

**Technical Data Sheet****Marshal EN 825**

EN 825 is an electroless Nickel plating system capable of producing deposits with relatively higher Phosphorus content (10 ñ 12 %)

- Semi bright Deposit
- Higher deposition rate
- Longer bath life
- Compatibility for Steel and Aluminum Components

Deposit Characteristics

❖ Phosphorus content	12 % (10 to 12 %)
❖ Density	7.8 (8 to 7.6)
❖ Hardness	450 HV
After heat treatment	
For 1 Hr. at 350 Deg.C	700 to 800 HV
For 4 Hr. at 350 Deg.C	9000 to 1000 HV
❖ Magnetic Property	Non magnetic
❖ Corrosion Resistance	
For 25 micron deposit	
➤ Neutral Salt spray	1000 hrs.

EN 825 electroless system is provided with three components, EN 825 A,B,C.

Solution Makeup for 100 liters.

D.I. Water	76 Lit
EN 825 A	6 Lit
EN 825 B	18 Lit

1. Take 76 lits of distilled or deionised water.
2. Add 18 lits of EN 825 B, while working bath is under continuous air agitated and filtration. Add 6 lits of EN 825 A. Ensure complete mixing.



3. When solution is clear, adjust pH between 4.8 to 5.1 using Dilute Sulphuric Acid or Ammonia Solution.
4. Continue filtration until solution is clear , when it is ready to use.

Operating Conditions:

◆ Temperature	88 to 93 Deg.C
◆ pH	4.8 to 5.1
◆ Bath Loading	1.0 to 2.3 dm ² per lit operating bath
◆ Concentration of Ni	5.8 gm/l
◆ Reducer Concentration	156 to 203 ml/lit

PH Control:

The addition of EN 825 A and C will normally hold the pH constant , however the pH should be checked electrometrically from time to time and adjusted when necessary using dilute sulphuric acid or 10% Potassium Carbonate solution (or 50 % Ammonia solution)

DO NOT ALLOW SULTION TO STAND AT WORKING TEMPERATURE WITHOUT PROCESSING WORK THRO IT.

3. EQUIPMENT:

Glass , Stainless Steel (EN 58J grade is preferred) previously passivated for 2 hours with Nitric Acid before use. Tanks fitted with loose polythene liners are preferred and strongly recommended. PTFE coated tanks have been found satisfactory. If these types of tanks are used , they should not be cleaned by scrubbing action as this will cause Nickel deposit on the lining.

It is pointed out that certain tank linings will require treating with Nitric Acid before using the EN 825 operating solution.

If it is found with any linings, including polythene, that seeding on the lining occurs , then the lining should be pre treated in 5% Nitric Acid (by volume) for 15 minutes at room temperature(18 C) to eliminate this effect.

Titanium Tanks:

Where EN 825 solution is to be installed in Titanium Tanks, ensure that tank is made anodic with a current density of 0.005 amp / dm² (0.05 amps / sq. inches) of anode area. The cathode will be a rigid mild steel rod.. However certain grades of Titanium may require verification of the above current density.

Ensure that the tank has been treated to give anodic film prior to the Electroless Nickel agents being added. The anodic protection can be effected by filling the tank with 10 -20 % sulphuric Acid and applying a voltage across the tank of 16 - 20 volts, the tank being anodic for 2 hours. The higher the current density , the thicker is the anodic film.

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Heating:

It is recommended that double tank system is used , where outer tank is filled with water , glycol or other suitable heat transfer liquid , and outer tank is heated with an electric or steam coil heating unit. However, heating system with glass or silica with appropriate heating capacity may be used. In order to avoid decomposition of the electroless nickel bath, ensure air agitation while heaters are on. The operating solution is highly active above 70 deg C. Remove fine deposits, should it occur on the heaters by using Nitric Acid.

Filtration:

Filter used should be of all polypropylene or stainless steel construction. The unit should be thoroughly cleaned and treated with 30 % Nitric Acid and again rinsed through with water before use.

If the solution is filtered at working temperature , then particular care to cleanliness is required.

Storage:

EN 825 concentrates, presents no problem under normal condition. The products should not be stored below 10 C. In the event of crystallization due to lower temperature, immerse the container in warm water. Stir the contents to ensure a homogenous mixture before use. Maximum storage temperature is 40 C.

SOLUTION MAINTENANCE:

Approximate consumption of the concentrates are;

For every 1 gm of Nickel	add	10 ml	of EN 825 A
		10 ml	of EN 825 C

Alternatively, for every 10 micron/dm ²	add	8.0 ml	of EN 825 A
		8.0 ml	of EN 825 C

Analytical Procedures

Estimation Of Nickel Content:

1. Take 5 mls of the bath solution.
2. Add 50 mls of distilled water plus a few drops of ammonia.
3. Add few grains of Murexide indicator.
4. Titrate using 0.10 Molar EDTA solution to purple end point.

