Hard Anodizing

Common Names: Hard Anodizing, Hard Coat, Type III

Applicable Specifications: Federal Specification Mil-A-8625

Description: When aluminum (or other "reactive metals) are made anodic in an aqueous electrolytic cell, an oxide coating forms. This electrolytic process is known as anodizing. The development of this process has resulted in many applications for which un-anodized aluminum would be unsuitable. Increased corrosion resistance, excellent wear and abrasion properties, and a limited range of decorative finishes are but a few of the advantages realized by hard anodizing. The surface roughness may also slightly increase as a result of the thicker anodic coating.

The nature of the oxide film is controlled by the anodizing electrolyte and the temperature of the electrolyte. Hard anodize is done at a low temperature where the oxide coating is not as soluble in the anodizing electrolyte. A higher voltage is also used. Therefore, the oxide coating grows to a greater thickness and is harder than standard (Type II) anodize. The coating formed will be extremely hard, non-porous, and non-conductive. At Palmetto Plating Co., Inc., we use the conventional sulfuric process. While Hard Anodize can be dyed, it is not recommended as the dying process reduces the hardness of the anodic coating and the color will be different from standard anodized parts. Hard Coat is commonly known as Type III anodize.

Function & Physical Finish: The basic reaction in an anodizing process is the conversion of the aluminum surface to aluminum oxide. This aluminum oxide coating can vary from 0.0002" to 0.004" in thickness and is hard, dense, and dielectric. After Anodizing, coatings are given a final seal operation. For maximum corrosion resistance, the potassium dichromate sealing process should be specified (this produces a slight yellow-green color). Anodizing will increase corrosion resistance, increase paint adhesion, improve decorative appearance, provide electrical insulation, and increase abrasion resistance.

The hard anodize is a gray-silver color, and depth of color is dependent upon the specific alloy.

Examples of Use: Medical equipment and components, food equipment, cooking utensils, automotive trim, electrical equipment, textile machinery, aircraft components.

Considerations & Limitations:

- Base Material: Aluminum, aluminum alloys. Die casting alloys can be anodized but may have significant differences in appearance and performance of the coating due to the natural porosity and differences in the composition at the surface of the cast material.
- Shape of parts: Can be used on virtually any shaped parts. Sharp edges are strongly not recommended as the integrity of the coating at sharp surface transitions will not be good.
- Size: Parts up to 5½ feet by 28 inches by 17 inches. Maximum weight 500 lbs.
- Quantity: Although quantity affects price, quantity is not a limiting factor. Price is determined by how many parts can be process in an hour.
- Thickness of Finish: Varies from 0.0002" to 0.004".
- Masking: Can be used to protect critical machined dimensions, but adds significantly to the cost per unit.
- Heat Treatment: Generally has no effect prior to anodizing.
- Method of Processing: Parts must be racked with a solid electrical contact. If this is a concern, contact points should be specified.
- Pre-Treatment: Parts must be clean and free from oil, grease and tape residue. Parts must be "chemically" clean prior to anodizing. Normal processing includes a non-etch cleaner, caustic etch, and de-smut/de-oxidizer. Use of abrasive blasting or mechanical finishing is sometimes used to obtain a particular surface finish. It should be noted that anodizing will amplify the visibility of any minor variations in the surface preparation.
- Post Treatment: After anodizing, parts are sealed to enhance and protect the surface from absorption of contaminants.
- Packaging: ***Parts are repacked as received***. It is often necessary to wrap parts with paper to prevent scratching. This will be done at the customer's request.

Quality Control Process solutions are checked and analyzed following an established schedule and monitored using SPC techniques. Thickness testing can be done at the customer's request. Salt Spray testing for non-standard alloys (e.g. 7075) (and for coating weight) can be done by submitting samples to an outside laboratory. This is done for an extra charge at the customer's request. We routinely submit samples for Salt Spray for 2024 and 6061 alloys.