

SurTec® 715 T

Alkaline Cyanide-Free Zinc/Nickel Process

Properties

- suited for barrel plating
- deposits layers with nickel contents of 10-15 % nickel
- deposits mate to semi bright zinc/nickel layers
- coatings are blister-free, ductile and easy to passivate
- high permeability for hydrogen, suited for the plating of hardened parts
- IMDS-number: 736126

Application

SurTec 715 T is used for barrel application.

The process includes the following products:

- SurTec 715 T C Complexing Agent is a mix of organic agents and stabilizers which makes nickel soluble in alkaline solution and causes a defined co-deposition
- SurTec 715 T Ni Nickel Solution contains 100 g/l nickel and complexing agents and is used to keep the electrolyte's nickel concentration constant
- SurTec 715 T L LCD Booster improves metal distribution and general gloss, and prevents dark areas in the lcd
- SurTec 700 EN Sodium Zincate Electrolyte, 3x Concentrate contains zinc and sodium hydroxide for the bath make-up (as an alternative to the make-up out of the salts)

make-up values:

sodium hydroxide	130 g/l
zinc oxide (pure)	12.5 g/l

For easier bath make-up, SurTec 700 EN Sodium Zincate Electrolyte, 3x Concentrate can be used instead.

SurTec 715 T C Complexing Agent	120 ml/l	
SurTec 715 T Ni Nickel Solution	18 ml/l	
SurTec 715 T L LCD Booster	0.25 ml/l	(0-2 ml/l)

analytical values:

zinc (Zn)	10 g/l	(6-12 g/l)
sodium hydroxide (NaOH)	130 g/l	(110-140 g/l)
nickel (Ni)	2 g/l	(1.2-2.5 g/l)

- make-up: Steps for make-up:
1. Fill in SurTec 700 EN Sodium Zincate Electrolyte, 3x Concentrate **or** dissolve sodium hydroxide and zinc oxide in 20 % deionised (DI-)water portion by portion, stirring vigorously (**caution: solution becomes hot!**). The solution should be clear and virtually colourless.
 2. Add SurTec 715 T C Complexing Agent and let it cool down.
 3. Add cold DI-water up to 80 % of the final bath volume.
 4. Then add the additives SurTec 715 T Ni Nickel Solution and SurTec 715 T L LCD Booster.
 5. Finally fill up to the final volume and mix well.
 6. Now the bath is ready to work, but the layer appearance will improve after a work-in period of approx. 20 Ah/l. The colour of the bath will change from violet to brown-red.

- cathodic
current density: 0.8-1.2 A/dm²
- voltage: 12-18 V
- current efficiency: 50-60 %
- deposition rate: 0.12 µm/min at 0.8 A/dm²
- temperature: 23°C (20-27°C)
The selected temperature must be kept as exactly as possible, optimal ± 1°C.
- heating/cooling: stainless steel, thermostatic control is required
- ratio
anode/cathode: 2:1
- anodes: nickel plated steel sheet or electrolytic nickel;
optimal: catalytically coated expended metal
- zinc generator: separately, with catalytically coated dissolution baskets
(SurTec Hydrogen Catalyst);
the dimensioning should be calculated individually,
therefore see:
<http://calculation.SurTec.com/Zincgenerator.html>
- tank material: steel with PP or PVC coating
- agitation: barrel rotation at 1-6 rpm
- filtration: continuously: 2-3 bath volumes per hour
- exhaust: recommended
- hints: Metal impurities can only be removed by dummy plating
at low current densities (0.1-0.2 A/dm²).
Remove copper parts immediately out of the bath.

recommended process sequence (for iron parts):

