QUALITY CONTROL ANODIZED ALUMINIUM

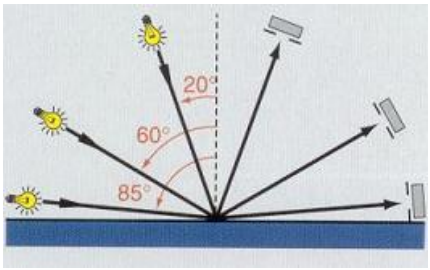
Gloss measurement

The measurement of gloss is important in projects where a lot of anodised sheets are mounted together (e.g. Facades).

The gloss value is mainly determined by the substrate, and our process can adjust this value only within a certain range and with approved substrates.

Measurement principle:

- The measurement is done by the reflection of light. Light will fall on the metal under a certain angle (20°, 60° or 85° parallel with the rolling direction) and the reflected light will be measured. The gloss is expressed in gloss units.
- With Coil's continuous anodising process, measurement angles of 20°, 60° or 85° are used.
- *The gloss is measured with a Multigloss 268 measurement device according to the ISO 7688 Norm.*



Anodic layer thickness

The anodic layer thickness is measured with an isoscope (EN ISO 2360), based on the principle of Eddy Currents. These currents are created through electromagnetic induction. When an alternating current (AC) is applied to a conductor, a magnetic field is developed in and around this conductor.

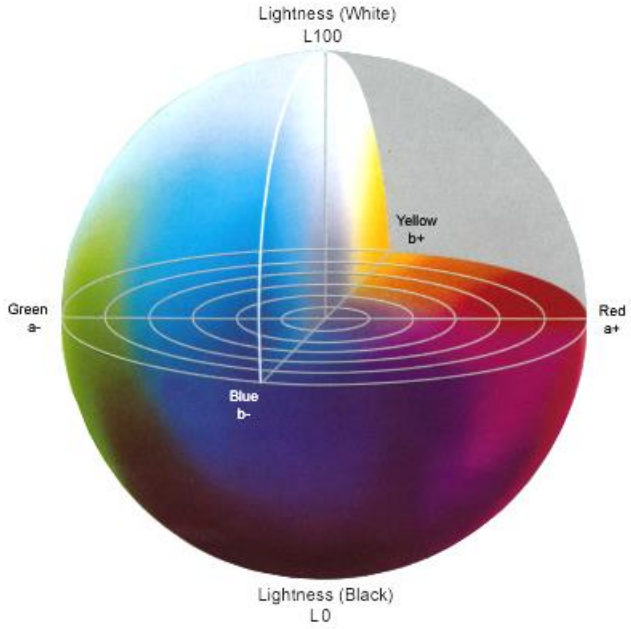
- When another conductor is brought into the proximity of this magnetic field, a current will be induced in this conductor.
- To measure the anodic layer thickness (which is non-conductive) a conductor is used to setup an alternating magnetic field at the surface of the instrument's probe.
- If the probe is brought near a conductive surface (the aluminium substrate), the alternating magnetic field will setup eddy currents on it. The distance of the probe from the substrate affects the magnitude of the Eddy Currents. This distance is the thickness of the non-conductive anodic layer thickness.

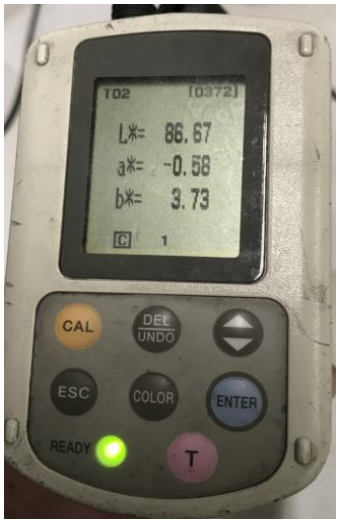
The nominal anodic layer thickness will be the minimum anodic layer thickness.

