluminium oxide layer.

The achievable layer thickness depends on the application, the desired layer properties and other parameters. For most applications, layer thickness values range from 5 to 20 μm.

The oxide layer builds up for 1/3 on the aluminium and for 2/3 in the aluminium. This must be considered during the design phase.

Nearly all wrought, cast and die-cast aluminium alloys destined for industrial use can be anodized. However, the alloy has great influence on the color of the anodized part. An alloy out of the 3,000 series has grey color, a 7,000 alloy has more gold-like appearance.

For more information please consult your Aalberts surface treatment contact.

<table>
<thead>
<tr>
<th>Properties</th>
<th>maximum layer thickness</th>
<th>corrosion resistance</th>
<th>hardness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>up to 20 μm depending on the alloy</td>
<td>max. 2,000 hours salt spray according to DIN EN ISO 9227 (acetic acid salt-spray test)</td>
<td>up to 250 HV 0.025, depending on the alloy</td>
</tr>
</tbody>
</table>

General specifications

MIL-8625 Type II

<table>
<thead>
<tr>
<th>alloy</th>
<th>components</th>
<th>appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000 series</td>
<td>unalloyed</td>
<td>clear / colorless</td>
</tr>
<tr>
<td>2,000 series</td>
<td>alloyed with Cu</td>
<td>yellow / gold</td>
</tr>
<tr>
<td>3,000 series</td>
<td>alloyed with Mn</td>
<td>grey</td>
</tr>
<tr>
<td>5,000 series</td>
<td>alloyed with Mg</td>
<td>dark grey</td>
</tr>
<tr>
<td>6,000 series</td>
<td>alloyed with Mg and Si</td>
<td>anthracite grey</td>
</tr>
<tr>
<td>7,000 series</td>
<td>alloyed with Cu and Zn</td>
<td>gold</td>
</tr>
</tbody>
</table>

Available colors clear, black, orange; others on request
DURNI-COAT®
functional finishing of metals via electroless nickel
DURNI-COAT® nickel layers are deposited on active substrate surfaces from aqueous nickel salt solutions and hypophosphite as the reducing agent. The surfaces of complex shaped components are treated true to their original contours; sharp edges and impressions, accessible cavities and bores are uniformly coated. Through variation of electrolyte and process parameters, DURNI-COAT® layers can be tuned to suit special requirements. The composition of the electrolyte and the processing conditions are used to control the phosphorous content of the DURNI-COAT® layers. This content can be varied between 3 and 14%. Phosphor-rous concentration is an important factor for many functional properties. DURNI-COAT® layers with higher phosphorous content are as-plated X-ray amorphous. Heat treatment brings about recrystallisation with the formation of nickel phosphides. Electrical and magnetic characteristics, and other mechanical and chemical properties, can be altered in this way.

The electroless nickel-plating (DURNI-COAT®) is carried out at our facilities according to DIN EN ISO 4527.

<table>
<thead>
<tr>
<th>Characteristics of the variants</th>
<th>DNC 450</th>
<th>DNC 520</th>
<th>DNC 771</th>
<th>DNC-AL</th>
<th>PTFE-DURNI-DISP</th>
<th>SIC-DURNI-DISP</th>
</tr>
</thead>
<tbody>
<tr>
<td>especially ductile and corrosion resistant, lead-free variant: DNC 471</td>
<td>especially corrosion and wear resistant, lead-free variant: DNC 571</td>
<td>especially wear resistant, lead-free</td>
<td>for aluminium and aluminium alloys</td>
<td>dispersion layer with embedded PTFE</td>
<td>dispersion layer with embedded SiC</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>components with high corrosion and chemical loads</td>
</tr>
<tr>
<td>pump compo-ents for use with natural gas and crude oil, food handling and processing equipment, nozzles, compressors, screws, threads</td>
</tr>
<tr>
<td>mining equipment and components, metal fittings and hydraulic flaps, vehicle components</td>
</tr>
<tr>
<td>structural parts for textile machines, printing presses, packaging machines, control system technology, electronics, electrical engineering, vehicle components</td>
</tr>
<tr>
<td>structural pneumatic and hydraulic components, mould construction, control levers, door lock fittings, shafts, bearing seats, textile machine parts</td>
</tr>
<tr>
<td>brake discs, cylinder running surfaces, pistons, valve plates, structural pneumatic and hydraulic parts, feeding funnels, rollers, track rollers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suitable materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>all types of low-alloy ferritic steel, cast iron-based materials, stainless steel, non-ferrous metals such as copper, brass and bronze, aluminium alloys, sintered metal materials, other metal and ceramic-based materials (depending on previously-supplied sample coatings)</td>
</tr>
</tbody>
</table>

For the most demanding specifications also double layers (DUPLEX-DNC) can be applied, e.g. the hard, wear-resistant DNC 771 layer in combination with a DNC layer with a higher phosphorous content.
IVD aluminium-vacuum coating

high-purity aluminium layers
Ion Vapour Deposition, known as IVD or Ivadising, is a physical vacuum deposition process which is used to apply a pure aluminium coating to various substrates, to improve the resistance to atmospheric and bi-metallic corrosion. The stages within the production process are as follows: After degreasing and grit-blasting the parts to be coated are loaded into a vacuum coating chamber and a vacuum is drawn. A noble gas is then back-filled into the chamber, and an electrical charge is applied. This results in a plasma / ionic glow discharge which is clearly visible as a purple haze in the chamber, and results in a super-clean surface. Once this is complete, the coating process can begin. Aluminium wire is fed into a series of superheated ceramic crucible. A high voltage is used to create very high temperatures. The aluminium is then vapourised as an electrically charged vapour, which has an affinity to deposit on to the components, which are electrically “earthed”. Once coated in IVD aluminium, the components have a dull grey appearance. The next step is to close the pores in the outer surface of the coating by glass bead peening. The parts can be used as plated, or, more commonly, the pure aluminium surface is then converted to an aluminium chromate using a chemical conversion coating.

**Corrosion resistance of IVD aluminium vacuum coating**

The process has been developed as three different coating classes, with a class 1 coating at 25 µm minimum, offering the best corrosion resistance. The class 2 coating is often used on machined parts where tight tolerances apply, and the thickness applied is generally 13-25 µm. Finally the class 3 coatings are generally applied to fasteners and other tight tolerance and detailed components. This process has typically 8-13 µm thickness and offers the lowest corrosion resistance. Corrosion resistance can be increased by converting the surface with a chromate treatment such as Surtec or Alodine.

