SurTec® 650
chromitAL® TCP

Properties

- hexavalent chromium free passivation for aluminium
- suitable as post-treatment of anodic coatings [1)]
- suitable as conversion coating of magnesium [1)]
- liquid concentrate, based on trivalent chromium
- excellent bare corrosion protection comparable to hexavalent passivations
- also works on alloyed and casted aluminium
- suitable as pretreatment before lacquering, powder coating and gluing and approved by GSB and QUALICOAT
- easy to handle in immersion, spray and wipe application
- produces an iridescent, faintly blue to tan and visible layer
- complies with LN 9368-3 ID-number 1108
- meets or exceeds MIL-DTL-81706B and MIL-DTL-5541F for bare corrosion (336 h in NSS per ASTM B-117, respectively, DIN EN ISO 9227)
- low contact resistance: < 5000 µOhm per square inch per MIL-DTL-81706B
- heat resistant inorganic passivation layer (see “hints”)
- applied for US-patent: 6,375,726; 6,511,532; 6,521,029; 6,527,841
- IMDS-number: 30429267

[1)] for detailed information please refer to the explicit information sheets

Application

SurTec 650 chromitAL® can be used in immersion, spray and wipe application.
Dilute SurTec 650 chromitAL® with DI-water before use.

	pretreatment before coating	***as corrosion protection***
layer weight:	50-120 mg/m^2	> 110 mg/m^2
make-up values:		
spray:	5 %vol (3-25 %vol)	25 %vol (10-50 %vol)
immersion:	5 %vol (3-20 %vol)	20 %vol (10-50 %vol)
temperature:	25°C (20-35°C)	40°C (30-40°C)
pH-value:	3.5 (2.5-3.95) adjust with 5 % sulfuric acid or 1 % sodium hydroxide solution	3.9 (3.7-3.95) adjust with 5 % sulfuric acid or 1 % sodium hydroxide solution
application time:	(for temperature dependency see “hints”)	(for temperature dependency see “hints”)
spray:	1 min (0.5-3 min)	2 min (1-6 min)
immersion:	1 min (0.5-3 min)	2 min (1-6 min)
spraying pressure:	1 bar (0.5-2.5 bar)	1 bar (0.5-1.5 bar)
agitation:	not necessary	not necessary

make-up: Steps for make-up:

1. Dilute SurTec 650 chromitAL® with deionised water under vigorous stirring.
2. Control the pH-value and adjust it cautiously with sulfuric acid (5 %) resp. sodium hydroxide solution (1 %), if necessary.

tank material: stainless steel or steel with acid- and fluoride-resistant coating

rack material: material: titanium, stainless steel (V4A), aluminium, plastic

filtration: necessary (min. 2 circles/h)
before coating: pore size ≤ 25 µm

heating: necessary; out of acid- and fluoride-resistant material

exhaust: required for worker's protection

recommended process sequence:

Standard procedures for immersion:

<u>For aluminium alloys with < 1 % silicium:</u>

1. mild alkaline degreasing	e.g. SurTec 133
2. alkaline etching	e.g. SurTec 181
3. deoxidising	e.g. SurTec 495 or SurTec 495 L
4. passivation	with SurTec 650 chromitAL®

<u>For aluminium alloys with > 1 % silicium:</u>

1. mild alkaline degreasing	e.g. SurTec 133
2. deoxidising	e.g. SurTec 495 or SurTec 495 L
3. passivation	with SurTec 650 chromitAL®

Standard procedure for spray:

1. acid degreasing	e.g. SurTec 478
2. passivation	with SurTec 650 chromitAL®

Between each step the surface has to be rinsed. The rinsing methods have to be adapted to the plating line.

The process sequences above are general recommendations. To qualify the process, modifications may be necessary.

general hints: Metallic tank material and goods to be passivated must be electrically isolated from each other.

Storage: During storage a slight precipitation may occur inside the SurTec 650 concentrate, which will not impair quality or function of the product.

Process sequence: Prior to the passivation with SurTec 650, the aluminium surface must be cleaned and deoxidised thoroughly. The surface must be water-break free.

Using a silicate containing degreasing, the surface has to be treated with a fluoride containing deoxidising subsequently.

