# PERFORMA 285

A High Efficiency Zinc/Nickel (12-15%) Electroplating Process

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| • General Description | The PERFORMA 285 process is an extremely reliable, production proven technology for depositing 12-15% wt nickel, zinc/nickel alloy coatings from an alkaline electrolyte. The addition agent system offers exceptionally high performance, is easy to use in production and provides exceptional corrosion protection, even after thermal shock at 120° C (250° F.) for 24 hours. Deposits are uniformly bright and readily accept trivalent passivates (clear, black) as well as hexavalent chromate conversion coatings (clear, yellow, black).<br><br>The PERFORMA 285 process is suitable for either rack or barrel plating installations and will provide maximum performance and the highest cathode efficiency when it is used in conjunction with COVENTYA's patented membrane anode system. These systems are individually engineered to meet the needs of a specific installation, so consultation with your nearest COVENTYA representative is necessary. |
| • Product Features | • Deposits are bright and burn-free, even at high current densities.<br>• Deposits do not display whiskers when bent after plating.<br>• Deposits are blister free, and exhibit excellent adhesion characteristics.<br>• The combination of this unique addition agent technology and COVENTYA's superior external generator technology makes precise zinc metal control easy and inexpensive.<br>• Less variation of nickel content as a function of current density than with competitive processes.<br>• Excellent covering power and uniformity of plate distribution.<br>• Suitable for either rack or barrel plating installations.<br>• Process is easy to use in production and offers higher cathode efficiency than competitive processes. This translates to reduced plating times and increased production.<br>• Deposits offer exceptional corrosion protection, even after thermal shock.<br>• Excellent replacement for cadmium. |

## Make-Up and Maintenance of the Plating Bath

- **Solution Composition**

Rack Installations:

| | Range | Optimum |
|---|---|---|
| Zinc Metal | 7-10 g/l (0.9-1.3 opg) | 8 g/l (1.1 opg) |
| Nickel Metal | 1-1.8 g/l (0.13-0.24 opg) | 1.2 g/l (0.16 opg) |
| PERFORMA 285 NI-CPL | 10-18 ml/L (1-1.8% v/v) | 12 ml/L (1.2% v/v) |
| Caustic Soda | 120-135 g/l (16-18 opg) | 125 g/l (17 opg) |
| Temperature | 24-28° C (76-82° F) | 26° C (79° F) |
| Sodium Carbonate | <45 g/l (<6 opg) | <45 g/l (<6 opg) |
| Cathode Current Density | 1-3 A/dm² (10-30 A/ft²) | 2 A/dm² (20 A/ft²) |
| Anode Current Density | > 4 A/dm² (>37 A/ft²) | > 4A/dm² (> 37 A/ft²) |
| Anodes in Plating Bath | | Nickel/Nickel Plated Steel Grating Membrane or Ceramic |
| Filtration | | |
| Plating Bath | | Continuous (2-3 times/hour) |
| Generator Tank | | Same |
| Agitation | | Mechanical (4-6 m/min) |
| PERFORMA 285 Base | 90-110 ml/l (9-11% v/v) | 100 ml/l (10% v/v) |
| PERFORMA 285 BRI Universal | 1.5-2.5 ml/l (0.15-0.25% v/v) | 2.0 ml/l (0.2% v/v) |
| PERFORMA 285 Additive K | Typically only needed to make corrections 5-10 ml/l (0.5-1% v/v) | 7.5 ml/l (0.75% v/v) |

| Barrel Installations: | Range | Optimum |
|---|---|---|
| Zinc Metal | 9-12 g/l (1.2-1.6 opg) | 10g/l (1.4 opg) |
| Nickel Metal | 1.2-2.0 g/l (0.16-0.27 opg) | 1.4 g/l (0.19 opg) |
| PERFORMA 285 NI-CPL | 12-18 ml/L (1.2-1.8% v/v) | 14 ml/L (1.4% v/v) |
| Caustic Soda | 120-135 g/l (16-18 opg) | 130 g/l (17.5 opg) |
| Temperature | 26-30° C (79-86° F) | 28° C (82° F) |
| Sodium Carbonate | <45 g/l (<6 opg) | <45 g/l (<6 opg) |
| Cathode Current Density | 0.5-1 A/dm² (5-10 A/ft²) | 0.8 A/dm² (8 A/ft²) |
| Anode Current Density | > 4 A/dm² (>37 A/ft²) | > 4A/dm² (> 37 A/ft²) |
| Anodes in Plating Bath | | Nickel / Nickel Plated Steel Grating Membrane or Ceramic |
| Filtration | | |
| Plating Bath | | Continuous (2-3 times/hour) |
| Generator Tank | | Same |
| Barrel Rotation | | 3-4 RPM |
| Barrel Perforation Size | | > 3mm |
| PERFORMA 285 Base | 90-110 ml/l (9-11% v/v) | 100 ml/l (10% v/v) |
| PERFORMA 285 BRI Universal | 1.0-2.0 ml/l (0.1-0.2% v/v) | 1.5 ml/l (0.15% v/v) |