The benefits of this process are numerous when compared to cadmium plating. The process is run in vacuum, and uses high purity aluminium. So there is minimal impact on the environment and the operators. The coating outperforms cadmium in salt spray corrosion tests.

<table>
<thead>
<tr>
<th>Coating class</th>
<th>Coating thickness µm</th>
<th>Type I (as coated) h</th>
<th>Type II (chromate converted) h</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25 +</td>
<td>504</td>
<td>672</td>
</tr>
<tr>
<td>2</td>
<td>13-25</td>
<td>336</td>
<td>504</td>
</tr>
<tr>
<td>3</td>
<td>8-13</td>
<td>168</td>
<td>336</td>
</tr>
</tbody>
</table>

IVD coated components, with a masked internal diameter. The components have been treated with a trivalent chromate after application of IVD.

<table>
<thead>
<tr>
<th>Further properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVD aluminium vacuum coating is smooth and uniform and consists of pure aluminium.</td>
</tr>
<tr>
<td>Provides sacrificial corrosion protection to steel without the risk of hydrogen embrittlement.</td>
</tr>
<tr>
<td>Provides improved corrosion protection to high strength aluminium alloys.</td>
</tr>
<tr>
<td>Can be used in contact with aero engine fuels.</td>
</tr>
<tr>
<td>Prevents contact corrosion e.g. titanium, stainless steel parts in aluminium assemblies.</td>
</tr>
<tr>
<td>Neither the process nor the coating create toxic materials.</td>
</tr>
<tr>
<td>Corrosion resistance is at least equal to that of cadmium.</td>
</tr>
<tr>
<td>The coating can be applied within closely controlled limits.</td>
</tr>
<tr>
<td>The coating is highly conducting.</td>
</tr>
<tr>
<td>The coating can perform in service at temperatures in excess of 400 °C.</td>
</tr>
</tbody>
</table>

**Applications**

The coating is currently used in aerospace and defence applications where critical corrosion resistance with electrical conductivity is paramount or where dissimilar metal contact can cause galvanic attack.

Typical components currently processed with IVD Aluminium Vacuum Coating include engine and airframe fasteners (steel and titanium), high tensile steel airframe parts, titanium bearing shells, landing gear components and assemblies, sintered magnets and electrical connectors.
high tech galvanics

tin, silver, gold plating and nickel sulfamate
treatment of a wide range of materials
Electroplating is a process that uses an electrical current to deposit a thin metal layer on the surface of a conductive metal part. This thin metal layer is deposited from an electrolyte which contains the ions of the specific metal. Electroplating is primarily used for changing the properties, such as wear resistance, corrosion resistance, friction etc., of metal parts. Also, electroplating is used for repair of worn out parts and for the fabrication of parts.

The principles of electroplating are as follows:
In a water-based electrolyte, which contains conductive salts and ions of the to be plated metal, a metal or conductive part is connected with the negative pole (cathode) of a rectifier. At the same time, the positive pole of the rectifier (anode) is connected with sheets of metal which are of the same sort as the metal ions in the solution.

When the rectifier is turned on, a current will start to flow and will cause oxidation of the metal sheet at the anode. This oxidized metal will dissolve in the electrolyte, creating new metal ions. Simultaneously, metal ions discharge at the cathode which results in a metal deposition on the submerged part.

<table>
<thead>
<tr>
<th>main process</th>
<th>max. dimension in mm</th>
<th>max. weight in kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold</td>
<td>600 x 100 x 400</td>
<td>25</td>
</tr>
<tr>
<td>Gold/Cobalt</td>
<td>400 x 300 x 450</td>
<td>10</td>
</tr>
<tr>
<td>other processes</td>
<td>1,900 x 500 x 850</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Swivel nuts with silver plating on the inside (above)
Thread guide for textile machines with nickel sulfamate surface (below)
DURALLOY®

optimisation of friction processes through specially structured metal surfaces
DURALLOY® is a special thin dense chrome coating with a maximum of 20 µm layer thickness. The specific structured surface of the DURALLOY® layer provides outstanding chemical resistance and material hardness for applications where conventional coating systems with comparable layer thicknesses are ineffective.

Due to its specific properties, in high friction applications the structured surface of the DURALLOY® layer significantly increases the wear and corrosion resistance of the coated material.

**Properties**

DURALLOY® is an extremely hard, crack-free, precise, very thin and ultrapure metallic chrome layer. By means of a high-energy process a nodular structured surface can be deposited on all types of metals, except for magnesium and titanium. Applications for aluminium components are limited (please contact us for details).

Due to the low process temperature of under 60 °C no changes to the structure of the base material occur during plating.

This essential advantage of the process ensures shape and hardness stability for any manufactured components. DURALLOY® provides effective protection against friction and vibration corrosion and thus considerably increases the wear resistance of the material when used, for example, in gears or with shaft-hub-joints.

<table>
<thead>
<tr>
<th>Layer material</th>
<th>TDC</th>
<th>TDC-LC</th>
<th>TDC-Ag</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Chrome</td>
<td>Chrome + LC</td>
<td>Chrome + Silver</td>
</tr>
<tr>
<td>in cases of load by friction and vibration corrosion and by wear</td>
<td>in cases of pressure load (linear guides, ball bearings) or exposure to aggressive gases (roller mills, metallurgy, defense technology)</td>
<td>in cases of load by starved lubrication, dry lubrication (e.g. vacuum technology)</td>
<td></td>
</tr>
<tr>
<td>Suitable materials</td>
<td>The range of the materials that can be coated with DURALLOY® includes most of the widely used engineering metals: steels up to 62 HRc and with a chrome content of 15 %, stainless steels, grey cast iron, sintered metals and bronze. For surface treatment of each of the particular base materials specific DURALLOY® processes are available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Layer properties depending on process</td>
<td>wear protection, corrosion protection, hardness, effective lubricant reservoir, dry-running characteristics, damping features, protection against vibration corrosion, non-magnetic, not magnetisable, outstanding adhesion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Linear guide with DURALLOY® layer

Micrograph of the DURALLOY® surface.

