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1. Portfolio Anodisation
Examples for anodised Aluminium Surfaces
### 2. Overview System Finish Surfaces

System Finish Surfaces (Status 01/2017) – Anodisation is marked in Red

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<th>Basic</th>
<th>Performance</th>
<th>Decor</th>
<th>Premium</th>
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</thead>
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<tr>
<td></td>
<td>Cost</td>
<td>Costs</td>
<td>Costs</td>
<td>Costs</td>
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<tr>
<td><strong>PowColor</strong> (Powder)</td>
<td>Facade Quality</td>
<td>Pre-anodisation with powder coating</td>
<td>RAL DM</td>
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<td>Top 5 Metallics</td>
<td>AnoLine in SD (AL Anolok / SanLine / Inox Optic)</td>
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<td>MetallicLine in SD</td>
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<td>RAL FS</td>
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<tr>
<td></td>
<td>RAL FS Metallic</td>
<td>Powder Coating</td>
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</tr>
<tr>
<td><strong>AnColor</strong> (Anodisation)</td>
<td>Nature toned Anodisation (E6/C0)</td>
<td>Structural Glasing (SG Anodisation)</td>
<td>Color Anodisation with/without mechanical Pre-treatment (E1 to E5, C31 to C35)</td>
<td>INOX Optic (Stainless Steel Optic)</td>
</tr>
<tr>
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<td>Blasting Pre-treatment Chem. Gloss (E7)</td>
<td>Silver &amp; Gold (EV2 - EV4) / S315</td>
<td>SANDALOR</td>
</tr>
<tr>
<td><strong>WetColor</strong> (Liquid Paint)</td>
<td>HDP</td>
<td>Duraflon</td>
<td>Trend Colors</td>
<td>Skincoat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Iron Oxide Colors AnoLine DF</td>
<td>PVDF</td>
</tr>
</tbody>
</table>

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**Notes:**
- Anodisation is marked in Red.
- See the full list of options for each category in the system documentation.
3. Requirements for the Anodisation of Aluminium
Influences of Alloy and Material

Anodisation of Aluminium:

Schüco is using the alloys AW 6060 or 6063 for profiles; for sheet material AW 5005. These alloys are suitable for anodisation.

Customer-owned material must be ordered and checked by the customer suitable for the anodisation process.

The mechanical pre-treatment of Aluminium sheets is technically possible, but requires beside a suitable Aluminium alloy also special technical equipment. Schüco does not offer the mechanical pre-treatment of Aluminium sheets.

Remarks:

Anodisation as a Schüco als Schüco System Finish service is limited to Aluminium as a suitable alloy and for the application architecture.

Customer-owned materials based on different metals (e.g. Steel, Zinc, Cupper, Titanium) or other Aluminium based alloys are not suitable for this process.

Required sheets for Schüco profile orders involving mechanical pre-treatment followed by anodisation will be anodised only because the sheets can not be mechanical treated. This difference will be visible.
3. Requirements for the Anodisation of Aluminium
EURAS Requirements and Norms

The anodisation process (also called in German „Eloxierung“) is performed based on the current version of DIN 17611.
The table contains the from Schüco offered surface pre-treatments E1 to E6 including comments for the limits.
According to DIN 17611, the anodisation is performed to create an oxide layer of ca. 20 µm for the usage case architecture with normal emissions from surroundings, industry and traffic. Anodisation according to British Standard (BS) with 25 µm oxide layer is possible upon specific order.

Anodising partners are member of Qualanod and work according to EURAS/EWAA.

<table>
<thead>
<tr>
<th>Symbol (DIN 16711)</th>
<th>Pre-treatment</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>E0</td>
<td>Degreasing and deoxidation</td>
<td>Mechanical surface blemishes, e.g. marks and scratches, remain visible.</td>
</tr>
<tr>
<td>E1</td>
<td>Grinding</td>
<td>Uniform, dull matt surface. Existing surface blemishes are largely removed, although ghost lines may remain visible.</td>
</tr>
<tr>
<td>E2</td>
<td>Brushing</td>
<td>Uniform, shiny surface with visible brush marks. Surface blemishes are only partly removed.</td>
</tr>
<tr>
<td>E3</td>
<td>Polishing</td>
<td>Shiny, polished surface. Surface blemishes are only partly removed.</td>
</tr>
<tr>
<td>E4</td>
<td>Grinding and brushing</td>
<td>Uniform, shiny surface. Mechanical surface blemishes are removed.</td>
</tr>
<tr>
<td>E5</td>
<td>Grinding and polishing</td>
<td>Smooth, shiny surface. Mechanical surface blemishes are removed.</td>
</tr>
<tr>
<td>E6</td>
<td>Etching</td>
<td>Silk matt or matt surface. Mechanical surface blemishes are evened out, but not removed.</td>
</tr>
<tr>
<td>E7</td>
<td>Chemical Brightening</td>
<td>After degreasing the surface in a vapour degreaser or a non-corrosive cleaner, the surface is given a very bright finish by treatment with special chemical or electrochemical brightening processes. Surface defects are only slightly reduced and corrosion effects may become visible.</td>
</tr>
</tbody>
</table>
4. Chemical Pre-treatment
Pre-treatments E0 and E6

