

## DURNI-COAT® DNM-4 Process

### Electroless nickel process for the plating of magnesium surfaces

**DNM-4** is a process which has been specially developed for the direct electroless nickel plating of magnesium alloys, such as AM50, AZ61 and AZ91, for example.

**DNM-4** offers a simple four-stage procedure as compared to conventional processes, which require many more process stages. The process operates without chromic acid.

#### Procedure

|                        |                       |            |                            |
|------------------------|-----------------------|------------|----------------------------|
| 1. Alkaline degreasing | <b>RIAG Clean 601</b> | 45 – 55 °C | 280 – 320 s                |
| 2. Rinse               |                       |            |                            |
| 3. Activator           | Fluoride              | 18 – 25 °C | 20 – 120 s                 |
| 4. Rinse               |                       |            |                            |
| 5. Magnesium pickling  | Special formula       | 38 – 42 °C | 240 – 360 s                |
| 6. Rinse               |                       |            |                            |
| 7. Activator           | Fluoride              | 18 – 25 °C | 20 – 120 s                 |
| 8. Rinse               |                       |            |                            |
| 9. Magnesium pickling  | Special formula       | 38 – 42 °C | 90 – 120 s                 |
| 10. Rinse              |                       |            |                            |
| 11. Electroless nickel | <b>DNM-4</b>          | 86 – 94 °C | 1 – 30 µm<br>= 4 – 140 min |
| 12. Rinse              |                       |            |                            |
| 13. Drying             |                       |            |                            |

Possible mechanical pre-treatments include: Grinding, blasting with corundum or glass beads. Care must be taken to ensure that the blasting agent is **only used for blasting magnesium**. The base materials must be free of: chromations, temporary corrosion layers, cutting or grinding auxiliaries, oils and treatment auxiliaries of any kind containing silicon.

## Alkaline degreasing

**RIAG Clean 601** is an alkaline degreasing agent for the removal of various impurities from magnesium surfaces such as AM50, AZ61 and AZ91.

### Container equipment and working parameters

|                |   |
|----------------|---|
| Tank material  | Sheet steel, stainless steel or other materials suitable for alkaline solutions |
| Racks          | Fully insulated racks must be used to hold the parts to be plated               |
| Heating        | PTFE, stainless steel, immersion heaters or heating element made of steel       |
| Agitation      | In order to ensure thorough cleaning, gentle movement is recommended            |
| Temperature    | 50 °C (45 – 55 °C)  |
| Treatment time | 280 – 320 s   |

### Maintenance

The solution should be analysed at regular intervals and supplemented by addition of the required quantity of **RIAG Clean 601**. The solution should be discarded and formulated anew as soon as the impurities are so great that the cleaning effect of the solution is substantially impaired.

### Activator

The activator is an acidic solution containing hydrofluoric acid, especially developed for the activation of magnesium alloys.

### Tank, equipment and working parameters

|                 |   |                                       |
|-----------------|---|---------------------------------------|
| Tank material   | Polypropylene or polyethylene                                       |                                       |
| Heating         | PTFE, electrical immersion heaters or steam-heated heating elements |                                       |
| Exhaust         | Required  |                                       |
| Agitation       | Required  |                                       |
| Temperature     | 18 – 25 °C  |                                       |
| Treatment times | 1.) 20 – 120 s  | 2.) 20 – 120 s depending on the alloy |

## Make up of 100 litres Activator solution

|                             |  |
|-----------------------------|--|
| Water, demineralised        | 70 L   |
| <b>DNM-4 Activator salt</b> | 10 kg (contains ammonia hydrogen difluoride) |
| <b>DNM-4 Activator acid</b> | 20 L (contains hydrofluoric acid)            |

1. Fill the tank with 70 % of demineralised water.
2. Carefully add the **DNM-4 Activator salt** while stirring. Continue stirring until the salt has dissolved.
3. Carefully stir in the **DNM-4 Activator acid** (strong acid).
4. Dilute with demineralised water to make up the desired working volume and mix well. Allow the solution to cool to room temperature.

## Maintenance

The pH value of the solution should be checked at regular intervals. In the case of values over 3.7, it has to be adjusted to pH 3.5 using **DNM-4 Activator acid**.

The bath life varies according to the impurities introduced and the desired etching rate.

As a basic rule, however, the bath must be renewed after a throughput of 60 – 70 dm<sup>2</sup> surface per litre of the bath. Care must be taken that no turbidity occurs.

## Wastewater treatment

Rinsing water and bath concentrates contain fluorides. The fluoride precipitation is carried out with lime water at a pH value of approx. 8.5 – 9.5.

A sufficient reaction time of at least 60 minutes should be observed. Then the filtration is carried out.

The filtrate must be passed to the wastewater plant. The filter residues must be disposed of as special waste.

## Magnesium pickling

The magnesium pickling contains a conducting salt and a conditioning substance and is used for the conditioning of the surface before electroless nickel plating.

## Container equipment and working parameters

|                |   |                 |
|----------------|---|-----------------|
| Tank material  | Polyethylene, PVC or Polypropylene  |                 |
| Heating        | PTFE, Glass or Porcelain, electrical immersion heaters or steam-heated heating elements |                 |
| Exhaust        | Required  |                 |
| Filtration     | Required. Cartridge filter type 5 µm.   |                 |
| Agitation      | Required  |                 |
| Temperature    | 40 °C (38 – 42 °C)  |                 |
| Treatment time | 1.) 4 – 6 min   | 2.) 1.5 – 2 min |

## Make up of 100 litres Magnesium pickling solution

|                                   |       |
|-----------------------------------|-------|
| Water, demineralised              | 85 L  |
| <b>DNM-4 Pickling Salt</b>        | 10 kg |
| <b>DNM-4 Pickling Additive SK</b> | 5 L   |

## Maintenance

The solution is operated up to throughput of 60 – 70 dm<sup>2</sup> surfaces per litre of the bath. Care must be taken that no turbidity occurs.

## Wastewater treatment

Rinsing water and bath concentrates contain complexing agents and must without exception be subjected to a special treatment.

A pH value <1 is set using hydrochloric acid. After a reaction time of 4 h, the complexing agents have been destroyed. The treated solution can then be passed to the wastewater plant.

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