

		Intranet Library -Technical Information- -surface technology-		Technical Product Management	
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Use	internal / external				

Hard - Anodizing (Guidelines for direct current method)

Mainly guideline values, list is only a recommendation which is not binding.
 We also recommend preparing test samples before final application.

Processing steps	G.AL C170R, G.AL C190R, G.AL C210R, G.AL C210E, G.AL C210 DYNAMIC, G.AL C250, G.AL C250GS, G.AL C250 ELOX ^{PLUS} , G.AL C330R, G.AL C330, G.AL C330 DYNAMIC		Rolled / Forged Plates
Degreasing	Best in hot steam. Dip-degreasing in alkaline cleaner: Concentration max 6% Duration in degreasing bath: max. 5 minutes Temperature: 70 – 80°C		Dip-degreasing in alkaline cleaner: Concentration approx. 40%, Duration in degreasing bath: 5 – 15 minutes Temperature: 70 – 90°C
Etching (alkaline Al-etchant)	None <u>only in exceptional cases</u> alkaline Al-etchant Duration max. 10 - 12 sec. Temperature: 60 – 70°C		Always alkaline Al-etchant Duration: 30 – 120 sec. Temperature: 60 – 90°C
Rinsing	two-stage rinsing		two-stage rinsing
Pickling	in a solution of: - 15% NaHSO ₄ - 12% H ₂ SO ₄ Duration: 20 – 30 seconds Temperature: 15 – 20°C		AlCu - Alloys: 50% HNO ₃ – solution, Duration 6 - 20 seconds Temperature 15 – 25°C AlSi - Alloys: 2,5% HF(hydrofluoric)– solution Duration 6 - 20 seconds Temperature 15 – 25°C AlCuSi - Alloys: 50% HNO ₃ –solution, + 2,5% HF Duration 6 - 20 seconds Temperature 15 – 25°C
Rinsing	two-stage rinsing		two-stage rinsing
Electrolytic Oxidation	Acid sulphur	10 – 15 %	10 – 20 %
	Aluminium sulphate	2 – 8 g/l	10 – 25 g/l
	Temperature	-5 to +2° C	-5 to +5° C
	Voltage	60 – 65 V	60 – 80 V
	Current density	3 A /dm ²	2 – 6 A/dm ²
	Layer build-up	approx. 1 µm/min	approx.. 2 – 3 µm/min
	pH – value	<1	<1
	Electrolyte stirring	oil-free com-pressed air	oil-free compressed air
Rinsing	two-stage rinsing		two-stage rinsing

Processing steps	G.AL C170R, G.AL C190R, G.AL C210R, G.AL C210E, G.AL C210 DYNAMIC, G.AL C250, G.AL C250GS, G.AL C250 ELOX ^{PLUS} , G.AL C330R, G.AL C330, G.AL C330 DYNAMIC	Rolled / Forged Plates
Repressing	<p>in repressing solution: Temp.: 90 – 100° C Timing: 3 minutes/1µm layer thickness</p> <p>in hot water: only with de-ionised water Temp.: 90 – 100° C Timing: 3 minutes/1µm layer thickness</p>	<p>in repressing solution: Temp.: 90 – 100° C Timing: 3 minutes/1µm layer thickness</p> <p>in hot water: preferable with de-ionised water Temp.: 90 – 100° C Timing: 3 minutes/1µm layer thickness</p>
Rinsing only when used repressing solution	two-stage rinsing	two-stage rinsing
Rinsing only when used repressing solution	one-stage rinsing, only with de-ionsied water	one-stage rinsing, preferable with de-ionsied water
Drying	Stream of hot air	Stream of hot air

Basic information

Materials of different alloys are not allowed to be used in the same bath.

Durability

Hard-anodized aluminium is resistant to neutral chemical substances (pH 5-8).

The hard-anodic generated layer is very resistant and also stays stable even in an acid or light alkaline environment on short term use, in case that the layer thickness is sufficient and the process has been well performed.

In outdoor weather, anodized aluminium shows good wear resistance in case provided that the cleaning process had been properly performed. (Alkaline cleaner will destroy the oxide layer in a long time run).

Coating thickness

The required thickness in hard-anodized parts depends on its application and the chemical and mechanical strains of the application. The coating layer builds up 1/2 into the material and 1/2 on top of the material.

Recommended coating thickness according to application (empirical formula):

Indoor & dry	approx. 40 – 50 µm
Wet areas	approx. 50 – 60 µm
Mechanical stressed components	approx. 50 – 70 µm
Aggressive environment	approx. 60 – 100 µm

Note:

The inside of slots and drilling holes might show a thinner coating thickness than the surface of the plate.

Roughness of the hard anodized oxide layer

The roughness increases dramatically with Al alloys with a Cu content >2%.

Gliding abilities of the hard anodized layer

For improving the sliding property and corrosion resistance, the hard-anodized layer can be impregnated in a PTFE - bath. This operation takes place after dipping the components.

Construction feature

The columnar form of the hard anodized layer can be the reason for chipped of parts on sharp edges of the component. Edges always have to be rounded otherwise parts will chip off and the correct function of the device cannot be guaranteed.

Rule of thumb:

Layer thickness	=	Radius
25 µm	=	R 1.6 mm
50 µm	=	R 2.4 mm
75 µm	=	R 3.2 mm

Minimum instruction/information for the galvanization

Material	Alloy (e.g. AW 5754 or AlMg3)
Degreasing	only in cast plates: "degreasing with superheated steam" or dip bath concentration max. 6%
Contact points	e.g. in threats or clamps
Pre-treatment	e.g. etching
Colour	e.g. natural or black
Coating thickness	e.g. 50 µm

Important for a good result:

Contacting:

During the anodizing process a big attention has to be paid on solid contacts. Not sufficiently solid contact always leads to erroneous surfaces (blotchiness, fluctuating layer thickness, partial melting of the base material).

Different alloys:

In principle, only components with the same / similar electrical conductivity can be anodized in one bath. Deviates the electrical conductivity between two components from each other about 15-20%, it may cause electrical discharges in the bath. Is a component hit from such a discharge, at this point no anodic layer structure is possible. Especially after black anodizing the material will show white dots.

Why should G.AL - (cast) aluminum plates are not etched?

The raw material for aluminum rolling and casting plates are ingots of Al-alloys (e.g. EN AW 5083). Special features of each aluminum wrought alloy are chemical depositions at the grain boundaries of the structure, which are considerably less noble than the rest of the structure. A rolling ingot gets reshaped (rolled), and these chemical depositions get comminuted and laminated into the structure.

With cast plates, these excretions are "free" to the grain structure. During the etching these base components are strongly affected and removed. This creates a rough, unsightly and stained surface. It is often misunderstood but not true that etching of cast plates uncovers or opens pores.

