

Protection upgraded

SurTec® 609 EC

Pre-Treatment prior to E-Coat

Properties

- SurTec 609 EC is suitable as multimetal passivation prior to painting (steel, aluminium, HDG and EG zinc and zinc die cast)
- creates uniform nanometre-scale films, reinforced by silicon dioxide components
- for spray and immersion application
- based on trivalent chromium
- for perfect adhesion of lacquers and excellent corrosion protection
- especially robust against flash rust
- enables automatic dosing via pH-measurement or conductivity
- free of phosphates, zinc, nickel, manganese and VOCs
- in full compliance with RoHS (EU Directive 2002/95/EC), WEEE (EU Directive 2002/96/EC) and ELV
- IMDS-number: 705870460

Application

The process includes the following products:

- **SurTec 609 EC Pre-Treatment prior to E-Coat** concentrate is used for the new make-up and for replenishment for multimetal applications
- **SurTec 609 Al 1** or **SurTec 609 Al 2 Replenisher** for the pre-treatment of aluminium surfaces
- **SurTec 612 N Alkaline Neutraliser** is needed to adjust the Free Acid

Make-up value:

SurTec 609 EC	2.0 %vol	(0.7-3.5 %vol)
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Analytical values:

Total Acid (TA)	4.0 Points	(3.0-17.5 Points)
chromium(III)	10-60 ppm	
zirconium	30-135 mg/l	

Make-up:

Steps for make-up of SurTec 609 EC:

1. Fill deionised water into the tank. Check the pH-value and adjust it to pH 4-6.5 with SurTec 612 N or with 1 % nitric acid if necessary.
2. Add SurTec 609 EC concentrate with vigorous stirring.
3. Control the pH-value and adjust it if necessary.

pH-value:

Multimetal application:

4.7 (4.2-5.2) adjust with SurTec 612 N or with SurTec 609 EC

Aluminium pre-treatment:

3.5 (3.0-4.0) separate bath adjustment is not necessary



Temperature:	room temperature (20-40°C)
Application time:	30 s (20-360 s)
Spray pressure:	0.8-1.2 bar
Tank material:	stainless steel, or steel with acid-resistant coating
Filtration:	recommended: 0.1-0.5 times the total bath volume per hour; pore size: ≤ 25 µm (see: "Hints")
Heating:	required, made of acid-resistant material
Exhaust:	according to local requirements
Hints:	<p>After some time, a minor amount of sludge could be formed in the bath. A precipitation of sludge on the surface of the parts, which could possibly lead to inclusions into the lacquering, can be avoided by continuous filtration. Slight residues in the tank can occasionally be removed by pressure cleaning, e.g. during a bath revision or a bath change.</p> <p>When processing steel parts, the colour of the passivation bath changes from light green to red/brown.</p> <p>The colour of the processed parts depends on material and alloy. Steel surfaces appear silver to brass/gold. Aluminium surfaces are colourless to yellowish.</p> <p>Aluminium Pre-Treatment:</p> <p>SurTec 609 Al 1 or Al 2 Replenisher is used as replenishment additive for the pre-treatment of aluminium surfaces and ensures a homogeneous structure of the passivation layer. The Process can be completely controlled via conductivity of the bath solution (see "analysis via conductivity").</p>
Storage:	During storage, a slight sediment may form, that does not affect the quality or function of the product.

Recommended process sequence:

1. Cleaning e.g. SurTec 168 LT / SurTec 086 (for steel only)
e.g. SurTec 168 MU / SurTec 086 (for multimetall)
2. Rinse
3. Rinse with DI-water (maximum 350 µS/cm)
4. **Passivation SurTec 609 EC**
(for Al pre-treatment, with SurTec 609 Al 1 or Al 2)
5. Rinse with DI-water (max. 50 µS/cm)
6. Hot air drying

The rinsing methods need to be adapted to the pre-treatment line.

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 609 EC	liquid, blue-green, clear	1.020 (1.01-1.03)	approx. 1.5
SurTec 609 Al 1	liquid, blue-green, clear	1.026 (1.01-1.04)	approx. 1.2
SurTec 609 Al 2	liquid, blue-green, clear	1.029 (1.01-1.04)	approx. 1.3
SurTec 612 N	liquid, colourless, clear	1.104 (1.09-1.12)	approx. 12.5

Maintenance and Analysis

Depending on the parameter used for maintenance, the pH-value or the conductivity needs to be controlled and adjusted regularly, at least 2 times per shift. An automatic bath control is recommended.

In case of controlling the process via pH-value, apply SurTec 609 EC concentrate to maintain the pH-value in the specified range of pH 4.2-5.2.

If the rinse prior to SurTec 609 EC has a good quality ($< 100 \mu\text{S}/\text{cm}$, max. limit: $200 \mu\text{S}/\text{cm}$), a control of the process via conductivity is possible. In this case, the conductivity can be used as parameter to run the automatic replenishment.

The concentration of **SurTec 609 EC** can be analysed by the Total Acidity (TA). A drag-in of impurities such as inorganic or organic salts, can influence the Total Acidity (TA). In case of such a bath contamination, after the pH-value has been adjusted, the determination of the TA-Points can lead to a misleading, that means to in too high value. This effect can be minimised by a good rinsing quality, but occasionally an additional routine control of the chromium content is recommended. If the Total Acidity exceeds 25 Points and the chromium(III) content is below 10 ppm, a new bath make-up is necessary.

As routine control, a photometric analysis or a titration of the chromium content can be used.

For the pre-treatment of aluminium, **SurTec 609 Al 1** or **Al 2** is added continuously, controlled by conductivity via a dosing system.