DURALLOY® facility in Villingen-Schwenningen, Germany
galvanic zinc
functional and decorative
Zinc is the most frequently deposited metal in surface technology. It serves as corrosion protection and provides cathodic protection for the base material. This means that the steel becomes the cathode and the zinc forms a sacrificial anode and dissolves at the imperfections of the layer. Below 100°C it is brittle, in the range of 100 - 200°C it becomes soft and elastic, above 200°C it becomes brittle again.

Metal parts are effectively protected against corrosion with galvanic zinc plating. With modern, fully automatic rack and barrel systems, we meet the highest functional and optical requirements in a reproducible manner and work in accordance with all current standards and specifications. With DIN 14001, we also meet the requirements for the conservation of natural resources and the environment.

**Post-treatment processes** (Cr VI-free): blue/transparent passivation, thick-film passivation, black passivation, sealings, topcoats, lubricants for wear protection and adjustment of friction coefficients.

**Process description**

The basis for high-quality galvanizing is electrolytic-chemical pre-cleaning through degreasing and pickling. Afterwards, the coating takes place in an acidic or alkaline electrolyte before the post-treatment(s) including the drying process complete the process. In order to produce and increase corrosion protection (zinc corrosion – white rust and base metal corrosion – red rust), a precisely adapted passivation and/or sealing can be selected - depending on the requirements or area of application.

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**Zinc**

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**Galvanizing Process DIN 9227 without coating corrosion (white rust)**

<table>
<thead>
<tr>
<th>Galvanizing</th>
<th>Process</th>
<th>DIN 9227 without coating corrosion (white rust)</th>
<th>DIN 9227 without base metal corrosion (red rust)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanic zinc</td>
<td>barrel</td>
<td>8</td>
<td>48</td>
</tr>
<tr>
<td>Galvanic zinc transparent</td>
<td>rack</td>
<td>16</td>
<td>72</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>barrel</td>
<td>72</td>
<td>144</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>rack</td>
<td>120</td>
<td>192</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>barrel</td>
<td>120</td>
<td>192</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>rack</td>
<td>168</td>
<td>264</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>barrel</td>
<td>120</td>
<td>264</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>rack</td>
<td>168</td>
<td>360</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>barrel</td>
<td>120</td>
<td>264</td>
</tr>
<tr>
<td>Galvanic zinc iridescent</td>
<td>rack</td>
<td>168</td>
<td>360</td>
</tr>
</tbody>
</table>

**Service**

We find the optimal coating process for your components on the basis of an individual consultation. From the first sampling to the introduction into series production, we define the relevant work steps together with you. On request, we can also supplement our technical services with a tailor-made service for you, e.g. 100% inspections, packaging, logistics with pick-up and delivery service. We also offer composite production (e.g. duplex layers, screw locking / sealing).
galvanic zinc-nickel

functional and high corrosion protection
galvanic zinc-nickel

Galvanically deposited zinc-nickel coatings offer excellent cathodic corrosion protection for the base material. In addition, they are suitable for use at higher temperatures. The zinc-nickel alloy layer has a significantly higher hardness than pure zinc. With a nickel incorporation rate of approx. 12 to 16 % and over 400 HV the zinc-nickel alloy layer has a significantly higher hardness than pure zinc.

By applying a conversion layer, resistances of over 1,000 hours are achieved in the salt spray test according to DIN EN ISO 9227. Galvanic coating with zinc-nickel is impressive due to its good chemical and mechanical properties. With modern, fully automatic rack and barrel facilities, we meet the highest functional and optical requirements in a reproducible manner and work according to all current standards and specifications.

We also fulfil the requirements of DIN 14001 for the conservation of natural resources and the environment. Post-treatment processes (Cr VI-free):

- Transparent passivation, thick film passivation, black passivation, sealings, topcoats, lubricants for wear protection and adjustment of friction coefficients.

Process description:

The basis for a high-quality zinc-nickel coating is electrolytic-chemical pre-cleaning through degreasing and pickling. Afterwards, the coating takes place in an electrolyte before the post-treatment(s), including the drying process, complete the process. In order to further increase the corrosion protection, a precisely adapted sealing can be selected – depending on the requirements or area of application.

### galvanic zinc-nickel

| Main features | The zinc-nickel process features very high corrosion protection. The processing of steel as well as zinc die-castings is possible. With an internal anode, an extremely good layer distribution can also be achieved. Zinc-nickel coatings are also suitable for processing high-strength parts. We also offer a utility model-protected flangeable zinc-nickel (ductile).
| Applications | Automotive industry, mechanical and apparatus engineering
| Facilities | rackware: goods window 2.30 x 1.20 x 0.40m
Bulk goods: modern double barrel machine with 280 kg filling weight and 180 litres volume

<table>
<thead>
<tr>
<th>Alloy coating</th>
<th>Process</th>
<th>without coating corrosion</th>
<th>without base material corrosion depending on the Zn or Zn alloy layer thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>galvanic zinc/nickel</td>
<td>barrel</td>
<td>120</td>
<td>480</td>
</tr>
<tr>
<td>transparent passivated</td>
<td>rack</td>
<td>192</td>
<td>600</td>
</tr>
<tr>
<td>galvanic zinc/nickel</td>
<td>barrel</td>
<td>168</td>
<td>600</td>
</tr>
<tr>
<td>transparent passivated, sealed</td>
<td>rack</td>
<td>360</td>
<td>720</td>
</tr>
<tr>
<td>galvanic zinc/nickel</td>
<td>barrel</td>
<td>120</td>
<td>480</td>
</tr>
<tr>
<td>iridescent passivated</td>
<td>rack</td>
<td>192</td>
<td>600</td>
</tr>
<tr>
<td>galvanic zinc/nickel</td>
<td>barrel</td>
<td>168</td>
<td>600</td>
</tr>
<tr>
<td>iridescent passivated, sealed</td>
<td>rack</td>
<td>360</td>
<td>720</td>
</tr>
<tr>
<td>galvanic zinc/nickel</td>
<td>barrel</td>
<td>168</td>
<td>480</td>
</tr>
<tr>
<td>black passivated, sealed</td>
<td>rack</td>
<td>240</td>
<td>600</td>
</tr>
<tr>
<td>galvanic zinc/nickel</td>
<td>barrel</td>
<td>48</td>
<td>480</td>
</tr>
<tr>
<td>black passivated</td>
<td>rack</td>
<td>72</td>
<td>600</td>
</tr>
</tbody>
</table>

a) The requirement was reduced to 720 h in order to limit the costs for the tests.