1. **soak cleaning**: clean the parts perfectly with well rinsable cleaners, because the alkaline cyanide-free electrolyte has no cleaning effect at all
recommendation: **SurTec 188** Highly Alkaline Cleaner
2. **pickling**: HCl 1:1; also in this step, well rinsable inhibitors and acid cleaners are absolutely required
recommendation: **SurTec 425** Detergent Pickling Inhibitor
3. **electrolytic cleaning**: anodic, only with soft complexing agents
recommendation: **SurTec 177** Electrolytical Cleaner
4. **activation**: after using an electrolytic silicate-containing cleaner (like SurTec 177), a fluoride activation is necessary
recommendation: **SurTec 481** Salt for Acid Dip
5. **rinsing**: between each step of the pretreatment, good rinsing is required in order to guarantee that neither silicate nor inhibitors nor detergents (tensides) are dragged into the electrolyte; recycled water must be of adequate good quality (in case of doubt, please send a sample for assessment)
6. **plating**: **SurTec 715 T** Alkaline Cyanide-Free Zinc/Nickel Process
7. **rinse**: double cascade rinsing
8. **neutralisation**: in 0.3 %vol hydrochloric acid (approx. pH 3)
9. **rinse**: intermediate rinsing recommended before passivation
10. **passivation**: **SurTec 680** Chromiting
11. **rinse**: double cascade rinsing
12. **sealing**: post dip or sealer, if necessary
13. **hot air drying** at 70°C

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 715 T C	liquid, violet	1.055 (1.03-1.08)	12 (11-13)
SurTec 715 T Ni	liquid, violet	1.270 (1.20-1.32)	7 (5.5-8.5)
SurTec 715 T L	liquid, colourless-yellowish	1.010 (1.00-1.03)	11.5 (11-13)
SurTec 700 EN	liquid, colourless	1.332 (1.31-1.35)	ca. 13

Maintenance and Analysis

Analyse the concentration of zinc, nickel and sodium hydroxide regularly.

Daily control analysis of the nickel content is necessary because possible excess of nickel cannot be masked but only worked out.

Keep the zinc content constant by an external zinc generator; dose the zinc concentrate formed in the generator according to the analysis.

Correct deposited nickel and drag-out losses (see: "Consumption") by adding **SurTec 715 T Ni Nickel Solution**. A dosage of 10 ml/l SurTec 715 T Ni represents 1 g/l nickel.

Dose the other additives according to the data of the make-up values. Add **SurTec 715 T C Complexing Agent** in relation to the addition of SurTec 715 T Ni. For easier dosing a maintenance premix can be prepared out of the two additives SurTec 715 T Ni Nickel Solution and SurTec 715 T C Complexing Agent.

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.

Zinc (Zn) – Analysis by Titration

reagents: 0.1 mol/l EDTA solution (Titrplex III)
buffer solution (100 g/l NaOH and 240 ml/l glacial acetic acid)
indicator: xylene orange tetra sodium salt (1 % in KNO₃)

procedure: Repeat determination:

1. Pipette 5 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 100 ml deionised water.
3. Add approx. 20 ml buffer solution.
4. Add a spatula tip of indicator.
5. Titrate with 0.1 M EDTA from violet to yellow.

calculation: consumption in ml · 1.3074 = g/l zinc

Sodium Hydroxide (NaOH) – Analysis by Titration

reagents: 1 N sulfuric acid
indicator: Tropaeolin O (0.04 % in 50 % ethanol)

procedure:

1. Pipette 5 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with 100 ml deionised water.
3. Add 3 drops of indicator solution.
4. Titrate with 1 N sulfuric acid from red to yellow.

calculation: consumption in ml · 7.98 = g/l sodium hydroxide

Nickel (Ni) – Analysis by AAS

equipment: atomic absorption spectrometer (AAS):
wave length: 232.0 nm
slit: 0.2 nm

reagent: hydrochloric acid (1:1) p.a.
nickel standard solutions

procedure: Dilution 1:1000:

1. Pipette 1 ml bath sample into a 1000 ml volumetric flask.
2. Add 1 ml hydrochloric acid (1:1) cautiously.
Attention: gas evolution (CO₂)!
3. Fill up to 1000 ml with deionised water and mix well.
4. Measure the absorption of this solution in the AAS at 232.0 nm against laboratory standards.

correction: rise by 1 g/l Ni = addition of 10 ml/l SurTec 715 T Ni

Consumption

The consumption depends heavily on the drag-out. To determine the exact amounts of drag-out, see [SurTec Technical Letter 11](#).

The following values per 10,000 Ah can be taken as estimated average consumption:

SurTec 715 T C	3-5 l
SurTec 715 T Ni	6-10 l
SurTec 715 T L	0-2 l

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 715 T C	T - Toxic N - Dangerous for the environment	WHC 2
SurTec 715 T Ni	T - Toxic N - Dangerous for the environment	WHC 2
SurTec 715 T L	C - Corrosive	WHC 2
SurTec 700 EN	C - Corrosive N - Dangerous for the environment	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>

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