

# SurTec® 831

## Electroless Nickel

### with low Content of Phosphor

#### Properties

- electroless nickel process, fulfils the requirements of ELV and RoHS
- phosphorous content of the layer: 1-4 %
- high hardness of fresh deposited layer: 700 HV (Vickers Hardness), can be increased by heat treatment up to 1000 HV
- relatively low working temperature (70-80 °C)
- stable bath with high deposition rate and long service life
- suitable for application on steel parts or on aluminium parts, pre-treated with zincate treatment SurTec 652 Q

#### Application

SurTec 831 Electroless Nickel is applied in rack or barrel application. The process includes the following products:

- SurTec 831 I Make-up Reductor contains the reduction additives and the stabilisers for the new bath make-up
- SurTec 831 II Nickel Concentrate for the new bath make-up and to correct the nickel content
- SurTec 831 III Reductor contains the reduction additives in the correct ratio for maintenance (for each part SurTec 831 II, two parts SurTec 831 III have to be added)

make-up values:	SurTec 831 I	15 %vol	
	SurTec 831 II	5 %vol	
	SurTec 831 III	only for maintenance	
analytical values:	nickel	6 g/l	(4.9-6.4 g/l)
	sodium hypophosphite	30 g/l	(26 - 34 g/l)

- make-up: Steps for make-up:
1. Fill 50 % of the deionised water into the tank.
  2. Add the calculated amount of SurTec 831 I Make-up Reductor and stir well.
  3. Add the calculated amount of SurTec 831 II Nickel Concentrate and stir well.
  4. Fill up to the final volume with deionised water.
  5. Check the pH-value (at room temperature) and adjust with sulfuric acid (10 %) or ammonia solution (1:1), if necessary.
  6. Start the filtration of the bath and heat up to working temperature.

temperature: 77°C (70-80°C)

pH-value: 6.3 (5.7-6.6)  
 adjust with sulfuric acid (10 %) or 25 % ammonia solution (1:1)  
 Measure the pH-value at room temperature or with a freshly calibrated pH-meter with temperature compensation.

deposition rate: 15-20 µm/h, depending on temperature, pH-value and bath age

agitation: strong fluting or air agitation (no compressed air, because possible impurities may disturb the bath)

tank material: stainless steel (type 316) with anodic protection or PP tank

filtration: with filter bags and strong bath agitation (10 times the total volume per hour): pore size 1-10 µm  
 Rinse new filter bags several times alternating with hot and cold water.  
 Do not use magnetic valve pumps.

heating: Tanks with outside wall heating are recommended. Indirect heating with steam tubes is possible (to cool down the bath quickly it can be fluted with cold water). By use of immersion heaters, they have to be fluted very strongly to prevent an overheating of the solution near the heater (this can lead to bath destruction).

cooling: required, out of acid resistant material

exhaust: required for worker's protection

hint: The bath should not be allowed to remain idle at operating temperatures for longer time without use. If there are longer rest periods, cool down the bath.

recommended process sequence (for iron parts):

1. hot degreasing  
*emulsifying:* e.g. SurTec 188 + SurTec 415  
*demulsifying:* e.g. SurTec 188 + SurTec 089
2. hydrochloric acid pickling, e.g. with SurTec 424
3. anodic electrolytic cleaning, e.g. SurTec 171
4. neutralisation, e.g. SurTec 481
5. **Electroless Nickel SurTec 831**
6. hot air drying
7. if necessary, heat treatment for 1 hour at 400°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 831 I	liquid, colourless to light yellow; clear	1.174 (1.14-1.30)	6.2 (5-7)
SurTec 831 II	liquid, green, clear	1.304 (1.29-1.34)	< 2
SurTec 831 III	liquid, colourless, clear to light yellow, clear	1.144 (1.11-1.18)	10.5 (9.5-11)

## Maintenance and Analysis

Check the pH-value regularly (best in a bath sample at room temperature). At growing service life of the bath, pH-value and temperature have to be adjusted to higher values to get a constant deposition rate.

Analyse the nickel content regularly and adjust by dosing SurTec 831 II. With addition of one part SurTec 831 II Nickel Concentrate, add two parts SurTec 831 III Reductor.

