



tank material: steel with heat resistant and acid resistant plastic coating  
 heating: necessary, out of acid resistant material (e.g. Teflon, glass)  
 agitation: rack or (low) air agitation  
 hints: As last step before Chromiting we recommend an acid dip in 0.5 %vol nitric acid (conc.), especially for parts plated in alkaline electrolytes. For zinc/nickel plated parts, an acid dip in hydrochloric acid is necessary (pH 2).

Because of the high make-up concentration of SurTec 680, a feed-back recycling of rinse-water is highly recommended. We will be pleased to calculate the conditions for your line.  
 (please consult: <http://chromiting.SurTec.com/>)

In case of recycling the feed-back rinse water, the precipitated zinc sludge must be removed out of the Chromiting bath (by sedimentation tank or filtration).

For rack applications it is recommended to install spray nozzles above the Chromiting bath, to rinse the parts as they exit the Chromiting solution to prevent flash drying of bath solution on the warm parts.

High iron contents in the Chromiting bath will at first lead to a colour change of the Chromiting layer, and eventually reduce corrosion resistance. For installations with a high input of iron we recommend the installation of an ion exchange system. The specific ion exchange resin SurTec 680 IAT (see the separate product information sheet) is able to remove selectively iron out of the Chromiting bath, without disturbing the passivation process.

recommended process sequence:

1. zinc or zinc alloy process
2. cascade rinsing
3. activation in nitric acid, pH 1.4-2.0
4. **Chromiting SurTec 680**
5. cascade rinsing
6. final rinse with 2 %vol SurTec 680 S Stabiliser
7. optional: sealing (e.g. SurTec 555 or SurTec 555 S)
8. hot air drying (70-85°C)

The rinsing methods have to be adapted to the plating line.

## Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 680	liquid, dark grey to violet	1.466 (1.44-1.49)	1.7 (1.4-2.0) (at 12.5 vol%)
SurTec 680 K Salt	salt, white	0.900 (0.70-1.10) kg/l	-
SurTec 680 C	liquid, dark red, clear	1.235 (1.21-1.26)	5.7 (4.8-7.0)
SurTec 680 S	liquid, colourless, clear	1.120 (1.09-1.15)	6.5 (5.8-7.3)

Note: In SurTec 680 Chromiting Concentrate, there is a slight settling possible that will not impair its function.

## Maintenance and Analysis

Check the pH-value regularly. Analyse and adjust the concentration of SurTec 680 regularly.

Strong dosages of SurTec 680 K Salt may lead to reduced cobalt concentrations. To raise the cobalt content, SurTec 680 C has to be added (10 ml/l SurTec 680 C correspond to 1 g/l cobalt). SurTec 680 Chromiting Concentrate can also be used for raising the cobalt content (50 ml/l SurTec 680 correspond to 1 g/l cobalt).

In case of using SurTec 680 S in the final rinse, the replenishment of the Stabiliser should be done in the same ratio according to SurTec 680 Chromiting Concentrate in the Chromiting bath, or according to analysis (see further on).

### Sample Preparation

Take a sample at a homogeneously mixed position. Let it cool down to room temperature. If the sample is turbid, let the turbidity settle down and decant or filter the solution.

### SurTec 680 – Analysis by Titration

reagents:	sulfuric acid (conc.) p.a. ammonium peroxodisulfate p.a. 0.1 N silver nitrate solution potassium iodide p.a. 0.1 N sodium thiosulfate solution (= 0.1 mol/l) starch solution (1 %)
procedure:	<ol style="list-style-type: none"><li>1. Pipette exactly 2 ml bath sample into a 250 ml beaker.</li><li>2. Acidify with 3 ml conc. sulfuric acid and mix by slight rotation (sample becomes clearly green).</li><li>3. Dilute with approx. 50 ml deionised water.</li><li>4. Add 15 ml silver nitrate solution.</li><li>5. Add 2 g ammonium peroxodisulfate.</li><li>6. Cover it with a watch glass, heat up with a heating plate and boil it for 20 min (only slight boiling, sample will slowly become clearly yellow).</li><li>7. After cooling to room temperature, wash down the drops from the watch glass and from the beaker's walls, using small amounts of deionised water.</li><li>8. Dilute with deionised water to approx. 100 ml.</li><li>9. Add 2 g potassium iodide (sample changes to milky light brown).</li><li>10. Titrate with 0.1 mol/l sodium thiosulfate solution to a weak brownish colour of the solution.</li><li>11. Add several ml of starch solution (sample changes to milky dark brown).</li><li>12. Continue titrating until the colour fades to milky pale green.</li></ol>
calculation:	consumption in ml · 1.083 = %vol SurTec 680

### SurTec 680 – Analysis by Photometry

- equipment: spectrophotometer or  
filter photometer with 560 nm filter unit ( $\pm 50$  nm)  
100 ml volumetric flask  
10 ml pipette  
1 cm cuvette
- reagents: hydrochloric acid (1:1) p.a.
- procedure: Prepare a 12 %vol standard solution (make up freshly at least every 3 month, see "possible errors"):  
Pipette 10 ml half conc. hydrochloric acid into a 1000 ml volumetric flask. Add 12 ml SurTec 680 Chromiting Concentrate, fill up with deionised water and mix well.  
Before each sample measurement, fill the 12 %vol standard solution into a 1 cm cuvette and measure it photometrically at 560 nm against water. Note the absorbance **ES**.  
Sample measurement:  
  1. Pipette 10 ml of the filtrated bath sample into a 100 ml volumetric flask.
  2. Add about 1 ml half conc. hydrochloric acid.
  3. Fill up with deionised water and mix well.
  4. Fill this solution into a 1 cm cuvette.
  5. Measure the cuvette in the photometer at 560 nm.
  6. Note the absorbance **EP**.
- calculation:  $EP / ES \cdot 12 = \%vol \text{ SurTec 680}$
- possible errors:
- Bath turbidity simulates a higher concentration, therefore the sample should be filtrated.
  - High amounts of iron impurities lead to wrong results.
  - Use the 12 %vol standard solution not longer than max. 3 month.