Service: We find the optimal coating process for your components on the basis of an individual consultation. From the first sampling to the introduction into series production, we define the relevant work steps together with you. On request, we can also supplement our technical services with a tailor-made service for you, e.g. 100% inspections, packaging, logistics with pick-up and delivery service. We also offer composite production (e.g. duplex layers, screw locking / sealing).
GLISS-COAT®
environmentally friendly dry lubricant coating systems for all kinds of friction partners
The GLISS-COAT® brand denotes the range of dry lubricant coatings developed by Aalberts surface treatment and designed to reduce friction and surface wear of the final coating. The coating materials are water-soluble. Various methods of application are possible. The type of application method depends upon the geometry and quantity of parts to be coated, the type of liquid coating material used, e.g. single or multiple component system, and the final coating requirements.

The properties of GLISS-COAT® can be adjusted according to customer and application-specific requirements.

Most GLISS-COAT® layers must be dried after application onto the surface to achieve the required properties with regard to adhesion, hardness, corrosion protection and lubrication. During the drying process temperatures below 100 °C are generally employed. The coated parts are spread out during drying in order to ensure uniform curing.

### Characteristics of the variant

<table>
<thead>
<tr>
<th>GLISS-COAT®</th>
<th>200-W</th>
<th>200-W-60P</th>
<th>200-W-100P</th>
<th>200-W-60P-KP</th>
<th>200-W-SO3</th>
<th>CO3</th>
<th>400-W</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>water-based, solvent-free coating system (basic system)</td>
<td>various compositions which contain lubricating additions</td>
<td>black-dyed surface with anti-friction properties</td>
<td>formation of a shiny lubricant film, if subject to pressure</td>
<td>high temperature coating for anti-adhesive applications (shielding gas nozzles for welding technology), applicable up to 600 °C</td>
<td>multi-functional combination coatings: a first layer + a functional paint coat without silane compounds</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Applications (rack and barrel plated parts)

- all parts that are subjected to an abrasive load
- movable vehicle interior components, e.g. hinge pins, bearing bolts, seat adjustment components, guide plates
- rotationally symmetric components, anchors
- leaf springs
- bolts, screws, nuts
- vehicle door locks
- guide mechanisms, rollers
- slide bearings, bushes
- insert/outsert injection moulding technology
- balls
- bearings fitted to drive systems, turbines and rotors
- coil compression springs for damping systems
- seat bolting devices
- spindles, shafts
- valves, stopcocks
- roller bearings
- toothed wheels
- gear racks

### Suitable materials

Depending on the process variant all metals, light metals as well as plastics destined for industrial use can be treated. Among others, the following substrates have been successfully treated for special applications: paper, non-woven fabrics, plastic foils, metal foils, ceramics

### General layer properties

- anti-friction properties, pressure resistant, helps prevent squeaking and grinding noises
- free of heavy metals according to the EU End-of-Life Vehicle Directive

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Small parts, treated with GLISS-COAT®

Pressure springs for automotive shock absorbers, treated with GLISS-COAT® 200-W-60P
functional painting

anti-friction flock coatings, cathodic dip paintings and phosphatations
Aalberts surface treatment offers a broad range of functional painting that includes cathodic dip paintings and anti-friction flock coatings. Pre-treatments and additional finishes, such as degreasing or phosphating without a downstream painting process are also offered. Assembling of components, customized final inspections or the realisation of the packaging instructions of our customers complete the range of services.

### anti-friction flock coating

**GLISS-COAT® FLOCK**

**Description**

GLISS-COAT® FLOCK is a coating to improve the absorption of impacts and noise. For this a low-friction GLISS-COAT® adhesive is combined with polymer-fibers. GLISS-COAT® FLOCK can be applied to phosphated, anodised and blasted metal surfaces as well as to plastic.

**Applications**

- All kinds of springs, profiles, anti-friction mechanisms, guides, guide rails, blocking pins
- Partial coatings are also possible, e.g. only the outside area or only the inside area of a spring.

**Layer properties**

- Compliant surface helps with variable tolerances, prevents squeaking and grinding noises
- Improves impact absorption, anti-friction properties, improved corrosion resistance
- Elevated wear resistance

### cathodic dip painting

**Description**

Cathodic dip painting is a process during which the workpiece to be coated is negatively charged and then immersed into a paint bath with positively charged paint particles. These paint particles are attracted to the workpiece on which they deposit and form a uniform film across the whole surface. Every gap and corner is coated until the film reaches the specified layer thickness. At this layer thickness the film acts as an insulation of the part so that the electrical attraction is suppressed and the coating process is finished. Subsequent to the application of the paint layer a heat treatment (baking) is carried out at 180 to 220 °C.

**Applications**

- The automotive sector (corrosion resistance)
- General mechanical engineering (corrosion protection, also for stamped parts)
- Well suited for complex shaped parts

**Layer properties**

- Good corrosion resistance
- High impact resistance

### zinc-phosphating

Aalberts surface treatment offers rack and barrel phosphating with and without oiling according to DIN EN 12476:2001. To confirm corrosion resistance performance it is necessary to test sample coatings.

**Applications**

- Lot of applications for the automotive sector, mechanical engineering as well as for many other branches.

**Layer properties**

- Primer for subsequent paintwork
- Moderate corrosion resistance
MAGOXID-COAT® / KEPLA-COAT®
plasma chemical coatings for light metals
MAGOXID-COAT® and KEPLA-COAT® are anodic plasma chemical surface treatments with functional characteristics, which – added up – cannot be achieved with conventional electroplating. MAGOXID-COAT® can be used to apply finishes to magnesium alloys, while KEPLA-COAT® is designed for use on aluminium and titan alloys. The plasma chemical process is used to produce oxide-ceramic layers which, in addition to providing a high level of protection against wear and corrosion, also fulfill requirements regarding hardness, uniform layer formation, fatigue strength, dimensional accuracy or temperature load capacity.