### 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 with a fluted filter.

### Nickel – Analysis by Titration

reagents:	0.1 mol/l EDTA (Titrplex III) ammonia (conc.) indicator: murexide
procedure:	1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer flask. 2. Dilute to approx. 100 ml with deionised water. 3. Add 12 ml ammonia solution. 4. Add a spatula tip of indicator. 5. Titrate with 0.1 mol/l EDTA from yellow to violet.
calculation:	consumption in ml · 0.587 = g/l nickel
correction:	rise by 0.1 g/l nickel = addition of 0.8 ml/l SurTec 831 II

### Na-hypophosphite – Analysis by Titration

reagents:	hydrochloric acid (1:1) 0.1 N iodine solution 0.1 N sodium thiosulfate solution starch solution (1 %, freshly made)
procedure:	1. Pipette 5 ml bath sample into a closable iodine number flask. 2. Dilute with 50 ml deionised water. 3. Acidify with 30 ml hydrochloric acid. 4. Add 50 ml 0.1 N iodine solution. 5. Close the flask and store for exactly 45 min in the dark. 6. Add some starch solution. 7. Titrate with 0.1 N sodium thiosulfate solution to complete discolouration.
calculation:	(50 - consumption in ml) · 1.0575 = g/l Na-hypophosphite
correction:	rise by 1 g/l = addition of 4 ml/l SurTec 831 III Reductor
hint:	SurTec 831 III is normally dosed according to SurTec 831 II Nickel Concentrate, in the ratio 2:1. Only in special cases small amounts of SurTec 831 III can be dosed separately.

## 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](#).

The following values per 100 dm<sup>2</sup> for each 1 µm layer thickness can be taken as estimated average consumption:

SurTec 831 II	65 ml
SurTec 831 III	130 ml

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

SurTec 831 II	50 kg
SurTec 831 III	100 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 831 I	Xi - Irritant	WHC 2
SurTec 831 II	T - Toxic N - Dangerous for the environment	WHC 2
SurTec 831 III	Xi - Irritant	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>

## Trouble Shooting

If trouble occurs always control temperature, pH-value and nickel content at first.

problem	possible cause	remedy
skip plating, bad throwing or rough edges	a) pre-treatment is inefficient	check the pre-treatment
	b) bath agitation is too much	reduce the bath agitation
	c) bath load is to low	increase the working load
	d) metallic contamination	analyse: work out or new make-up
	e) organic contamination	throw away the bath and make a new bath make-up
roughness in the deposits	a) bath contamination by small solid particles, metal abrasion...	control the filtration (pore size: approx. 5 µm)
	b) bath solution is turbid	maybe can occur at too high pH-values: check and adjust the pH-value
	c) make-up water is contaminated	check the water quality
	d) too fast or too high dosage of the additives in the deposition	dose the additives portion by portion over the day (or automatically) , choice adding area far away from the parts
	e) magnetism in the substrate	demagnetize substrate before plating
	f) filter bag is contaminated	change filter bag regularly
streaks in the deposits	a) gas streaks by sort of agitation/part fixation	control agitation and part fixation
	b) drag-in of silicates	change pre-treatment or make a fluoric post-dip
	c) rinsing method is inefficient	improve the rinsing procedure
	d) metallic contamination	analyse: work out or new bath make-up
	e) organic contamination	throw away the bath and make a new bath make-up
	f) bath agitation is inefficient	improve the bath agitation
	g) bath load is to low	increase the working load
	h) Reductor content is too low	analyse and correct the content
pitting	a) heavy metal contamination	analyse: work out or new bath make-up
	b) too high bath activity	lower pH-value, temperature and bath load
	c) Reductor content is wrong	analyse and adjust/work out
matte deposits	a) organic contamination	throw away the bath and make a new bath make-up
	b) bath parameters are nor correct	analyse the bath completely
	c) metallic contamination	analyse: work out onto a large surface
	d) bath is too old	throw away the bath and make a new bath make-up
poor adhesion	a) zinc content is too high	throw away the bath and make a new bath make-up
	b) pre-treatment is insufficient	improve the pre-treatment
	c) passivated parts	reduce the transfer times
	d) drag-in of (pickling-) inhibitors	improve the rinsing process
	e) quality of the basic material	control the alloy