Calculation :

$$\text{ml. titrated} * \text{M E.D.T.A.} * 11.738 = \text{g/l Ni}$$

To raise 1 gm/lit Nickel add 10 ml/lit EN 825 A

Estimation Reducer:

1. Take 5 mls of the bath solution in a conical flask with stopper.

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2. Add 50 mls of distilled water followed
3. Add 25 ml of 6 N Hydrochloric Acid and 50 mls 0.1N Potassium Iodate solution.
4. Add 1 gm of Potassium Iodide Crystals
5. Stopper the flask and leave for 30 minutes in a dark place.
6. Titrate with 0.1 N Sodium Thiosulphate , using starch indicator till colorless end point.

$$[(\text{ml of KIO}_3 * N \text{ KIO}_3) - (\text{ml Na}_2\text{S}_2\text{O}_3 * N \text{ Na}_2\text{S}_2\text{O}_3)] * 94.62 = \text{ml/lit Reducer}$$

Normal range should be maintained between 156 - 203 ml/lit.

To raise 1 ml/lit reducer add 0.24 ml/lit EN 825 C

Estimation of Phospite Ion:

1. Take 2 mls of bath solution in a conical flask with stopper.
2. Add 50 mls of distilled water followed by 20 mls of 5% Sodium Bicarbonate solution.
3. Add 50 mls of 0.1N Iodine. Stopper and keep for 20 minutes in a dark place.

$$(\text{mls 0.1 N Iodine}) - (\text{mls 0.1 N Sodium Thiosulphate}) \times 5.5 = \text{gms /lit Sodium Phosphite}$$

The process will operate satisfactorily with up to 250 gms / lit of Sodium Phosphite in solution.

5.HEALTH & SAFETY:

EN 825 A concentrate is Acidic. However EN 825 B and C are mildly alkaline. Nevertheless the normal precaution when handling chemicals should be followed. Do not take internally and wear face masks and protective clothing when handling them



TROUBLE SHOOTING GUIDE

<u>Problem</u>	<u>Cause</u>	<u>Remedy</u>
Roughness	a. Precipitated or suspended material iron , filter media, high phosphite concentration	Filter to remove precipitated material.
	b. Poor cleaning and / or rinsing prior to EN 825 operating bath.	Improve cleaning and / or rinsing.
Pitting	a. Suspended material in solution	Filter to remove
	b. Oil or other organic material	Filter through activated carbon at room temperature
	c Low Reducer	Check the analysis and replenish
Brightness	a. Organic contamination	Filter through activated carbon at <u>low</u> temperature.
	b. High activity	Adjust Reducer content.
	c.High pH	Adjust pH to recommended range. Check for accuracy of pH measurement. Electronic measurement is recommended.
Blistering	a. Improper cleaning or preparation	Improve cleaning
	b. Improper zincating of aluminium	Check and adjust zincate. Improve rinsing
	c. Improper heat treatment	Heat treat for 1 hour at 400 C in an inert atmosphere
Patterns& Streaking	a. Pattern in base material	Polish and buff to remove patterns
	b. Improper cleaning or rinsing	Improve cleaning or rinsing
	c. Work load too close to tank or other parts	Separate parts - keep work 30 away from tank sides.
	d. Lack of agitation	Install agitation device
	e. Gas pattern due to positioning of work	Reposition pieces to avoid gas streaking, use mild agitation

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	f. Low Load rate	Increase load rate to optimum of 1 - 2.3 dm ² (15 - 35 sq.inch / lit.)
Adhesion	Improper cleaning and rinsing	Improve cleaning and rinsing.
Speckling	Suspended particles in solution	Filter solution
Bath Decomposition	a. Temperature too high	Reduce temperature to recommended range or increase agitation
	b. Reducer concentration too high	Reduce EN 825 C addition
	c. Imbalance in chemistry	Analyze and adjust bath activity to recommended range
	d. Metallic or solid particles in bath (flaking off of defective nickel deposit)	Cool solution and filter to remove particles
	e. Plating on side tanks	Remove solution from tank and clean out deposited nickel.
Low Deposition rate	a. Low solution temperature	Increase temperature to recommended range.
	b. Cooling of solution by work load	Pre heat work in hot water
	c. Low Ni or reducer concentration	Analyse and adjust.
	d. Low pH	Increase pH to recommended range with Sodium Carbonate solution / ammonia
	e. High load rate	Decrease load rate to a maximum of 1 - 2.3 dm ² (15 - 35 sq ó) / lit of solution.
Rapid pH change	a. Introduction of acid / alkali in solution	Improve rinsing to prevent carry over
	b. High work load to solution volume solution	
	c. High temperature	
Black Deposit	a. Low reducer concentration	Increase reducer using EN 825 C
	b. Low bath activity	Raise solution activity to recommended range
	c. Metallic impurities	Discard part (or all) of the solution



		and replenish with new material. (See under Pattern/ Streaking)
	d. Organic impurities	
	e. Improper rinsing or cleaning	Carbon treat at low temperature. Improve cleaning / rinsing
Nickel seeding	a. Localized hot spots caused by poor heating arrangement on plant	Correct by altering heating solution
	b. Roughened tank lining	Replace pipe work , put in a tank liner
	c. Active tank lining , pumps etc	Remove solution from tanks etc. Re passivate plastic tanks and stainless steel etc. With Nitric acid. Titanium tanks must be re-anodised. Pumps and pipe works must be treated with Nitric acid
	d. Freshly prepared solution left without working	Remove solution in clean tanks, Clean pump, pipework etc with Nitric acid . Re install and work immediately.