

SurTec® 650

chromitAL® TCP

Properties

- hexavalent chromium free passivation for aluminium
- based on trivalent chromium
- liquid concentrate
- excellent bare corrosion protection comparable to hexavalent passivations
- also works on alloyed and casted aluminium
- suitable as pretreatment before lacquering, powder coating and gluing
- easy to handle in immersion, spray and wipe application
- produces an iridescent, faintly blue to tan and visible layer
- meets or exceeds MIL-DTL-81706 and MIL DTL 5541 F for bare corrosion (336 h in NSS per ASTM B-117, respectively, DIN 50021 SS)
- low contact resistance: < 0.8 mOhm/cm²
- 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

Application

SurTec 650 can be used in immersion, spray and wipe application. SurTec 650 Concentrate is diluted with DI-water before use.

make-up values:	<i>corrosion protection</i>		<i>pretreatment before coating</i>	
<i>spray</i>	25 %vol	(10-50 %vol)	10 %vol	(5-25 %vol)
<i>immersion</i>	20 %vol	(10-15 %vol)	7 %vol	(5-20 %vol)
temperature:	40 °C	(30-40 °C)	30 °C	(20-40 °C)
pH-value:	3.9	(3.70-3.95)	3.5	(3.3-3.95)
	adjust with 5 % sulfuric acid or 1 % sodium hydroxid solution			
application time:	temperature dependency see "hints"			
<i>spray</i>	2 min	(1-6 min)	2 min	(1-6 min)
<i>immersion</i>	2 min	(1-6 min)	2 min	(1-6 min)
spraying pressure:	1 bar	(0.5-1.5 bar)	1 bar	(0.5-2.5 bar)
agitation:	not necessary			
make-up:	Steps for make-up:			
	1. Dilute SurTec 650 Concentrate with deionised water under vigorous stirring.			
	2. Control the pH-value and adjust it cautiously with 5 % sulfuric acid or 1 % sodium hydroxid solution, 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)
heating: necessary; of acid and fluoride resistant material
exhaust: required for worker's protection
recommended process sequence:

Standard procedures for immersion:

For aluminium alloys with < 1 % silicium:

1. mild alkaline degreasing
2. alkaline etching
3. deoxidizing
4. passivation with SurTec 650 chromitAL®

For aluminium alloys with > 1 % silicium:

1. mild alkaline degreasing
2. deoxidizing
3. passivation with SurTec 650 chromitAL®

Standard procedure for spray:

1. acid degreasing
2. passivation with SurTec 650 chromitAL®

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

general hints: ***Storage:*** During storage a slight precipitation may occur inside the SurTec 650 Concentrate, which does not impair the quality and the function of the product.

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

Using a silicate containing degreasing, the surface has to be treated with a fluoride containing post-dip.

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 the 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 opposite influence of temperature and immersion time on the deposited chromitAL[®]-layer. With higher bath temperature only a short immersion time is needed, 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 - in place for colourless chromate process:

at 30 °C: 60 s (45-90 s)

Layer weigh: The weigh of the chromitAL[®]-layer is strongly depending on the roughness of the aluminium surface.

Passivation layers with best corrosion resistance have a weigh of approx. 0.25 g/m² (0.11-0.5 g/m²).

Colourless layers have a weigh of approx. 0.08 g/m² (0.05-0.20 g/m²).

As pre-treatment before lacquering a layer weight of 0.08-0.12 g/m² is recommended.

Temper resistance: The drying temperature should not be higher than 65 °C on the parts. The freshly plated chromitAL[®]-layer contains integrated water. At drying temperatures of > 65 °C, the layer may dry too fast and can become microcracked. 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 the 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.

Layer weigh: At pretreatment of rolled and pressed aluminium products before coating the layer weight of the passivation is not relevant. 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 (roomtemperatur-100 °C).

Technical Specification

(at 20 °C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 650	liquid, green	1.005 (1.00-1.01)	3.8 (3.6-4.0)

Maintenance and Analysis

Check the pH-value regularly. Analyse and adjust the concentration of SurTec 650 regularly. ([Analysis by Photometry](#) can be requested separately - but it is 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: sodium hydroxide solution (10 %)
 H_2O_2 (30 %)
 hydrochloric acid (17 %)
 potassium iodide
 0.1 N sodium thiosulfate solution
 starch solution (1 %)
- procedure: 1. Pipette 100 ml bath sample into a 250 ml Erlenmeyer flask.
 2. Add 20 ml sodium hydroxide solution.
 3. Add approx. 5 ml H_2O_2 and stir for 5 min for reaction.
 4. Add another 5 ml H_2O_2 and stir for 5 min at room temperature.
 5. Cover the Erlenmeyer flask with a watch glass and boil the solution for 30-40 min under stirring. It is important to evaporate excessive H_2O_2 (maximum evaporation loss: 50 ml).
 6. Chill the solution and filter it using a fine grained filter paper (blue ribbon).
 7. Rinse the filter with approx. 10 ml deionised water. The filtrate must be clear and free of precipitates.
 8. Dilute the filtrate with deionised water up to about 100 ml.
 9. Add 40 ml hydrochloric acid (colour turn from yellow to orange).
 10. Add about 1 g potassium iodide.
 11. Titrate with 0.1 N sodium thiosulfate solution until the solution is only slightly yellowish.
 12. Add some starch solution.
 13. Continue the titration until the blue colour disappears.
- calculation: consumption in ml $\cdot 1.613 = \% \text{vol SurTec 650}$

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.
- 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. Wait 5 min before filling up.
 4. Fill up with deionised water and mix well.
 5. Calibrate the AAS with comparable chromium standards and measure the prepared dilution of the sample (in ppm).
 6. In respect to the dilution calculate the concentration of chrome in the bath (in ppm).
- calculation: concentration of chrome in ppm $\cdot 0.0974 = \% \text{vol SurTec 650}$
- hint: Choose the dilution in order that the measured values is 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 (53 %)
procedure:	<ol style="list-style-type: none">1. Passivate a test part with a known surface area (in m²) 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 (= M₁).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 (= M₂).
calculation:	$(M_1 - M_2) / \text{surface area} = \text{layer weight in g/m}^2$

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 m² surface (included a supposed drag-out of 200 ml/m² 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/m²)
- 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:

<u>product</u>	<u>hazard designation</u>	<u>water hazard class</u>
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>

2 June 2008/DK, PV

Trouble Shooting

problem	possible cause	remedy
removable white residue on the surface	a) pH-value too high	adjust the pH
	b) temperature too high	cool down the bath
	c) immersion time too long	shorten the immersion time
heavy turbidity of the chromitAL® bath	a) pH-value too high	adjust the pH
	b) local overheating	evtl. 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 the pretreatment and the activation
	insufficient agitation in the chromitAL® bath	evtl. slight bath agitation