

SurTec® 615 HL

Thick Layer Manganese Phosphating

Properties

- for immersion application
- suitable for steel substrates
- produces dark grey to black and thick phosphating layers
- excellent lubrication and wear resistant properties
- suitable for automotive parts, fasteners, washers and other moving components
- produces micro-crystalline layers
- uniform deposition
- excellent corrosion protection
- forms only very small amounts of sludge
- adherent deposition

Application

The process SurTec 615 HL includes the following products:

- SurTec 615 HL is used for make-up and replenishment
- steel wool is dissolved at the initial make up to reach a certain amount of iron inside the bath, in order to prevent a too extreme attack on the surface when first parts are treated
- manganese carbonate ($MnCO_3$) in order to adjust the Free Acid

make-up values: SurTec 615 HL 150 g/l (135-165 g/l)
steel wool 1 g/l

analytical values: Total Acid (TA) 11.5 Points (10.0-13.0 Points)
Free Acid (FA) 1.5 Points (1.0 - 2.0 Points)
Relation TA / FA 7.7 (5.5-12.5)
Fe(II) content 1-4 g/l

make-up: Steps for make-up:

1. Dissolve SurTec 615 HL in water with strong agitation.
2. Add the steel wool to the bath and wait until it has been dissolved, while stirring.
3. After the recommended make-up additions are made, analyse the bath in order to confirm the required parameters.
If it is desired to modify these parameters, our technical staff will assist in changing the bath make up proportions.

temperature: 97 °C (95-98 °C)

application time: 5-20 min

agitation: not recommended

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

hint: The deposited layer weight varies from 5-20 g/m².

recommended process sequence:

1. degreasing, e.g. SurTec 168/089 or SurTec 138/089
2. rinsing
3. pickling (optional), sulfuric acid combined with SurTec 422
4. rinsing
5. grain refinement (optional), SurTec 616 V
6. Phosphating **SurTec 615 HL**
7. rinsing
8. DI-water rinsing or oiling
9. 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 615 HL	liquid, greenish-brown	1.340 (1.31-1.37)	< 2

Maintenance and Analysis

Analyse and adjust SurTec 615 HL regularly.

Continuously replenish evaporation losses by adding DI-water.

In case of high throughput, use an automatic dosing system to avoid varying concentrations.

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 to approx. 50 ml with deionised water.
3. Add 5 drops of indicator.
4. Titrate with 0.1 N sodium hydroxide solution from colourless to light pink.

calculation: consumption in ml = TA-Points

correction: For each missing TA-Point = addition of 13.6 g/l SurTec 615 HL

Free Acid Points (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 to approx. 50 ml with 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: Add 0.3 g/l MnCO_3 to decrease 0.1 Free Acid Points. Disperse the MnCO_3 in some water and add it to the bath.

Iron(II) – Analysis by Titration

- reagents: 0.1 N potassium permanganate solution (KMnO_4)
sulfuric acid (50 %)
- procedure: 1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 20 ml deionised water.
3. Add 5 ml sulfuric acid.
4. Titrate with 0.1 N potassium permanganate solution to a stable pink colour (for at least 15 s).
- calculation: consumption in ml \cdot 0.56 = g/l Fe(II)
- correction: Usually the iron content stabilises at about 3.0 g/l iron.
However, the Fe(II) concentration must not exceed 4 g/l. At the iron content is higher than 4 g/l, a partly new make-up of the bath is necessary.

Ingredients

- phosphoric acid
- nitric acid
- manganese 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 615 HL Phosphating	200 kg
steel wool	1 kg
manganese carbonate (MnCO_3)	3 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 615 HL	T - Toxic	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>

3 June 2009/DK, PV