

SurTec® 612

Bi-Cationic Zinc Phosphating

Properties

- for spray application
- suitable for steel and zinc substrates
- produces micro-crystalline layers
- uniform deposition
- excellent corrosion protection
- forms only very small amounts of sludge
- adherent deposition of predominantly phosphophyllite crystals
- excellently prepares surfaces for subsequent coatings
- very inert layer, suitable for electrophoretic lacquering

Application

The process SurTec 612 includes the following products:

- SurTec 612 M is used for make-up
- SurTec 612 R is used for replenishment
- SurTec 612 S is used as accelerator
- NaOH (99 %), only is used to neutralise too high amounts of Free Acid

make-up values:	SurTec 612 M	34 ml/l	
	SurTec 612 S	0.5 ml/l	
analytical values:	Total Acid	23 Points	(18-27 Points)
	Free Acid	1.0 Points	(0.6-1.5 Points)
		to neutralise 1 Point, add 0.4 g/l NaOH	
	SurTec 612 S	6 Points	(5-7.5 Points)
	zinc content	0.9 g/l	(0.7-1.1 g/l)
	nickel content	0.55 g/l	(0.40-0.70 g/l)

make-up: Steps for make-up:

1. Dissolve SurTec 612 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, dissolve 0.5 l SurTec 612 S in 5 l water and add it to the bath.
3. Analyse the Free Acid Points and adjust them by adding pre-diluted caustic soda very carefully and slowly.

temperature: 52°C (50-55°C)

application time: 1-5 min

spraying pressure: 0.9 bar (0.8-1.0 bar)

tank material: stainless steel

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

heating: necessary; stainless steel heaters (type 1.4571)
or steel coated with PTFE

cooling: not applicable

exhaust: required for worker's protection

hints: The deposited layer weight varies from 1.4-2.0 g/m².
The deposited phosphate layer is suitable excellently as a basis for electrophoretic lacquering. The weight loss of the phosphate layer during the lacquering only is 0.3-0.8 % of the overall weight of the phosphate layer (other phosphating processes usually show a weight loss of 5 %). Hence, besides best corrosion resistance of the layer system, also the electrophoretic lacquer system is not contaminated by dissolved phosphating layer particles.

recommended process sequence:

1. degreasing combined with grain refinement, e.g. SurTec 145
2. rinsing
3. **Phosphating SurTec 612**
4. rinsing
5. DI-water rinsing
6. drying < 110°C

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

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 612 M	liquid, green	approx. 1.440	< 1
SurTec 612 R	liquid, green	approx. 1.390	< 1
SurTec 612 S	liquid, yellowish	approx. 1.214	approx. 11.5

Maintenance and Analysis

Replenish evaporation losses continuously by adding deionised water.

In case of high throughput, use an automatic dosing system to avoid varying concentrations. Especially SurTec 612 S should be dosed continuously.

Analyse and adjust Total Acid, Free Acid and SurTec 612 S regularly.

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 10 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:	To adjust the Total Acid Points, use SurTec 612 R: Add 1.4 ml/l SurTec 612 R for each missing Total Acid Point.

Free Acid (FA) – Analysis by Titration

reagents:	0.1 N sodium hydroxide solution indicator: bromophenol blue
procedure:	1. Pipette 10 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:	To neutralise 1 Free Acid Point, add 0.4 g/l NaOH (pre-diluted with water, 10 %).

SurTec 612 S Accelerator – Analysis by Titration

reagents:	0.1 N potassium permanganate sulfuric acid (50 %) urea p. a.
procedure:	1. Pipette 50 ml bath sample into a 250 ml Erlenmeyer flask. 2. Add 1-2 ml of sulfuric acid (50 %). 3. Titrate with 0.1 N potassium permanganate solution to a stable pink colour (for at least 15 s). consumption in ml = A 4. Pipette 50 ml bath sample into another 250 ml Erlenmeyer flask. 5. Add 1-2 ml of sulfuric acid (50 %). 6. Add 4 g urea. 7. Stir the solution until the urea has dissolved and wait for approx. 5 min. 8. Titrate with 0.1 N potassium permanganate solution to a stable pink colour (for at least 15 s). consumption in ml = B
calculation:	A - B = SurTec 612 S - Points
hints:	Add 0.27 ml/l SurTec 612 S for each missing Point

Zinc and Nickel – Analysis by AAS

- equipment: atomic absorption spectrometer (AAS)
100 ml volumetric flask
- reagents: hydrochloric acid (conc.) p. a.
zinc standards
nickel standard solutions
- procedure: 1. Pipette 1 ml filtrated sample into a 100 ml volumetric flask.
2. Acidify with 5 ml conc. hydrochloric acid.
3. Fill up to 100 ml.
4. Measure with the AAS in comparison to zinc and nickel standards.

Layer Weight Determination

- equipment: analytical balance with an accuracy of 0.1 mg
- reagents: chromic acid (5 %)
- procedure: 1. Phosphate a test part of known surface area.
2. Rinse it with deionised water and dry.
3. Weigh it by means of the analytical balance (= **A**).
4. Remove the phosphate layer in 5 % chromic acid at 75°C for 10 min.
5. Rinse the part and dry it.
6. Weigh test part again (= **B**).
- calculation: $[A - B] / \text{area in m}^2 = \text{g/m}^2 \text{ layer weight}$

Ingredients

SurTec 612 M and SurTec 612 R

- phosphoric acid
- nitric acid
- zinc salts
- nickel salts

SurTec 612 S

- nitrite 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 612 M	100 kg
SurTec 612 R	100 kg
SurTec 612 S	10 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 612 M	T - Toxic N - Dangerous for the environment	WHC 3
SurTec 612 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>

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