It is recommendable to adjust the last rinse before the chromitAL® bath to pH 3.5-4, in order to avoid strong pH variations in the SurTec 650 bath.

After passivation with SurTec 650, the parts have to be rinsed. For best corrosion resistance, rinsing with deionised water is recommended. For successive lacquering, the last rinse must have a conductivity of less than 30 µS/cm.

Further treatment and tests: As a qualitative determination to proof the deposited chromitAL®-layer, a spot test is available. The test kit and its instruction can be ordered separately.

Before testing the corrosion resistance of parts in the salt spray test, the surface has to be stored for 24 hours.

hints for corrosion resistance:

Process parameter: There is an inverse influence of temperature and immersion time on the deposited chromitAL®-layer. With higher bath temperature, a short immersion time is sufficient; with lower temperature a longer immersion time will be necessary.

Recommended combination for best corrosion protection:

at 30°C:	4 min	(2-6 min)
at 40°C:	2 min	(1-3 min)

Colourless layer – to replace a colourless chromate process:

at 30°C:	60 s	(45-90 s)

Layer weight: The weight of the chromitAL®-layer strongly depends on the roughness of the aluminium surface.
Passivation layers with best corrosion resistance have a weight of approx. 0.25 g/m^2 (0.11-0.5 g/m^2).

Colourless layers weigh approx. 0.08 g/m^2 (0.05-0.20 g/m^2).

Temper resistance: During drying, the surface temperature should not exceed 65°C. The freshly deposited chromitAL®-layer contains integrated water. At drying temperatures of > 65°C, the layer may dry too fast and get micro-cracked. The result is a small loss of corrosion resistance. This loss is only minor, but increasing with rising drying temperature.

Already dried passivation layers only show marginal loss of corrosion resistance after further heat treatment.

The influence of the temper process on the corrosion resistance depends on the type of aluminium alloy and has to be tested in special case. For example, copper free aluminium alloys can be tempered at > 100°C almost without loss of corrosion resistance.

hints for coating:

Storage: Treated surfaces with SurTec 650 can be coated immediately after drying or stored as long as they are protected from contamination and temperature extremes. For optimum results, the parts should be coated within 7 days. To be compliant to QUALICOAT, it should be coated within 16 h, and, to be compliant to GSB within 24 h, respectively, as Premium Coater within 12 h.

Layer weight: For pretreatment of extruded profiles before powder coating, a layer weight of 0.05-0.12 g/m^2 must be observed. The formation of the passivation layer should be tested directly after the pretreatment with a spot test.

Drying temperature: The drying temperature should be 65°C (room temperature - 100°C).

Maintenance and Analysis

Check the pH-value regularly. Analyse and adjust the concentration of SurTec 650 regularly. (Analysing methods by photometry can be requested separately - but they are less exact.)

Sample Preparation

Take the sample at a homogeneously mixed position. Let it cool down to room temperature. If the sample is turbid let the turbidity settle down and filter with a blue band filter paper.

SurTec 650 – Analysis by Titration

reagents:
sulfuric acid (conc.)
ammonium peroxodisufate p. a.
silver nitrate solution (0.1 mol/l)
potassium fluoride p. a.
potassium iodide solution (10 %)
0.1 N sodium thiosulfate solution
starch solution (2 %)

procedure:

1. Pipette 100 ml bath sample into a 250 ml Erlenmeyer flask.
2. Acidify with 3 ml sulfuric acid.
3. Add 3 g ammonium peroxodisufate.
4. Add 10 ml silver nitrate solution.
5. Cover the Erlenmeyer flask with a watch glass. Than heat up the solution and boil it slightly for 20 min (the solution must not evaporate completely!).
6. Let it cool down to room temperature.
7. Add a spatula tip of potassium fluoride.
8. Add 15 ml potassium iodide solution.
9. Leave 5 min for reaction.
10. Titrate with 0.1 N sodium thiosulfate solution until the solution becomes weakly yellow.
11. Add 5 ml starch solution (solution colour turns to blue-black).
12. Continue titrating until the colour changes to milky light green.

calculation: consumption in ml · 1.613 = %vol SurTec 650

SurTec 650 – Analysis by AAS

equipment: atomic absorption spectrometer (AAS):
wave length: 357.9 nm; slit: 0.7 nm

reagents: nitric acid (1:1) p. a.
chromium standard solutions

procedure: Make an exact dilution of 1:20:

1. Pour 5 ml nitric acid (1:1) p. a. into a 100 ml volumetric flask.
2. Pipette 5 ml bath sample into the flask and mix well.
3. After 5 min waiting time fill up with deionised water, mix well.
4. Calibrate the AAS with comparable chromium standards and measure the prepared dilution of the sample (in ppm).
5. In respect to the dilution calculate the concentration of chrome in the bath (in ppm).

calculation: concentration of chrome in ppm · 0.0974 = %vol SurTec 650

hint: Choose the dilution in order that the measured values are in the linear measurement range of the AAS.

SurTec 650 – Determination of the Layer Weight

equipment:	analytical balance (+/- 0.1 mg)
reagents:	50 %vol nitric acid (65 %)
procedure:	1. Passivate a test part with a known surface area in m^2 (preferably > 2 dm^2) in SurTec 650. 2. Rinse with deionised water and dry with compressed air at room temperature. 3. Weigh the dry part within 3 h after passivation with the analytical balance (= $\mathbf{M_1}$). 4. Remove the passivation layer in nitric acid (4 min by 20-25°C). 5. Rinse with deionised water and dry with compressed air at room temperature. 6. Weigh the dry part again with the analytical balance (= $\mathbf{M_2}$). 7. Repeat the analysis with a cleaned and deoxidised but not-passivated test part(= $\mathbf{M_3}$ and $\mathbf{M_4}$)
calculation:	($\mathbf{M_1}$ - $\mathbf{M_2}$) / surface area = **A** ($\mathbf{M_3}$ - $\mathbf{M_4}$) / surface area = **B** **A** - **B** = layer weight in g/m^2
hint:	For determination of the layer weight always a fresh solution should be used. At the latest after 1 m^2/l the solution has to be renewed.

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 650	liquid, green, clear-turbid, contingency precipitate	1.005 (1.00-1.01)	approx. 3.4

Ingredients

- trivalent chromium salts

Consumption and Stock Keeping

The consumption depends heavily on the drag-out. To determine the exact amounts of drag-out, see SurTec Technical Letter 11.

The following values can be taken as estimated average consumption:

45-55 ml SurTec 650 concentrate are sufficient for treating 1 m^2 surface (including a supposed drag-out of 200 ml/m^2 at a make-up concentration of 20 %vol).

The consumption is depending strongly on further factors:

- the drag-out may be significantly higher for rough surfaces and scooping parts (up to 300 ml/m^2)
- at rough surfaces, the effective surface is higher than the part's dimension, so the chemical consumption is higher
- drag-in of alkalinity into the SurTec 650 bath can lead to precipitations which means additional consumption

In order to prevent delays in the production process, per 1,000 l bath the following amount should be kept in stock:

SurTec 650	500 kg

Product Safety and Ecology

The safety instructions and the instructions for environmental protection have to be followed in order to avoid hazards for people and environment. The Material Safety Data Sheets (according to European legislation) contain explicit details for this.

The following hazard designations and classifications into water hazard classes (WHC) have to be taken into account:

product	*hazard designation*	*water hazard class*
SurTec 650	-	WHC 1

Warranty

We are responsible for our products in the context of the valid legal regulations. The warranty exclusively accesses for the delivered state of a product. Warranties and claims for damages after the subsequent treatment of our products do not exist. For details please consider our general terms and conditions.

Further Information and Contact

In our forum, you can discuss topics of the surface technology:
http://forum.SurTec.com/

If you have any questions concerning the process, please contact your local technical department: http://SurTec.com/International.html

1 October 2012/DK, WT

Trouble Shooting

problem	possible cause	remedy
removable white residue on the surface	a) pH-value is too high	adjust the pH
	b) temperature is too high	cool down the bath
	c) immersion time is too long	shorten the immersion time
heavy turbidity of the chromitAL® bath	a) pH-value is too high	adjust the pH
	b) local overheating	evtl. use indirect heater
	c) drag-in of alkalinity, phosphates or hard water	increase the rinsing quality before the chromitAL® bath
cloudy layer	a) insufficient activation	check pretreatment and activation
	b) insufficient agitation in the chromitAL® bath	evtl. slight bath agitation