**Suitable materials**
- For use with all common magnesium alloys
- Virtually any magnesium-based material suitable for industrial use
- Suitable for almost all wrought, cast and die-cast aluminium alloys
- For use with all common aluminium- or titan-based materials

**Application**
- Bobbins, clutch components, conveyor guide rails, cylinder tubes, driving gears, housings, levers, packaging moulds, piston valves, pulleys, rollers, sealing units
- Aviation and space sector, fine precision screw threads, heating radiators, optical components, vacuum technology
- Bracket devices, cylinders and drums, cylindrical tubes, fixing discs, housings, rotors, running wheels, sealing gaskets
- Aviation and space sector, fine precision screw threads, heating radiators, optical components, vacuum technology

**Properties**
- MAGOXID-COAT® and KEPLA-COAT® are electrolytic processes which make use of an external power source. The workpiece being processed takes on the function of the anode. The surface of the material is transformed into the corresponding oxides. The electrolytes used are saline solutions. Anodizing takes place, as the plasma is discharged in the electrolyte, on the surface of the workpiece, being processed. The effect of the oxygen plasma produced in the electrolyte on the metal surface causes partial short-term surface melting and a bonded oxide ceramic-metal compound forms on the workpiece. Due to an increase in volume, 50 % of the produced oxide layer grows outwards. Edges, cavities and relief designs are coated uniformly. In other words, there is no edge build-up that occurs in conventional electroplating processes.

**Layer properties depending on alloy**
- High wear resistance, excellent corrosion resistance, outstanding hardness, high thermal insulation, excellent fatigue strength, good dimensional accuracy, high absorption, low reflection, good chemical resistance
MagnaCoat®
thick-film systems with high chemical resistance
MagnaCoat®

Components in contact with products in the chemical industry such as filter funnels, reactor vessels and pipelines can be coated with MagnaCoat®, a thick-film system based on fluorinated polymers, as an alternative to the costly use of alloys such as Hastelloy or enamelling. Other machine parts or baths, e.g. in the electroplating or semiconductor industry, are also suitable for Magna-Coat® coating. Magna-Coat® is a high-quality fluorinated thermoplastic with good thermal, chemical and dielectric properties. Magna-Coat® can be applied electrostatically and is thermally melted. The layer thickness is 0.3 to 0.5 mm, depending on the heat capacity of the parts to be coated. The mechanical strength of the coating permits subsequent processing, e.g. by grinding. In this way, exact dimensional tolerances can also be achieved.

With MagnaCoat® coatings, Aalberts surface treatment offers thick-film polymer coatings and fluoropolymer coatings with an almost pore-free surface. This makes the surfaces resistant to diffusion. The combination of good non-stick properties, abrasion resistance and excellent corrosion protection make Magna-Coat® thick-film systems ideal solutions for applications under chemically aggressive conditions.

---

<table>
<thead>
<tr>
<th>Applications</th>
<th>MagnaCoat® is suitable for heavy corrosion protection. Typical parts in the chemical industry are storage vessels, reaction vessels, fittings, agitators or measuring probes. Can also be used for dryer or calender rolls.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coatable base materials</td>
<td>various metals, stainless steel, grey cast iron</td>
</tr>
<tr>
<td>Pre-treatment</td>
<td>degassing, sandblasting, degreasing, primer if necessary, powder coating or spraying</td>
</tr>
<tr>
<td>Characteristics</td>
<td>excellent chemical resistance, diffusion resistant, high temperature resistance and wear resistance, non-stick properties, easy cleaning, high layer build-up</td>
</tr>
</tbody>
</table>
| Performance characteristics | Layer thickness: 100 µm - 1.5 mm  
Temperature resistance: -40 ºC bis 290 ºC  
Roughness Rq: up to 1.5 µm  
Foodstuffs approval: partial  
Diffusion resistance: very good  
Bending strength: very good, up to 4 mm radius without spalling  
Chemical resistance: very good |
| Service | We find the optimal coating process for your components based on an individual consultation. From the first sampling to the introduction into series production, we define the relevant production steps together with you. On request, we can also supplement our technical services with a logistics concept tailored to your needs, including pick-up and delivery services. |

Corrosion protection – basket with ball (MagnaCoat® layer)  
Insulation coating Rilsan for medical instruments  
Motor housing with MagnaCoat® coating
TempCoat®
fluoropolymer coatings
TempCoat®

Many manufacturing processes involving metal surfaces in contact with the product would be very difficult to resolve in a satisfactory way, even with highly refined metal surfaces. Only the use of special fluoropolymers produces hydrophobic surfaces with very low surface tension, which effectively prevents the adhesion of various substances such as adhesives, rubber and plastic materials or foodstuffs. The non-stick effect is further increased by reducing the surface contact area through targeted modification of the surface structure with defined roughness profiles. The surfaces modified in this way are indispensable in a wide variety of industries and applications such as printing, baking, the chemical industry and even high-class frying pans. The Aalberts surface treatment solution is called TempCoat®.

The efficient and trouble-free processing and handling of metals, plastics, paper and foodstuffs in various production processes is no longer conceivable without the excellent anti-friction properties of product-contacting surfaces. Fluorinated polymers are indispensable as coating materials for such applications due to their low friction coefficients for static and sliding friction. The typical minimal difference between the two values offers the great advantage of reducing the stick-slip effect in reciprocating motion.

The TempCoat® fluoropolymer coatings offer outstanding non-stick properties, anti-friction properties or high chemical resistance. Combinations of different properties are also possible. Both the use of special additives, such as graphite or molybdenum disulphide, and the multilayer structure including reinforcing layers, make it possible to adapt the layers specifically to the desired application. For example, multilayer, wear-resistant, anti-adhesion systems improve demoulding processes or the excellent dry lubrication properties of anti-friction systems protect sliding components from failure.

