ACCU-LABS INC.

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A2LA Accredited ISO/IEC 17025:2005 Certificate # 2558.01

387 High-Phosphorus Electroless Nickel Plating System

The 387 System is specifically formulated to produce a semi-bright to bright nickel-phosphorus deposit at a consistent rate of deposition. The 387 System is recommended for applications requiring minimum deposit porosity for severe corrosive environments.

The 387 System offers the following characteristics:

- Exceptional Stability
- High Corrosion Resistance
- Consistent Rate of Deposition
- Good Ductility, Compressively Stressed
- Low Operating Cost
- Meets Mil-C-26074E and AMS 2404C Specifications

DEPOSIT PROPERTIES:

Phosphorus Content	10%-13% Typical Weight Percentage
Melting Point	1620°F
Density	7.85 Grams per Cubic Centimeter
Hardness	480-540 HK_{100}
Magnetic Properties	Non-Magnetic
Nitric Acid Test	Passes
Hydrochloric Acid Test	Passes
Neutral Salt Spray	Up to 1000 hours *(see optimization note)

BATH OPERATING DATA:

Solution Make-up Materials Required:

- 387-N (Nickel Component) 7% by volume
- 387-M (Make-up Component) 15% by volume
- DI water to operating volume
- 50% Ammonium Hydroxide Solution to raise pH to recommended range for steel substrates
- Potassium Carbonate Solution to raise pH to recommended range for aluminum substrates

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Accu-Labs 387 Make-up Procedure:

- Add DI water to properly cleaned and passivated tank (fill to half volume)
- Add required amount of 387-M
- Add required amount of 387-N
- Fill tank to ~99% of working volume DI water
- Mix thoroughly with solution filtration and slight to moderate air agitation
- Heat to 190°F & analyze nickel content and adjust to 6.0 g/l
- Check pH and adjust to 4.90 *(see optimum corrosion protection guidelines below)

Recommended Operating Parameters:

Component	**Range**	**Optimum**	*** Optimum Corrosion Protection**
Nickel Metal	5.10-6.30 g/l	6.0 g/l	6.0 g/l monitor consistently and maintain 90% - 100%
Sodium Hypophosphite	27.0-33.0 g/l (submit periodic samples to Accu-Labs)	30.0 g/l	30-33.0 g/l (submit periodic samples to Accu-Labs)
pH (use properly calibrated equipment)	4.30-5.10	4.90	***4.3 – 4.5 Monitor & maintain consistently***
Temperature	185-195° F	190° F	190°F (adjust upward as bath ages if necessary)
Bath Loading Sq Ft/Gal	0.10-1.0Ft²	0.50	0.40-0.80

Note: pH can be adjusted upward with a 50% solution of ammonium hydroxide. Potassium carbonate is preferable when plating on aluminum. If pH needs to be adjusted downward a solution of 10% sulfuric acid can be used. **pH may require upward adjustment as bath ages; your application may vary.**

Typical Bath Performance:

- Plating Rate-Typically 0.30 mils/hour with parameters at optimum for corrosion resistance

Bath Maintenance: To ensure proper operation of the 387 system, the solution chemistry should be maintained using the aforementioned operating parameters. This is accomplished by measuring and monitoring the nickel metal concentration. Upon determination of the nickel metal concentration, additions of both 387-N and 387-R are made based on the following replenishment guide for a 100 gallon bath:

Nickel %	**Nickel Concentration**	**Additions 387-N**	**Additions 387-R**
100	6.0 grams per liter	None	None
95	5.7 grams per liter	1.3 liters	1.3 liters
90	5.4 grams per liter	2.6 liters	2.6 liters
85	5.1 grams per liter	3.9 liters	3.9 liters
80 (split additions)	4.8 grams per liter	7.8 liters	7.8 liters
75 (split additions)	4.5 grams per liter	9.1 liters	9.1 liters

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NICKEL METAL DETERMINATION:

Reagents:

- 0.0575M EDTA
- 50% Ammonium Hydroxide
- Murexide Indicator

Procedure:

- Add 10 ml of cooled bath sample to 100 ml DI water
- Add 10 ml ammonium hydroxide solution
- Add 0.2 grams murexide indicator
- Titrate with EDTA from pale yellow to purple (violet) end point
- Record number of mls of EDTA titrated

Calculation:

- Mls of 0.0575 x 0.339 = grams/liter nickel (17.7 mls of titrated EDTA = 6.0 g/l nickel metal)
- Mls of 0.0575 x 5.654 = % nickel metal in solution (17.7 mls of titrated EDTA = 100%)

Handling Considerations:

When handling Accu-Labs 387 components proper precautions should be observed. Do not take internally and avoid contact to skin and eyes. Wear clean chemical resistant gear, goggles, gloves, apron, footwear, and face shield. Refer to MSDS prior to using.

Notice of Disclaimer: The recommendations contained within this technical data are made in good faith and are based on our technical background and experience. However, since the conditions of use are beyond our control, this knowledge is given on the express terms and agreement that Accu-Labs, Inc. will not be held liable to any person in contract, tort (including negligence), strict liability, or otherwise any claims, damages, or losses whatsoever. Nothing herein shall be deemed a testimonial to use any product or process in infringement of any existing patent rights and no guarantees, expressed or implied, are made regarding information, product, processes, recommendations, description and safety notations contained herein.