Sample Preparation

Take a bath sample at a homogeneously mixed position and let it cool down to room temperature. If the sample is turbid, let the turbidity settle and filter it through a blue-ribbon filter.

SurTec 609 EC - Analysis via Conductivity

Measuring device: conductivity meter

Procedure: A new make-up (without pH-adjustment) in deionised water has the following conductivity:

$$2.0 \text{ \%vol SurTec 609 EC} = 5.3 \text{ TA-Points} = 650 \mu\text{S}/\text{cm}$$

For aluminium pre-treatment:

$$0.8 \text{ \%vol SurTec 609 EC} = 270 \mu\text{S}/\text{cm}$$

At the beginning of the production, Fe, Zn and Al are dissolved into the process solution, which lead to increasing TA and conductivity. During the process, the metal concentrations stabilize (due to drag-out with the parts and precipitation of the previously dissolved metals). After stabilization, the following values apply:

$$2.0 \text{ \%vol SurTec 609 EC} = 7.0\text{-}10.5 \text{ TA-Points} = 700\text{-}1300 \mu\text{S}/\text{cm}$$

For aluminium pre-treatment:

$$0.8 \text{ \%vol SurTec 609 EC / Al 1 or Al 2} = 300\text{-}500 \mu\text{S}/\text{cm}$$

Correction: If a good rinsing water quality can be ensured prior to the SurTec 609 EC bath, the conductivity can be maintained at $700\text{-}800 \mu\text{S}/\text{cm}$ by automatic dosing of SurTec 609 EC concentrate.

Total Acid (TA) - Analysis by Titration

- Reagents: 0.1 mol/l sodium hydroxide solution (= NaOH solution)
indicator: phenolphthalein (or pH meter)
- Procedure:
 1. Pipette 100 ml bath sample into a 250 ml Erlenmeyer flask.
 2. Add about 3 drops of indicator.
 3. Titrate with 0.1 mol/l NaOH solution from colourless to pink (or pH 8.5).
- Calculation: consumption in ml = TA-Points
- Correction: for each missing TA-Point = addition of 5 ml/l SurTec 609 EC

Chromium - Analysis by Titration

- Reagents: sulfuric acid (conc.)
ammonium peroxodisulfate p. a.
0.1 mol/l silver nitrate solution
potassium fluoride p. a.
potassium iodide solution (10 %)
0.01 mol/l 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 peroxodisulfate.
 4. Add 10 ml silver nitrate solution.
 5. Cover the flask with a watch glass and boil the solution 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 0.01 mol/l sodium thiosulfate solution until the solution becomes weakly yellow.
 11. Add 5 ml starch solution (*sample turns blue-black*).
 12. Continue to titrate until the colour changes to milky light green.
- Calculation: consumption in ml · 1.6 = ppm chromium
- Correction: for each missing ppm chromium = addition of 0.7 ml/l SurTec 609 EC
- If the Total Acidity exceeds 25 TA-Points and simultaneously the chromium content is below 10 ppm, the bath needs to be replaced with a new make-up.

Zirconium - Analysis by Photometry

Test: Zirconium Cuvette Test LCK 364 by HACH LANGE

Measuring device: Table photometer or POCKET photometer with wavelength 500 nm with adapter for the cuvette tests and POCKET light protection cap

Procedure: Dilution 1:4 (F = 4) for bathes with 0.5-3.5 %vol SurTec 609 EC:

1. Pipette 25 ml filtered bath sample into a 100 ml volumetric flask, fill up to the mark with deionised water and mix well.

Measuring of the zero value:

2. Close the cuvette slit of the photometer and set the blank value at 500 nm against air.
3. Then remove the sealing from the DosiCap, unscrew the cap from the cuvette and screw the inverted cap on the cuvette.
4. Then let the dye stuff dissolve in the cuvette by shaking for 10 s (*now the solution is yellow, it must be clear and free of air bubbles and particles*). Clean the cuvette with a soft cloth to remove fingerprint residues and measure the absorbance $ABS_{(zero)}$ in the photometer at 500 nm.

Measuring of the bath sample:

5. Take the cuvette out of the photometer, open the cap and pipette 0.2 ml diluted bath sample into the cuvette.
6. Close the cuvette with the cap and shake it very well (*depending on the zirconium content, the solution turns slightly or strongly orange*).
7. After 5 minutes measure the absorbance $ABS_{(zero + sample)}$ at 500 nm in the photometer.

Calculation: Determination with POCKET or table photometer at 500 nm (measuring without program):

First calculate the 0.2 ml cuvette volume change for the determination of the blank value:

$$ABS_{(zero)} \cdot 0.9643 = ABS_{(corr.)}$$

With the corrected zero value calculate the absorbance of the sample (with dilution factor F = 4):

$$ABS_{(zero + sample)} - ABS_{(corr.)} = ABS_{(sample)}$$

$$ABS_{(sample)} \cdot 644 = \text{mg/l zirconium in the bath}$$

Correction: addition of 1 ml/l SurTec 609 EC = increase by 4 mg/l zirconium

Ingredients

- chromium(III)salts
- fluorides

Stock Keeping

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

SurTec 609 EC	100 kg
SurTec 609 Al 1 or Al 2	100 kg

Product Safety and Ecology

Classification and designation are noted in the **Material Safety Data Sheets** (according to the European legislation). The safety instructions and the instructions for environmental protection have to be followed in order to avoid hazards for people and environment. Please pay attention to the explicit details in our Material Safety Data Sheets.

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 further processing of our products do not exist. For details, please find our country-specific **General Terms and Conditions** for downloading on our homepage or ask your regional SurTec representative.

Further Information and Contact

If you have any questions concerning the process, please contact your local technical department.

For further information and contact details, please visit our homepage:

<http://www.SurTec.com>

30 April 2023