### SurTec 680 – Analysis by AAS

- equipment: atomic absorption spectrometer (AAS)  
wave length: 357.9 nm  
1000 ml volumetric flask, 1 ml pipette
- reagents: acetylene/synth. air  
chromium standard solutions: 5, 10, 20 ppm  
hydrochloric acid (conc.) p.a.
- procedure: Make a dilution 1:1000:  
  1. Pipette 10 ml hydrochloric acid into a 1000 ml volumetric flask.
  2. Add 1 ml bath sample and mix shortly.
  3. Wait 5 min before filling up.
  4. Fill up with deionised water and mix well.
  5. Calibrate the AAS with the chromium standards and directly after this measure the prepared dilutions.
- calculation:  $\text{measured value in ppm} \cdot 1.25 = \%vol \text{ SurTec 680}$

- possible errors:
- The pipette has to be clean and should be rinsed with bath solution before it will be used for the bath sample.
  - If the reaction time of hydrochloric acid with the bath sample is too short, chrome has no good configuration for AAS measurement. The result will be too low.
  - Warm up the AAS lamp for 10-15 min (see AAS instructions).
  - Calibration has to be done before each measurement.
  - Older AAS lamps can leave the linear measurement range.

### **Cobalt – Analysis by AAS**

- equipment: atomic absorption spectrometer (AAS)  
wave length: 240.7 nm  
slit: 0.2 nm
- reagents: hydrochloric acid (1:1)  
cobalt standard solutions
- procedure: Make a dilution 1:500:  
  1. Pipette 1 ml bath sample into a 500 ml volumetric flask.
  2. Add 5 ml hydrochloric acid (1:1).
  3. Fill up to 500 ml with deionised water and mix well.
  4. Measure against cobalt laboratory standards by AAS.
- calculation: measured value in ppm · 0.5 = g/l cobalt
- correction: rise by 1 g/l cobalt = addition of 10 ml/l SurTec 680 C  
or 50 ml/l SurTec 680

### **SurTec 680 S (in the Final Rinse) – Analysis by Titration**

- reagents: 0.1 N iodine solution  
hydrochloric acid (1:1)  
starch solution (1 % in deionised water)
- procedure:
  1. Pipette 50 ml of the rinsing bath into a 300 ml Erlenmeyer flask.
  2. Dilute with 50 ml deionised water.
  3. Add 20 ml hydrochloric acid.
  4. Add 1 drop of the starch solution.
  5. Titrate with 0.1 N iodine solution from colourless to blue.
- calculation: consumption in ml · 0.272 = %vol SurTec 680 S

## **Ingredients**

SurTec 680 S

- boric acid

## 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](#).

For each litre dragged out solution, 125 ml of SurTec 680 concentrate has to be added; best is a dosage of SurTec 680 based on throughput.

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

SurTec 680	210 kg
SurTec 680 K Salt	60 kg
SurTec 680 C	30 kg
SurTec 680 S	30 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 680	T - Toxic N - Dangerous for the environment	WHC 2
SurTec 680K Salt	Xn - Harmful	WHC 1
SurTec 680 C	T - Toxic N - Dangerous for the environment	WHC 2
SurTec 680 S	-	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>

## Trouble Shooting

problem	possible cause	remedy
slight white clouds in/on the Chromiting layer	a) if the clouds are already visible on the plated zinc (after activation)	check the quality of the parts, the pre-treatment and the zinc plating process
	b) insufficient rinsing and drying conditions	check the pH-value of the activation ( $\leq 2$ ); shorten the rinsing times (in total $< 2$ min); check the pH of the last rinse (best: 5-6) or use SurTec 680 S in the last rinse; optimize the drying process: first cold drying (air blow), then dry 10-15 min at 60-80°C
	c) pH-value of the Chromiting bath is too high	correct the pH with nitric acid to pH 1.8
	d) loss of complexing agent SurTec 680 K Salt (high zinc contents lead to precipitation of complexing agent)	add SurTec 680 K Salt in steps of 1 g/l (for 1 g/l zinc add 2 g/l SurTec 680 K Salt)
yellowish Chromiting layer	content of iron in the bath is too high	find out the source of the iron contamination and prevent it: high amounts of iron can be precipitated and filtered by rising the pH to 3.5 (using sodium bicarbonate); further dissolution of iron can be reduced by adding SurTec 660 A (only if SurTec 680 IAT is not used); for continuous input of iron we recommend the installation of an ion exchange system (SurTec 680 IAT).
pale colour of the Chromiting layer, bad corrosion protection	working parameters of the Chromiting are not correct	check concentration, pH-value, agitation temperature and application time - and correct these parameters if necessary
discolouration of the Chromiting layers after 1-4 weeks	a) inadequate storage conditions	high humidity, high temperatures and salts on the part's surface impair the Chromiting layers
	b) too thin zinc layer	possible migration of base metal cations can lead to discolouration => increase the plating time
	c) metal impurities in the zinc bath or the Chromiting bath	keep the electrolyte free from metal impurities; for the Chromiting bath: use the ion exchange SurTec 680 IAT for eliminating metal impurities
	d) in case of using a sealer: be aware that it is not too alkaline and that the resulting layer is not too thick	dilute the sealing bath; adjust the pH-value as low as possible