

General Information

Aluminium is the general term for ultrapure and pure aluminium. Aluminium corrosion resistance can be excellent due to a thin surface layer of aluminium oxide that forms when the metal is exposed to air, effectively preventing further oxidation. The layer thickness is 0.05µm, and it looks dull, silvery grey. At pH=4 to pH=9, this protective oxide layer is highly corrosion resistant. Aluminium is the most abundant metal in the earth's crust, and its melting point is 660.4°C. It is a relatively light, soft and stringy material which is increasingly used in the manufacturing industry to make lighter vehicles to help with fuel savings.

The production of aluminium is very energy-intensive: 13 to 17.8 kWh of electrical energy are required in the electrolysis to produce one kilogram of aluminium. When alloyed with magnesium, silicon and other metals, the properties of aluminium alloy are comparable with those of steel. Aluminium should not be in direct contact with other metal parts such as steel, as it will form contact corrosion.

Caution is advised when condensation is present. Condensation results from a temperature difference between ambient air and the component to be coated. Before the application of coatings or other materials, the object should be kept at room temperature. For example, if a component in the open air at low temperatures is brought into a heated area/spray booth, a film of moisture is formed on the metal surface which is barely visible to the eyes. However, this thin layer will jeopardise the adhesion of any coating.

Remedy: store or place components in a heated building at max. 70°C relative air humidity overnight, for 12-16 hours. Another possibility is to bring the cold object into the spray booth before painting and heat it to 40-50°C for 2-3 hours, depending on the thickness of the material.

Different aluminium surface treatments:

Pure Aluminium:	Surface is not treated; however, a thin oil coat is always to be expected.
Anodised Aluminium:	Anodizing (electrolytic oxidation of aluminium) is an artificial enhancement of the anodic oxide layer. Suitable solutions (e.g. sulphuric or chromic acid) are treated electrolytically and decomposed by an electric current. A 5-25µm layer of oxide is formed on the aluminium anode surface. This produces a hardness of between 200-400 HV (Vickers-hardness). After anodizing the aluminium can be dried, immersed in a hot coloured solvent and then purged.
Chromated Aluminium:	In this chemical method the aluminium surface is formed by the action of chromic acid complex chromium, hydrochloric acid, which will etch the base material. The dissolved metal ions move into the chromate layer. Chromate coatings have a thickness from 0.05 to 1.5µm and they rank among passivated protective layers. Depending on the kind of chromate process, different colours are used.
Coated Aluminium:	Varnish, paint powder coated.

Substrate: Aluminium

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When aluminium is to be coated an assessment of the surface and substrate before further processing and treatment of the substrate is of great importance:

Testing of	Method	Distinguishing marks
Oily surface	Press on absorbent paper (Time about 1-2 minutes)	Paper becomes transparent from oil
Metal blank aluminium	Scratch test with a coin or knife back	Coin runs at low pressure leave scratches
Anodised aluminium (anodic oxidised aluminium)	Scratch test with a coin or knife back	Coin runs at low pressure leave no scratches
Chemically treated aluminium	Scratch test with a coin or knife back	Coin runs at low pressure leave scratches
Chromated aluminium	Visible	Transparent coloured layer
Lacquered aluminium	Visible Test with solvent	Transparent or colour coating swells and can be peeled off.

Pre-treatment before coating of aluminium

When grinding an aluminium object, a highly explosive dust is created. Therefore, only appropriate tools and equipment with anti-static properties should be used, in compliance with EU directives. At the same time make sure that there is adequate ventilation and that personal protective equipment is worn. To avoid contact corrosion and possible later adhesion issues, use only proper and certified grinding media and grinding tools when processing any aluminium objects.

The appearance of the coating and the smoothness of the film surface are closely related to the state of the substrate. No direct lacquer or primer can effectively cover up poor surface conditions (e.g. deep sanding marks, coarse blasting structure), if a smoother finish is desired, the primer coating must be sanded to the desired surface finish.

Mechanical:	
Caution:	Wear gloves when working with aluminium!
Cleaning:	Degrease with a correct Valspar final degreaser/cleaner and wipe dry with a clean cloth.
Sanding - hard aluminium: (sanding Filler back)	Sand areas with P150 grinding machine, alternative: red (fine) scuff pad
Sanding - hard aluminium: (paint DTM or Primer wet/wet)	Sand areas with P240 grinding machine, alternative: grey (extra fine) scuff pad
Sanding - soft aluminium: (sanding Filler back)	Sand areas with P240 grinding machine, alternative: grey (extra fine) scuff pad
Sanding - soft aluminium: (paint DTM or Primer wet/wet)	Sand areas with P240 grinding machine, alternative: grey (extra fine) scuff pad

Anodized aluminium	This hard coating must be completely removed by suitable blasting or grinding systems before any painting system is used.
Corroded aluminium	White rust is visible and must be removed by a suitable blasting or sanding system (P150 – P240).
Aluminium profiles	Joins, rivets and corrugations can be worked with rotary grinders. Suitable grinders are stainless steel brushes, brass brushes and korfex brushes. Rivets must not be damaged during grinding (tensile strength).
Blasting	Select suitable abrasive blasting systems for aluminium, e.g. glass bead, dry ice blasting etc. (do not use abrasives containing iron).
Sanding dust to be aspirated or extracted	After the grinding/sanding work, the grinding residue must be thoroughly extracted with a vacuum cleaner (observe explosion protection) or removed with compressed air.
Cleaning:	Thorough cleaning with slow universal thinner or suitable degreaser and a clean white cloth. Repeat this process until the cloth is no longer turns black.
Painting:	Recoating must be executed without any undue delay (within 60-90 minutes), otherwise through exposure to the atmosphere, the aluminium surface will develop a non-contacting surface layer with poor adhesive properties. Depending on the requirements and expected demands on the coating, direct lacquers or primers with topcoat can be applied (Epoxy, Polyurethane or wash-primers).

Note:

Coating work must not be executed below 8°C, e.g. paint work in the open air. Ideal conditions for adhesion and high quality coatings are at room temperatures of 18°C and up. Do not apply any paint to objects which are subject to the influence of moisture, rain, fog or condensation. Before applying paint to any old coatings, it is recommended that you perform an adhesion test by cross-cutting & a solvent test to check the integrity of the old coating.

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