**EURAS E0 – non-decorative Anodisation**

This pre-treatment should not be used for visible architectural part. E0 suitable only for non-visible supporting structures as corrosion protection: The surface is only de-oiled and deoxidised – surface defects are still visible and will be even more noticeable. Areas of corrosion will not be removed.

**EURAS E6 – Chemically etched**

This treatment is the most often requested one: After de-oiling and deoxidation, the surface is etched by chemicals (= light metal removal), thereby defects (e. g. scratches, texture stripes) are reduced but not completely removed (this is only possible via mechanical pre-treatment).

![E0 Example of Corrosion](image)

![E6 Example](image)
5. Mechanical Pre-treatment

Pre-treatment E1 to E5

Mechanical Pre-treatments E1 bis E5

E1 to E5 are time-requiring and expensive, because these steps must be done by hand or with special equipment. The usability of profiles, e.g. the accessibility of the main viewing sides for the grinding, brushing and/or polishing step, must be checked via the profile drawings by the anodised partner prior to the Schüco confirmation. Non-mechanically accessible profiles can only be treated via E6 followed by coloration. This difference is optically visible. The capacity is limited both in volume as well as in profile dimensions, because only a few companies still offer this service and base on their equipment.
5. Mechanical Pre-treatment

Comparison E1 – E5

Mechanically pre-treated anodised surfaces will show an “individuality“ due to the treatment by hand and due to the usage of finisher-specific equipment (as fine texture of the resulting pre-treated & anodised surface) – orders should therefore not be given to different finish companies and samples should be checked and agreed on. By ordering via Schüco will Schüco provide this service.

The implied orientation of the profile surface due to the pre-treatment & the anodising step results in different optical impressions upon change of orientation of the profile (horizontal to vertical)– this is not a defect but the result of the requested and ordered pre-treatment.

Mechanical pre-treated Surfaces
No colour but texture representation!
Structure of C0 (Nature) with the pre-treatments E1, E2, E3, E5 und E6 (left to right)
In contrast to powder or liquid paint coating, anodisation is performed in aqueous media without much temperature via an electrochemical reaction:

\[ 2 \text{Al} + 6 \text{OH}^- \rightarrow \text{Al}_2\text{O}_3 + 3 \text{H}_2\text{O} + 6\text{e}^- \]

In a sequence of bath the required steps, chemical pre-treatment, anodising, if required with coloration and the sealing of the created $\text{Al}_2\text{O}_3$ cells.

Top: Scheme of the created $\text{Al}_2\text{O}_3$-Zellen (Source: BWB / CH).
Below: Bath Sequence Plant (photo Schüco / KOE)
6. The Anodisation Process
Pictures from the E6 Process – Chemical Etching

Top: Etching; Below: Rinsing

Top: Anodisation; Unten: Sealing
7. Anodisation Standard Colours
Standard Colours EURAS C0 (Nature) and Bronze Colours EURAS C31 to C35

Standard colours are produced in a 2-step method in the anodisation process:

During the first step, the Al₂O₃ cell is formed - for the EURAS C0 (Nature) colour, the cells remain empty and a matt, metallic impression results.
For the Bronze colours EURAS C31 to C35, there will be an increasing amount of Tin oxide precipitated within the Al₂O₃ cell resulting in the colorations Light Bronze to Black.

During the sealing step, the Al₂O₃ cell will be closed and the resulting surface becomes weathering-stable.
8. Special Anodisation I: Colours EV2 to EV4

AnColor Decore Colours: New Silver (EV2), Light Gold (EV3) and Gold (EV4)

This process is absorptive, e.g. the $\text{Al}_2\text{O}_3$ cells are filled with the water-based pigmentation followed by sealing. The enclosed pigmentation causes the colour impression:

- New Silver (EV2 as E6 pre-treatment)
- Light Gold (EV3 as E6 pre-treatment)
- Gold or Brass (EV4 as E6 pre-treatment)

These colours are often used for renovations because these classical colours have been used in the past much more than today. Combinations of such colours with mechanical pre-treatments (E1 to E5) are possible but must be checked for a suitable finish partner.
9. Special Anodisation II: INOX Optic
AnColor Premium Colours Classic and Plus

INOX Optic (stainless steel optic) is offered in two different – due to mechanical pre-treatment and coloration – different choices:

Classic coloration similar to EURAS C31/C32 with a fine brushing similar to E5, glossy.

