Anodizing

Anodizing is one of the most widespread methods of surface treatment for aluminum workpieces. The anodizing procedure specifically oxidizes the surface of the part with electrolytes – the top layer is converted into the stable oxide compound Al2O3. By varying the process parameters, layers from 5 to 25 µm can be created in addition to organic, inorganic, or electrolytic dyeing.

The surface treatment takes place in an electrolysis bath, where the workpiece serves as the anode and the sulfur or oxalic acid filling acts as the cathode. Direct current is generally used for a weak current flow between the two electrodes. The resulting material ions produce electrochemical corrosion on the aluminum surface, and the atomic oxygen released in this way reacts with the metallic aluminum to form a hard oxide layer.

Anodizing is primarily used to give aluminum workpieces better corrosion resistance. By adding dyes to the Al2O3 layer, anodizing can also be used to apply permanent color coding
to parts or improve their appearance – for example with a black finish.

Chrome plating

Chrome layers with thicknesses between 8 and 10 µm serve decorative purposes and are offered by Inocon as glossy or matt chrome plating.

Electroplating is used to apply the coating. Chromium ions are supplied by an aqueous solution with a chromic acid base.

Combined layers are generally required, with chromium always forming the top layer. For example, Inocon uses a two-layer chrome-plating procedure with nickel as the first layer and chromium as the top layer.
The three-layer procedure is also used, in which first copper, then nickel, and finally chromium are deposited.

Electropolishing

This electrochemical method reduces surface roughness and removes impurities, micro-cracks, and texture defects on parts made of stainless steel varieties. The workpiece is placed in a bath of material-specific electrolytes, where it acts as the anode, from which a thin metallic layer is removed when a direct current is applied.

Electropolishing acts at the micrometer scale and removes pronounced rough spots, with increased removal at edges, making electropolishing suitable for fine deburring as well. The process is considered gentle on texture since it involves no thermal or mechanical loads.

In addition to decorative applications, electropolished elements are also used in the chemical and food industries, container construction and medical technology.

Powder coating

Powder coating generally refers to the electrostatic version of the process in which the powder, consisting of pigmented thermoplastic or reactive binders of epoxy, polyester or polyacrylate resins, is applied to the workpiece.

Inside the spray nozzle, the powder acquires a negative electrostatic charge and flows along the field lines to the grounded workpiece, even reaching the back side. The electrostatic charge reduces the overspray and ensures that the powder adheres to the workpiece until it has time to thermally fuse with it.

This last step is what produces the actual closed and homogeneous layer, with a thickness ranging between 80 and 160 µm. Depending on the powder type, the layers can withstand high stresses, are weather- and corrosion-resistant and can be created in a wide range of color tones. Powder coating is a commonly used method as it is easily automated and efficient. Black coatings are most commonly applied.

In a long-term salt spray test as per DIN EN ISO 9227 NSS:2017-07 conducted by an independent testing laboratory, it was shown that powder-coated aluminum parts are extremely corrosion-resistant: even after 504 hours, no corrosive alterations were discernible on the standard part.

This exceeds even the target time for the highest resistance class C5 as per DIN 55633:2009-04 by an impressive 24 hours.

Test report 20190122:

Test time	Result
240 h	No visible changes
360 h	No visible changes
504 h	No visible changes

Performed by the Institut für Galvano- und Oberflächentechnik Solingen GmbH & Co. KG on March 27, 2019

Shot blasting

Shot blasting is a method for surface finishing that removes impurities, microcavities, and burrs. Ball-shaped, stainless steel blasting material in a troughed blasting unit is accelerated by a throwing wheel to impact the part surface with high kinetic energy.

The resulting deformation in the top layer of the part results in higher strength and prevents the formation of corrosion areas. The treatment produces a homogeneous, slightly rough and matt surface.

Zinc plating

This collective term applies to various methods for applying pure zinc coatings to steel. In all cases, the goal is to protect the substrate from corrosion for as long as possible.

The most commonly used zinc-plating method at Inocon uses a bath containing an electrolyte that connects the workpiece functioning as the cathode to an anode of pure zinc.

Depending on the process parameters, the layers deposited in this way range between 2.5 and 25 µm. The method, which is standardized in DIN 50979, is primarily suited for lending corrosion protection to small parts.

The zinc present on the surface can also be subjected to corroding reactions itself, depending on the ambient conditions, which is why it is additionally protected against zinc corrosion (white rust) in a subsequent passivation step.

In addition, treatment with suitable solutions free of chromium VI creates a chromate layer that significantly improves the corrosion resistance of the zinc coating. Dyes can also be applied during this process step. Blueish or black transparent colors are encountered most frequently.