**Applications**
- folding shoes, casting tools, laminating tools, glue tanks, ball valves, gear wheels

**Coatable base materials**
- Aluminium, steel, stainless steel, ceramics, copper (limited), plastics, cast iron, glass

**Pre-treatment**
- degassing, sandblasting, degreasing

**Characteristics**
- excellent non-stick properties, easy cleaning, high chemical corrosion protection, good non-stick and anti-friction properties, suitable for foodstuffs

**Performance-characteristics**
- **Layer thickness**: 7 µm - 1.5 mm
- **Friction coefficient** (stat.) up to 0.09 (against mild steel)
- **Roughness**: Ra up to 1.0 µm
- **Foodstuffs approval**: partial

**Service**
- We find the optimal coating process for your components based on an individual consultation. From the first sampling to the introduction into series production, we define the relevant production steps together with you. On request, we can also supplement our technical services with a logistics concept tailored to your needs, including pick-up and delivery services.

---

Volume flaps with TempCoat® as corrosion protection

TempCoat® gives excellent nonstick properties and good chemical resistance to a funnel. Through such funnels flow sticky liquid substances, which are processed e.g. in the food-industry or in the plastic and rubber industry.
FlexiColor®
decorative powder coatings
for highest requirements
FlexiColor®

The metallic surfaces of a large number of components, housings and covers must be protected from corrosion and weather influences and they must also be impact and scratch resistant. There are also requirements for the optical appearance and the tactile feel. This spectrum of characteristics is provided to electrically conductive surfaces through powder coating. In powder coating, an electrically conductive material is coated with powder paint. Electrically charged particles of the coating powder and the workpiece to be coated attract each other. The powder is electrically charged via an electrode in the spray gun. The workpiece is earthed so that an electric field is formed between the material and the gun, transporting the powder particles to the surface of the material. The subsequent thermal treatment of the coated materials at 160 - 200°C causes the powder particles to form a smooth, uniform surface. The powder coatings used are based on polyamide, epoxy or polyester resins and offer good protection against scratches, impacts, corrosion and weathering. Powder coatings are available in almost all RAL colours as well as in different variations of gloss and structure and can also be used for decorative purposes. Aalberts surface treatment offers the environmentally friendly FlexiColor® process as a solution.

In order to ensure optimum adhesion of the powder coating to metallic substrates as well as very good corrosion protection, even for damaged paint surfaces, Aalberts surface treatment uses modern zirconium-based conversion coatings.

### FlexiColor®

<table>
<thead>
<tr>
<th>Applications</th>
<th>car bicycle carrier, devapor housing, vehicle trim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coatable base materials</td>
<td>most metals and almost all electrically conductive materials</td>
</tr>
<tr>
<td>Pre-treatment</td>
<td>degreasing, pickling, passivating</td>
</tr>
<tr>
<td>Characteristics</td>
<td>high corrosion protection, excellent optics, antibacterial structural coating for medical use, excellent chemical resistance, impact resistance</td>
</tr>
<tr>
<td>Performance characteristics</td>
<td><strong>Layer thickness:</strong> 35-600 µm, <strong>Temperature resistance:</strong> -40 °C to 160 °C, depending on coating type</td>
</tr>
<tr>
<td>Service</td>
<td>We find the optimal coating process for your components based on an individual consultation. From the first sampling to the introduction into series production, we define the relevant production steps together with you. On request, we can also supplement our technical services with a logistics concept tailored to your needs, including pick-up and delivery services.</td>
</tr>
</tbody>
</table>

Covers for gas distribution with powder coating

Powder coating: Application of powder paint in the spray booth
screw locking and thread sealing
screw locking and thread sealing

We are specialists for high-quality functional metal finishing and high-quality pre- and post-processing of thread pre-coating. Thanks to our many years of expertise in the fields of screw locking, thread sealing, loss protection and lubricant coating, we are able to implement your requirements even for difficult materials and properties.

<table>
<thead>
<tr>
<th>process</th>
<th>microencapsulated adhesive</th>
<th>permanently elastic sealing coating</th>
<th>polyamide spot coating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applications</td>
<td>The micro-encapsulated pre-coating is a permanent screw lock to maintain the pre-tension force during frequent load changes. In addition, the permanent safeguard also acts as a seal and complies with DIN 267 Part 27.</td>
<td>A permanently elastic thread seal with a dry surface and high sealing effect against almost all media. Coating is carried out according to customer specification or according to DIN 267 part 27.</td>
<td>Spot-coating is a plastic spot with many properties: loss protection, reduction of loosening torque, adjustment protection with subsequent adjustability. The coating complies with DIN 267 Part 28.</td>
</tr>
<tr>
<td>Adhesives</td>
<td>360° coating, Loctite Dri-Loc®, Precote®, 3M ScotchGrip</td>
<td>360° coating, Loctite Dri-Seal®, Vibra-Seal®, Precote®</td>
<td>90°-120° angle coating, Loctite Dri-Loc-Plastic®, PPA 571, polyolefin</td>
</tr>
<tr>
<td>Coatable base materials</td>
<td>threaded parts of almost any kind, screws from MS to M20, customer-specific special parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre- and post-treatment Characteristics</td>
<td>degreasing and cleaning, corrosion protection, lubricant coating (Torque’N’Tension, OKS, Gleitmo etc.)</td>
<td>Excellent chemical resistance, diffusion resistant, high temperature resistance and wear resistance, non-stick properties, easy cleaning, high layer build-up</td>
<td></td>
</tr>
<tr>
<td>Performance characteristics</td>
<td>Standard: DIN 267 part 27 + 28 or according to customer specification</td>
<td>Shelf life: up to 4 years</td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>We find the optimal coating process for your components based on an individual consultation. From the first sampling to the introduction into series production, we define the relevant production steps together with you. On request, we can also supplement our technical services with a logistics concept tailored to your needs, including pick-up and delivery services.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LASOX-COAT®
selective oxidation of aluminium surfaces via laser technology
The LASOX-COAT® process in comparison to other laser processes for material treatment.

### Suitable materials

In principle, all aluminium alloys can be coated.

For alloys containing silicon (Si >8 %) the hardness can be increased by about 50 % compared to the hardness of the original alloy. Also, aluminium alloys with silicon contents above 20 % can be coated with LASOX-COAT®. Furthermore, die cast alloys become harder due to the surface treatment. Silicon particles in the base material actually support the development of a thicker although slightly rougher layer.