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| • Make-Up Procedure | 1. Clean the tank to be used for the new plating solution.<br>2. Make-up the base electrolyte (zinc metal and caustic soda) per the composition suggested above. Contact your COVENTYA representative for special bulletins covering various make-up procedures utilizing proprietary make up concentrates. *Note: Do not proceed to Step 3 until the temperature of the electrolyte has cooled to 28° C (82° F).*<br>3. Add the required amount of PERFORMA 285 Base and mix well.<br>4. Add the required amount of PERFORMA 285 BRI Universal and mix well.<br>5. If recommended, add the required amount of PERFORMA 285 Additive K and mix well.<br>6. Add the minimum amount of PERFORMA 285 NI-CPL (see note below) and mix well.<br>7. Analyze solution, and adjust to final bath composition suggested above for the type of installation involved (rack or barrel).<br>8. Prior to beginning regular production plating, electrolyze the solution for a short period of time at normal current densities. Electrolyzing the bath for approximately 2.5 AH/liter (10 AH/gallon) of solution is generally sufficient.<br>9. A 2amp/30 minute Hull cell test should now be conducted for rack baths; a 1amp/30 minute panel for barrel baths. With a new make-up, the panel may be full bright. For operating solutions, a full bright panel is not typical (see PERFORMA 285 Training Guide). A nickel anode is used when running Hull cell tests on the PERFORMA 285 process operating solution. The extended plating time depletes the zinc content in the cell, so the solution should be changed between each panel that is run.<br>***Notes:*** ***We recommend using the minimum concentrations of zinc, nickel and caustic at make-up. Each will rise to their normal optimum levels through normal bath replenishment on an amp-hour basis.***<br>***To minimize possible precipitation of nickel compounds, premix PERFORMA 285 NI-CPL with PERFORMA 285 Base in the ratio of 2 parts NI-CPL to 1 part Base.*** |

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| • Operating Conditions | **Operating Notes:**<br>• The zinc concentration must be kept within the indicated limits. A zinc generator is essential.<br>• The electrolyte must be analyzed regularly (at least once per day, preferably once per shift), adjusted and maintained. Large variations in zinc must be avoided!<br>• The caustic concentration must be analyzed and adjusted using liquid caustic (highest quality available).<br>• The nickel concentration must be analyzed and adjusted using PERFORMA NI-CPL (10 ml/l (1%) of PERFORMA NI-CPL will increase the nickel by 1 g/l (0.134 opg)).<br>• It is important to routinely check the replenishment of the additives to ensure consistent production quality. Automatic feed control units are recommended.<br>• All alkaline electrolytes form carbonates. The accumulation of carbonates reduces bath efficiency. It is important to maintain the carbonate level below 60 g/l (8 opg) for consistent performance.<br><br>**Addition Agents:**<br><br>There are four liquid addition agents used when making up and operating baths utilizing the PERFORMA 285 process. The rates at which these individual additives are consumed depend upon the amp-hours of plating done, as well as the typical current density at which plating is done, and dragout factors.<br><br>The four additives are:<br><br>1. PERFORMA 285 Base: The primary make-up additive. Provides grain refinement, proper alloy composition, and maximizes current density at which plating can be performed.<br><br>2. PERFORMA 285 BRI Universal: Works synergistically with the other PERFORMA 285 process additives to ensure proper deposit brightness and to extend the limiting current density at which plating can be performed.<br><br>3. PERFORMA 285 Additive K: May be used to ensure mid to low current density clarity.<br><br>4. PERFORMA 285 NI-CPL: Used to establish and maintain the correct level of nickel in the operating solution. |
| • Equipment | **Anode Options: Nickel / Nickel Plated Steel / PMS / 3S**<br><br>All zinc/nickel plating baths gradually build up in decomposition products that reduce cathode efficiency. This is true regardless of the proprietary process being used. This effect is more apparent in barrel plating installations than rack installations. This detrimental effect can be eliminated by using one of the options COVENTYA offers for preventing certain electrolytic reactions from occuring at the anode.<br><br>For installations that are not interested in these special anode options, the most popular anode choice is flat nickel sheets that are at least 6.7 mm (1/4") thick. Another option is to use nickel plated, perforated flat steel plates, similar in thickness to the pure nickel sheets.<br><br>Submerged, nickel plated, steel anode rails are suggested in the plating bath, and will reduce clean-up time on the equipment, and provide better contact of the anodes to the buss bar. |

Titanium baskets should never be used in a PERFORMA 285 process solution due to the poor electrical conductivity of titanium. Likewise, titanium baskets should never be used in the external zinc generator because they will retard the proper chemical dissolution of zinc.

