

SurTec® 611

Zinc Phosphating

for Continuous Application

Properties

- low consumption
- no attack on the material
- uniform deposition
- excellent corrosion protection
- forms only a very small amount of sludge
- long solution life
- fast and adherent deposition of phosphate layers
- prepares the surface for subsequent lubrication

Application

SurTec 611 is applied in continuous immersion process.
The process SurTec 611 includes the following products:

- SurTec 611 M is used for make-up
- SurTec 611 R is used for replenishment
- SurTec 612 S is the accelerator

make-up values:

SurTec 611 M	163 ml/l
SurTec 612 S	1.0 ml/l

analytical values:

Total Acid (TA)	25.5 Points	(24-27)
Free Acid (FA)	6.5 Points	(6 - 7)
Free Acid Ratio (FAR)	5	(4 - 5)
Phosphoric Acid (PA)	17.5 Points	(17-18)
Phosphoric Acid Ratio (PAR)	1.5-2.0	
SurTec 612 S	0.8-1 Points	

make-up:

Steps for make-up:

1. Dissolve SurTec 611 M in water with strong agitation.
2. Pre-dilute SurTec 612 S in water and add it to the bath
(e.g. for 1000 l bath: dilute 1 l SurTec 612 S in 5 l water).

temperature: 85 °C (70-90 °C)

application time: > 8 s

tank material: stainless steel

filtration: remove sludge periodically: filter sludge and return filtrate to the bath

heating: necessary; stainless steel heaters (type 1.4571)

cooling: not applicable

exhaust: required for worker's protection

hints: The bath must not be operated below 24 Total Acid Points.
In case of continuous application and/or high throughput, use an automatic dosing system to avoid varying concentrations.

recommended process sequence:

1. lead quenching at 450 °C
2. hydrochloric acid pickling
3. rinsing
4. grain refinement SurTec 611 V
5. zinc phosphating **SurTec 611**
6. rinsing

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

Technical Specification

(at 20 °C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 611 M	liquid, greenish	1.665 (1.63-1.70)	< 1
SurTec 611 R	liquid, greenish	1.665 (1.63-1.70)	< 1
SurTec 612 S	liquid, yellowish	1.214 (1.19-1.24)	11.5 (10-12.5)

Maintenance and Analysis

Analyse and adjust Total Acid, Free Acid and SurTec 612 S Accelerator regularly.
Replenish evaporation losses continuously by adding DI-water.

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.

Total Acid (TA) – Analysis by Titration

reagents: 0.1 N sodium hydroxide solution
indicator: phenolphthalein

procedure:

1. Pipette 2 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 50 ml deionised water.
3. Add 5 drops of indicator.
4. Titrate with 0.1 N sodium hydroxide solution from colourless to pink.

calculation: consumption in ml = TA-Points

correction: Add 5 ml/l SurTec 611 R for each missing Total Acid Point.

Free Acid (FA) – Analysis by Titration

- reagents: 0.1 N sodium hydroxide solution
indicator: bromphenol blue
- procedure: 1. Pipette 2 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 50 ml deionised water.
3. Add 5 drops of indicator.
4. Titrate with 0.1 N sodium hydroxide solution from yellow to blue.
- calculation: consumption in ml = FA-Points
- correction: If the FA-values differ from the desired values, please contact one of our technical staff.

Free Acid Ratio (FAR)

$$\text{FAR} = \text{TA} / \text{FA}$$

Phosphoric Acid (PA) – Analysis by Titration

- reagents: 0.1 N sodium hydroxide solution
potassium oxalate solution (20 %)
indicator: phenolphthalein
- procedure: 1. Pipette 2 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 50 ml deionised water.
3. Add 20 ml potassium oxalate solution.
4. Add 5 drops of indicator.
5. Titrate with 0.1 N sodium hydroxide solution from colourless to pink.
- calculation: consumption in ml = PA-Points

Phosphoric Acid Ratio (PAR)

$$\text{PAR} = \text{TA} / \text{PA}$$

SurTec 612 S Accelerator – Analysis by Titration

- reagents: 0.1 N potassium permanganate
sulfuric acid (50 %)
- procedure: 1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer flask.
2. Add 10 ml sulfuric acid.
3. Titrate with 0.1 N potassium permanganate to a stable pink colour (at least 15 s).
- calculation: consumption in ml = SurTec 612 S - Points
- hints: Before analysing SurTec 612 S, verify that the bath contains no Fe(II): Fe(II) will interfere the titration! To insure the absence of Fe(II), use dipyrindyle paper (colour change to red indicates Fe²⁺). If Fe(II) is present, eliminate it by adding SurTec 612 S, e.g. in case of a new make up: for 1000 l bath dilute 1 l SurTec 612 S in 5 l water and add it to the bath. Repeat the analysis to confirm the absence of Fe(II).

Ingredients

- phosphoric acid
- nitric acid
- zinc 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](#).

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

SurTec 611 M	200 kg
SurTec 611 R	200 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 611 M	T - Toxic N - Dangerous for the environment	WHC 3
SurTec 611 R	T - Toxic N - Dangerous for the environment	WHC 3
SurTec 612 S	T - Toxic N - Dangerous for the environment	WHC 2

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>