### Duration of coating

proportional to the coating area, pilot plant 40 seconds for 1 cm², standard coatings 3 seconds for 1 cm²

### Roughness

in laser tracking direction $R_a$ of 1 μm, perpendicular to laser tracking direction more than double (depending on the alloy)

### Duration of interaction (laser beam with surface)

ca. 0.005 seconds

### Layer thickness

Corundum layer approximately 6 to 10 μm, remelt area about 100 μm. On die-casting alloys corundum layers of >20 μm are possible but the roughness increases to $R_a$ >10 μm.

### Hardness of the aluminium oxide

c.a. 2,000 HV

### Application

Housing edges, pump impellers, laser labeling and laser lettering, pneumatic valves, proportional valves, brake pistons, hydraulic and pneumatic sliders

### Benefits

Partial wear protection, corrosion protection, production of labels, patterns, shapes and lines; no use of process chemicals
SELGA-COAT®
selective galvanic coatings of aluminium alloys in self-contained tools
SELGA-COAT® is a further developed Aalberts surface treatment technology for the selective coating of parts made of aluminium-based wrought, cast and die-cast alloys. Precisely defined surface areas are coated with masking taking place in self-contained tools.

With the partial hard anodizing of aluminium-based alloys, the part being coated acts as an anode. The electrolyte circulates in high speed cycles with high current density between anode and cathode. The use of high-speed electrolytes in conjunction with reactors tailored to components produces coatings with markedly improved characteristics in comparison to conventionally produced coatings. These improvements include better covering capacity, increased hardness, a more regular microstructure, vastly improved levelling properties and far cleaner surface quality. In general no further machining of the coated surface areas is required.

Application
SELGA-COAT® surface treatments have proved themselves many times over for the partial coating of vehicle parts, among others:
- hydraulic power steering pumps
- engine pistons (diesel, otto)
- plates for stop & start systems
- pump housings (power steering)
- valve body assembly
- valve housings for electronic stability control (ESC)
- heat exchangers for exhaust gas recirculation systems
- aluminium plates for automatic transmissions

We plan and realise manual and automatic plant systems to individual requirements.

Characteristics of the SELGA-COAT® process
Hard anodizing of aluminium alloys:
- increased corrosion and wear resistance
- layer hardness between 300 and 500 HV
- electrical insulation
- rapid layer build-up, e.g. 12 µm in less than 1 min
- thickness tolerances ±2 µm
- lower roughness compared to conventional processes

Our plant systems are solid, component-specific and self-contained. They can be integrated into existing mechanical production lines without difficulty. The advantages of this complete integration of surface treatment into the manufacturing process are short processing, simple logistics, low emissions and a high level of operational and process reliability.

All SELGA-COAT® plant systems work on the closed circuit principle. As coatings are applied selectively, only minimal amounts of electrolyte are lost thus maintaining the consumption of electrolyte at highly cost-effective levels.

Services:
- development and design
- job shop
- production process-integrated plant systems for SELGA-COAT®
FuseCoat®
diffusion galvanizing (sheradizing)
for highest corrosion protection requirements
FuseCoat®

Zinc diffusion coating (sherardizing) is a modern corrosion protection process of the highest quality. In the coating process, the workpiece is exposed to a “zinc atmosphere” in a slowly rotating, closed chamber at temperatures between 350°C and 450°C and, in a diffusion process, is coated with a close-contour zinc layer, whereby the zinc penetrates into the steel surface. The diffusion bond between zinc and the ferrous carrier material in combination with a suitable conversion layer (Cr(III)-passivation) ensures excellent long-term corrosion protection.

FuseCoat®
Applications corrosion protection in the automotive industry and construction industry, railway vehicle elements, fastening elements, offshore products, sheet metal parts, stamped parts, clamps, caps
Coatable base materials unalloyed carbon steels, low-alloy steels, heat-treated steels, high-strength steels, sintered materials, grey cast iron, cast iron
Pre-treatment degreasing, degassing, blasting
Characteristics high corrosion resistance, very high mechanical strength, salt water resistance, impact strength
Performance characteristics Process: Diffusion galvanizing (sherardizing) + Cr(III) passivation + TopCoat, sealing, cathodic dip painting or powder coating
Layer thickness: 15-100 µm, uniform even with complex geometries
min. size: 30x30x30 mm
Unit weight: 10-20 g to 40 kg
Cathodic corrosion protection: 1000 h (with Topcoat 2000 h) according to DIN EN ISO 9227

No hydrogen embrittlement - high hardness, impact-resistant, temperature-resistant, ductile
Service We find the optimal coating process for your components based on an individual consultation. From the first sampling to the introduction into series production, we define the relevant production steps together with you. On request, we can also supplement our technical services with a logistics concept tailored to your needs, including pick-up and delivery services.
PlasmaCoat®
metallic coatings and combination coatings for the highest requirements
PlasmaCoat®

The safe and trouble-free handling of materials or sheet products made of plastics, textiles or paper requires transport rollers and other components with wear-resistant traction surfaces, which must also have non-stick and conductivity properties, depending on the application. Aalberts surface treatment offers a variety of perfect coatings with the PlasmaCoat® process. These are applied by thermal spraying. PlasmaCoat® combines the extreme surface hardness and excellent wear protection of thermally sprayed metal or ceramic coatings with the non-stick and anti-friction properties of fluorinated polymers as a matrix. The adjustment of different roughnesses and profiles leads to the desired traction properties.

With PlasmaCoat®, high-quality metal coatings and ceramic coatings are produced by thermal spraying. The highest surface hardness improves wear protection and extends the life cycle of mechanically highly stressed components. In addition, excellent non-stick properties or extremely wear-resistant sliding properties can be achieved with a topcoat. PlasmaCoat® coatings can be applied to almost all metallic materials and also to CFRP materials. PlasmaCoat® can also replace hard chrome coatings when mechanically reworked.