Color measurement

- A color can be expressed in a 3-dimensional system, based on 3 axes :
  - L*-axis : black – white
  - a*-axis : green – red
  - b*-axis : blue – yellow

- The colour is measured with a Minolta CR-400 measurement device, according to the CIE-L*a*b* system, with following technical properties:
  - C-Xenon lamp
  - Temperature: 6774 Kelvin
  - Colour deviation expressed by distance: Delta E ($\Delta E^2 = \Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2}$)





Sealing

The sealing quality is very important as a good sealing will determine various characteristics of the anodic layer such as:

- abrasion resistance
- anti-fingerprint behavior
- hardness
- corrosion resistance
- non-fading of the color
- light stability

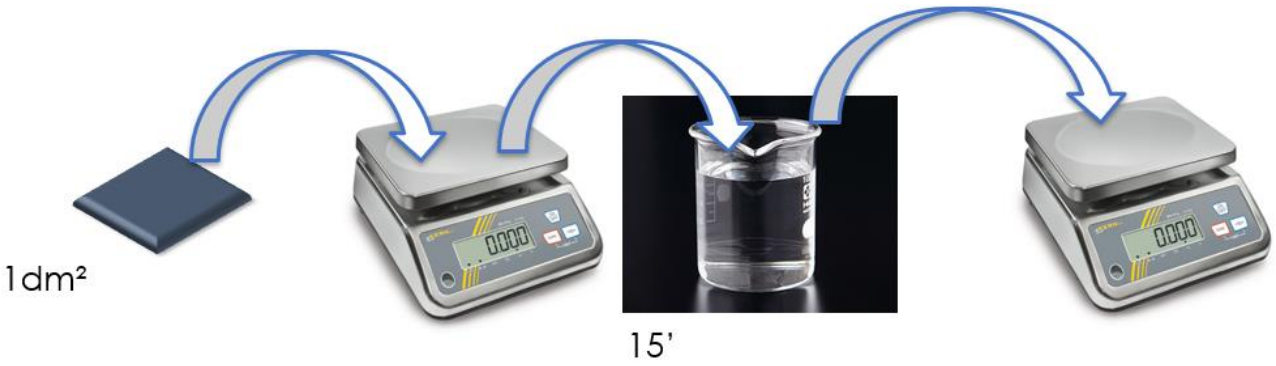
Mass loss test

The sealing quality will be expressed by a mass loss test in accordance with the standard ISO3210.

- With this test, a test piece of 1 dm² will be immersed in an aqueous phosphoric acid / chromic acid solution for 15 minutes.
- This solution will dissolve any unsealed anodic layer. This will result in a loss of weight and the well-sealed anodic layer will be left.
- The bare aluminium will not be attacked as the Cr6+ will passivate the aluminium.
- The test piece will be weight before and after the immersion. The loss of mass is calculated and will be expressed in mg/dm2.

Guarantee for General purpose and architectural applications

C-Bond; C-Bond Brush C-Bond Brite; C-Iconic	C-Wall; C-Brush; C-Brite C-Deco;	C-Flex	C-Tech	Qualanod
15 mg/dm²	20 mg/dm²	25 mg/dm²	30 mg/dm²	30 mg/dm²



Dye spot test

The sealing quality can also be expressed by the dye spot test, in accordance with standard ISO 2143.

- Information on the sealing quality will be given by testing the resistance of the anodic layer to the absorption of dyes.
- A drop of a specified acid solution will attack the test surface. After that the test surface will be washed and dried.
- Consecutively, a drop of a specified dye is allowed on the same spot. After washing and slightly whiting the surface with a light abrasive, the test area is examined to assess the intensity of the stain.
- The intensity will be compared with a standard, and the loss of absorptive power is expressed as a numerical value : an excellent sealing quality will result into a loss of absorptive power whilst a poor sealing quality will not have a loss in absorptive power.

Continuity of the anodic layer

The continuity of the anodic layer is evaluated with a Copper Sulfate Test in accordance with Standard ISO2085.

Measurement principle:

- Drops of copper sulfate reagent are put on surface areas of about 100 mm².
- If the area includes points where the metal is bare or poorly covered by an anodic layer, a chemical deposition of copper takes place on the aluminium, accompanied by a release of gas (H2).
- After the test, black and / or dark reddish spots can be seen where the coating is not continuous.

Corrosion resistance of continuously anodised aluminium

Bare aluminium will spontaneously react with water or moist air and the result will be an aluminium oxide layer. This oxide layer acts as a protective barrier.

This natural oxide may quickly deteriorate and different forms of corrosion attacks will be possible.

Anodising will replace the thin natural oxide layer by a structured, highly resistant layer.

Accelerated corrosion tests have been executed to assess the performance of pre-anodised aluminium. Since these have been done in the lab as a simulation of different environments, experience out of daily life and use has been gathered in our building inspection report.