**Filtration:**

Continuous filtration is required at a rate of 2-3 turnovers per hour to remove particles that might cause shelf roughness. In addition, filtration of the off-line zinc generator tank is required to remove material that may accumulate as zinc balls dissolve.

**Agitation:**

Some type of agitation is recommended to prevent cathode gas streaking. COVENTYA recommends either cathode rod movement, or returning the filtered solution to the plating bath through eductors. In barrel plating installations the barrel rotation typically provides sufficient agitation.

**Tanks:**

Lined steel, plastic or polypropylene are acceptable materials.

- **Replenishment Additions**

Replenishment additions of all additives should be based on the number of amp-hours of plating since the last addition. Production experience will determine the exact amount required, but a suggested starting point is as follows:

| | Rack | Barrel |
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| PERFORMA 285 Base | 1.5-2.5 liters / 10,000 AH (1 gallon / 15,000 – 25,000 AH) | 1.0-2.0 liters / 10,000 AH (1 gallon / 20,000-37,000 AH) |
| PERFORMA 285 Additive K | Typically only needed for corrections | |
| | 0.2-1.0 liters / 10,000 AH (1 gallon / 37,850-190,000 AH) | Not normally needed |
| PERFORMA 285 BRI Universal | 0.5-1.5 liters / 10,000 AH (1 gallon / 25,000-75,000 AH) | 0.5-1.5 liters / 10,000 AH (1 gallon / 25,000-75,000 AH) |
| PERFORMA 285 NI-CPL * | 8.0-12.0 liters / 10,000 AH (1 gallon / 3,150 – 4,750 AH) | 8.0-12.0 liters / 10,000 AH (1 gallon / 3,150 – 4,750 AH) |

- Do not make additions of PERFORMA 285 NI-CPL in increments greater than 0.05% by volume. Smaller, more frequent additions are always suggested since they will minimize operating costs and provide more consistent production results. Also additions should be spread evenly across the surface of the plating solution, and should be mixed into the bath to ensure uniform composition.

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| • Typical Processing Cycle | 1. Soak Cleaner<br>2. Electro Cleaner<br>3. Cold Water Rinse<br>4. Cold Water Rinse<br>5. Hydrochloric Acid Pickle<br>6. Cold Water Rinse<br>7. Cold Water Rinse<br>8. Alkaline Pre-dip (80-100 g/l)<br>9. PERFORMA 285 Process<br>10. Cold Water Rinse<br>11. Cold Water Rinse<br>12. FINIDIP/LANTHANE<br>13. Cold Water Rinse<br>14. Cold Water Rinse<br>15. FINIGARD/ POSTDIP<br>16. Dry |

## Waste Management

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| • General Comments | Local waste treatment regulations vary considerably from area to area. Consequently, it is not possible to state the proper waste treatment procedure that will meet all requirements. Furthermore, the PERFORMA 285 process contains a complex mixture of materials that will chelate nickel ions so they can be deposited from this alkaline electrolyte. These chelators are stable and difficult to treat. COVENTYA offers a full line of proprietary OMEGA Water Care products, and can assist companies in meeting their local effluent limits. Contact your local COVENTYA representative for additional information on the best way for you to meet your local effluent requirements. |

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| • Safe Handling | The PERFORMA 285 process addition agents are safe to handle however, the preparation, maintenance, and disposal of solutions containing them require the handling of highly alkaline materials. Avoid contact with the skin or eyes. Wear proper protective clothing. If solution is splashed in the eyes, flush immediately with large volumes of cold water, and rinse with a 5% boric acid solution, and seek medical assistance as soon as possible. |
| • Storage Considerations | The PERFORMA 285 process addition agents are stable upon standing, and exhibit excellent shelf life. They do not require any special storage precautions, other than they should not be exposed to extremely low temperatures for prolonged periods of time. The addition agents are not combustible. Despite the excellent shelf life, proper inventory rotation is recommended. |

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| • Product Information | Product Name / Appearance / Specific Gravity<br>PERFORMA 285 Base — Light Yellow Solution — 1.020 (@25° C)<br>PERFORMA 285 BRI Universal — Light Yellow Solution — 1.050 (@25° C)<br>PERFORMA 285 Additive K — Clear Solution — 1.020 (@25° C)<br>PERFORMA 285 NI-CPL — Dark Green Solution — 1.260 (@25° C) |
| • IMDS Number | 736126 |
| • Disclaimer of responsibility | The data set forth in this bulletin is believed by COVENTYA, Inc. to be true, accurate, and complete, but is not guaranteed. Our sole warranty is as stated in our Standard Terms and Conditions of Sale. We cannot warrant that our customers will achieve the same results from any process, chemical or product described in this bulletin because we do not have control over the conditions of use; nor can we assume any responsibility for our customer's use of any of our products in a manner which infringes the patents of third parties. |