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| Applications | sealing and sliding seats of motor rotors, gear shafts and pinion shafts, bearing bores, running surfaces of piston rods, sealing strips, seats of axles and shafts, valve spindles, roller surfaces, shaft protection sleeves, gears, pins, cylinders and cylinder liners, etc. |
| Coatable base materials | Aluminium, steel, stainless steel, cast iron, brass, copper, aluminized steel |
| Pre-treatment | degassing, sandblasting, degreasing |
| Characteristics | excellent non-stick properties with high wear resistance and traction (round or sharp-edged structure) |
| Performance characteristics | Layer thickness: 80-300 µm  
Abrasion resistance: very good  
Hardness (scratch resistance): 28-70 HRC  
Bending strength: good, radius 6 mm without cracking |
| Service | We find the optimal coating process for your components based on an individual consultation. From the first sampling to the introduction into series production, we define the relevant production steps together with you. On request, we can also supplement our technical services with a logistics concept tailored to your needs, including pick-up and delivery services. |
thermal spraying
In thermal spraying, a coating material in the form of wire or powder is melted or fused and accelerated onto the component to be coated. Before coating takes place, the surface is cleaned and roughened by blasting with corundum. The roughness of the surface enables mechanical bonding of the spray particles and ensures the adhesion of the coating.

Depending on the type of coating and the application, the usual coating thicknesses for thermal spraying are between one tenth and several mm.

The coatings are suitable both for the protection and functionality of new parts as well as the repair of worn components.

<table>
<thead>
<tr>
<th>Coating materials</th>
<th>Coating materials in thermal spraying are metals, alloys, hard metals or ceramics. Thermal spraying is superior to many other coating processes due to the large selection of materials for the targeted adjustment of functional properties. Common coating materials are: • metals and alloys: Aluminium, copper and nickel alloys, molybdenum, bronze, white metal, chromium and chromium-nickel steels; nickel and cobalt-based hard alloys • hard metals: Tungsten and chromium carbide in metal matrix of nickel, cobalt or chromium • oxide ceramics: Oxides of aluminium, chrome, titanium and zirconium</th>
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</thead>
<tbody>
<tr>
<td>Process</td>
<td>Thermal spraying processes differ in the form of the spray material and in the type of thermal and kinetic energy used to melt and accelerate the spray particles. The coating properties, such as wear and corrosion resistance, hardness or adhesion, are determined not only by the coating material but also by the spraying process. The procedures we employ are: • powder and wire flame spraying • flame spraying and melting • high velocity flame spraying • plasma spraying • arc spraying</td>
</tr>
<tr>
<td>Applications</td>
<td>Thermal spray applications include wear and corrosion protection, electrical and thermal insulation or conductivity, and the generation of certain friction and sliding properties. Examples are: • plain bearing and sealing seats of turbine and compressor rotors • bearing and coupling seats of drive shafts • piston rods and cylinder running surfaces of compressors • bearing bores of pedestal bearings, gear housings or gear wheels • erosion and corrosion protection of turbomachinery components • fan blades and conveyor elements</td>
</tr>
<tr>
<td>Service</td>
<td>Our services in connection with coating: • pre-machining and finishing of coated components • complete preparation of components • restoration of geometry and function of damaged components • quality assurance coating and component testing • technical advice on coating selection and design • application-oriented coating development</td>
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</table>
SILA-COAT® 5000
powerful sealings of aluminium alloys surfaces
SILA-COAT® 5000 is carried out in a three-step process:
1. Pre-treatment, suited to the aluminium material;
2. Conversion treatment;
3. Sealing using an electrophoretically applied
   liquid paint.

The corrosion resistance will be improved and particu-
larly the alkali resistance increases considerably. The
regularly formed network structure of the paint system
provides for a sealing and a levelling of the surface.

Improvement of alkali resistance compared to HART-COAT®
layers. Via the chronoamperometric method (measurement at
rest potential) it can be determined after which time the cor-
rrosion attack starts. In this case the measurement was performed
in a 3 % aqueous sodium hydroxide solution.

Benefits
• excellent alkali resistance
  (following ASTM D 1647)
• high corrosion protection
• levelling of surface
  (e.g. from Ra=1.28 µm to Ra=0.27 µm)
• high dielectric strength
• food compatibility according to FDA
  regulations
• no cytotoxicity according to ISO 10 993-5
  (biocompatibility)
• uniform layer formation
• thickness of the paint layer 25 ±5 µm

Applications
SILA-COAT® 5000 is especially well-suited for applications in the following
industrial sectors:
• Food processing industry
• Medical engineering
• Mechanical engineering
• Plant and systems engineering
• Packaging industry
• Automotive industry
zinc flake coating
corrosion protection for fasteners, structural and chassis parts
zinc flake coating

Originally conceived as an environmentally friendly chromium VI-free electroplating alternative, zinc flake corrosion protection has established itself not only in the automotive sector due to its wide range of applications. Zinc flake coatings enable safe corrosion protection, e.g. for high-strength steels, without hydrogen-induced stress cracks occurring.

Constant friction coefficients, dimensional accuracy and colour choice are, along with the highest corrosion protection requirements, additional outstanding properties of zinc flake coatings.

| Applications | automotive industry, construction and agricultural machinery, fastening elements, brake parts, chassis components, springs, threaded parts, aviation, punched parts, offshore wind plants |
| Coatable base materials | hardened steel, spring steel, high-strength steel, zinc die-casting |
| Pre-treatment | optional: degreasing, blasting, phosphating |
| Characteristics | long-term corrosion protection, very thin layer thicknesses, integrated lubricant additives, stable friction coefficients even with multiple screw connections, no hydrogen-induced stress corrosion cracking, very high corrosion protection depending on requirements >1500 h, silver or black surfaces, no distortion from high heat treatment temperatures, topcoats for high-strength aluminium compounds, protection against contact corrosion. |
| Performance characteristics | **Outstanding corrosion protection** under cyclic loading, **No red rust** >1,000 h salt spray test (DIN EN ISO 9227), **Barrier protection**: delayed red and white rust and contact corrosion, **Resistance to chemicals**: resistant to acids, alkalis, cleaning agents, oils, petrol and organic solvents |
| Layer thickness: | 6-25 µm (depending on requirements) |
| Topcoats for duplex coatings and non-ferrous metals | Temperature resistance: 180-300°C depending on the product |
| Process temperatures: | from air drying to thermal curing |
| Friction coefficients: | according to requirement |
| Color: | silver, black, (others on request) |
| Service | We find the optimal coating process for your components based on an individual consultation. From the first sampling to the introduction into series production, we define the relevant production steps together with you. On request, we can also supplement our technical services with a logistics concept tailored to your needs, including pick-up and delivery services. |
| Zinc flake application method: | bulk material (dip-spin), rack dip-spinner (rack-spin) and spray application (full automatized) |
### Processes

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