Detailed reports regarding the accelerated corrosion tests or on the building inspection report can be obtained upon request.

Neutral salt spray test

- According to standard ISO9227.
- The corrosion resistance will be evaluated in a NaCl environment, which simulates marine environments.
- Samples with anodic layers of 10 and 15 microns have been exposed to this environment during 1000 hours. Afterwards pitting corrosion, as a result of the attack, is made visible and an assesment is made which can be done on 2 ways :

- The pitting density and sizes are compared with figures, the so called Chart Method in accordance with standard ISO 8993.
- Grids of 5 mm squares have been made and the number of squares with at least 1 pit is counted, the so called Grid Method in accordance with standard ISO8994.

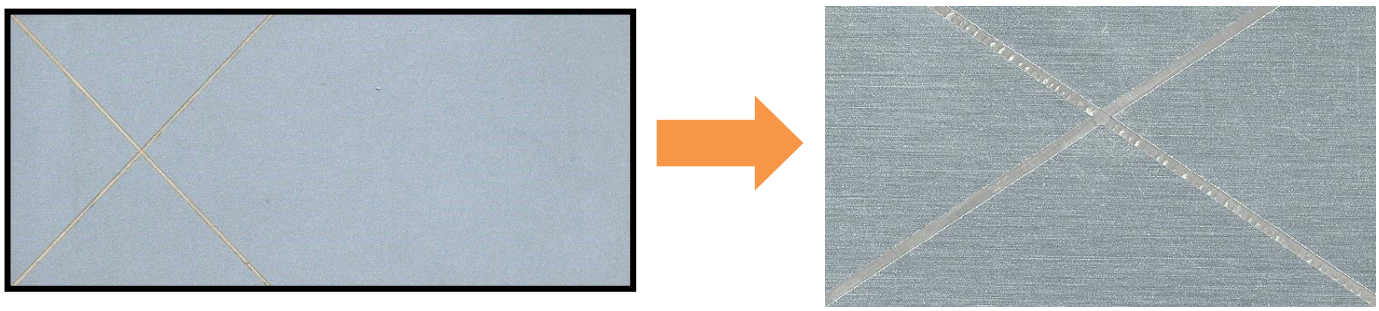
- Conclusion of the test :
  - No corrosion attack
  - No filiform corrosion on bent, deformed or machined parts of the samples
  - No filiform corrosion on flat parts of the samples
    - COIL guarantees the absence of filiform corrosion for C-Wall, C-Flex and C-Bond (regardless of surface finish being matt, brushed or brite)

Kesternich test

- According to standard ISO6988.
- The corrosion resistance will be evaluated in a sulphur dioxide environment which is representative for an industrial environment.
- The test consists out of a cyclic wetting and drying whereas 1 cycle consists out of :
  - 8 hours exposure to a SO2 atmosphere (100% RH at 40°C)
  - 16 hours exposure to an ambient atmosphere (70% RH at 23°C)
- Testing during 42 cycles
- Evaluation in accordance with standard ISO10289 :
  - Evaluation of the ability to protect the substrate from corrosion
  - Evaluation of the ability to retain the integrity
- Conclusion of the test :
  - Good corrosion protection

Weather resistance

- Evaluation of the resistance of anodised aluminium against exposure to humid atmospheric conditions at elevated temperatures.
- Tropical test in accordance with ISO 6270-2:
  - Samples in a climatic chamber (100%RH and 40°C)
  - Evaluation for traces of corrosion and changes in appearance after 200h, 450h, 650h and 1000h.
- Conclusion of the test :
  - Excellent protection
  - Corrosion is initiated in the carved cross, but does not propagate outside these carvings.



Building inspection report

A study has been executed on different buildings, with service lives even more than 30 years, by an independent engineering group.

Summary of the study :

- Not any trace of erosion of the anodic layer.
- The anodic layer thickness remained unchanged to their initial thickness.
- No deterioration due to adhesion, failures, blooming, peeling, blistering, cracking, …
- None of the clear or bronze anodised surfaces has been subject to color fading, color shifting or yellowing.

Certifications

Coil is certified ISO 9001:2015.

Certificate of Compliance

For Architectural Applications, a Certificate of Compliance may be requested. This Certificate provides you with supplementary measurements, documented and certified.