Plus coloration between EURAS C0/C31 with a fairly coarse brushing similar E1, matt.

INOX Optic Plus (top) and Classic (below)
Only Representation of mechanical Pre-treatment!
10. Special Anodisation III: SG (Structural Glazing)
AnColor Performance Anodised Profiles for SG Usage

After the SG process, glass sheets will be glued with special adhesives to special Aluminium profiles. Those profiles will carry via the adhesive the weight of the glass elements.

Due to this usage, the SG anodisation is specially defined and controlled within the EU via the ETAG 002. Schüco is the only system provider with EU approval according to ETAG 002 for SG anodisation in den approved colours (Stand 03.09):
- E6/C0 (Nature)
- E6/C31 – C35 (Bronze colours)

Untreated SG profiles (without SG anodisation) can only be sampled up to a length of 3 lm due to this approval.

Hotel Westin, Warsaw, Poland
11. Special Anodisation IV: Sandalor®
AnColor Premium Coloured Anodisation

Sandalor® represents a protected tradename by Interoxid AG.

The Sandalor® process combines the advantages of anodised Aluminium Oxide layers with a broad colour selection. The metallic Character of the Aluminium remains intact. Coloration and metallic impression results in the beauty and exclusivity of Sandalor®.

For profiles and sheets Aluminium alloys in anodising quality are required. Sheets must be out of one production of one supplier. For larger projects each batch should have similar alloy and production parameters.
12. Special Anodisation V: Blasting and chemical Brightening

AnColor Premium Coloured Anodisation

- **Blasting** is a method for cleaning and structuring of surfaces applied in a variety of industries for different materials. This method applied on Aluminum profiles intended for architectural application results in a uniform optic with a broken texture from the blasting material. This surface is then protected by an anodisation layer.

- **Chemical Brightening** (Qualanod E7) is a chemical process (in contrast to the polishing process (E3)), which results in a brightened surface protected by the formed anodisation layer. This process is currently limited to profile length of 3.7 m for technical reasons. Insulated profiles without foam can be used in this process.

Samples Blasting: S/C0 (left) and S/C33 (right) after anodisation (Pictures Schüco).

Samples Chemical Brightening: E7/C31 (left) and E7/C35 (right) after Anodisation (Pictures Schüco).
13. Special Anodisation VI: Object Solutions Anodisation

Object Solutions Anodisation are agreed customer / Schüco unique tailor-made combinations of mechanical pre-treatments of the Aluminium surface combined with the coloration of the build-up anodisation layer based on approved Qualanod processes.

This solution offer is volume depended and requires the communication & agreement between involved architects / planers with Schüco for the development and approval of unique special surfaces within the AnColor (Anodisation) process group. The usability of the intended profiles, customer owned material as well as price and delivery time must be checked and agreed.

Samples of available colorations for object anodisation solutions (Pics. Schüco)

Unique surface finishes will result by combination with mechanical pretreatments
12. Limitations for anodised Surfaces

Stability and Protection Function

**Stability of anodised Surfaces**

The build-up Al₂O₃ layer as an ceramic material is quite hard (250 to 450 HV (Vickers)) and protects (limited by the softness of the Aluminium (50 to 70 HV)) the surface.

This layer has no electric conductivity.

The Al₂O₃ layer is chemically amphoteric, e.g. this layer is dissolved (= destroyed) by both acids and bases. This irreversible destruction is achieved by even short contact times with weak organic acids or spray mortar. The resulting removal of the Al₂O₃ layer removes the intended protection and can only be repaired by part exchange. As protection measure, protection foiling during work at the building site is recommended.

**Protection function of anodised Surfaces**

Anodised Surfaces are protected against Filiform corrosion (corrosion form based on the interaction of Aluminium – Chloride) due to the special structure of the Al₂O₃ layer, specifically the extent of adhesion of this layer to the metallic Aluminium.

If these anodised surfaces are cleaned periodically by expert companies, these surface will have a long life and protection time without larger optical changes.
12. Limitations for anodised Surfaces

Limits of anodised Surfaces

**Destruction of Protection layer** – Interaction of basic or acidic materials upon the created $\text{Al}_2\text{O}_3$ layer.

**Texture Stripes** – technically unavoidable depending on the profile geometry and only removable, if at all, by mechanical pre-treatment.

For prolonged interactions with destructive emissions or in production areas, anodised surfaces are not suitable – Schüco will inform upon request regarding alternatives.

(Photos: Schüco)
13. Contact Details

For additional information and support for the presented products, please contact the Service Centre Finish (SCV)

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