



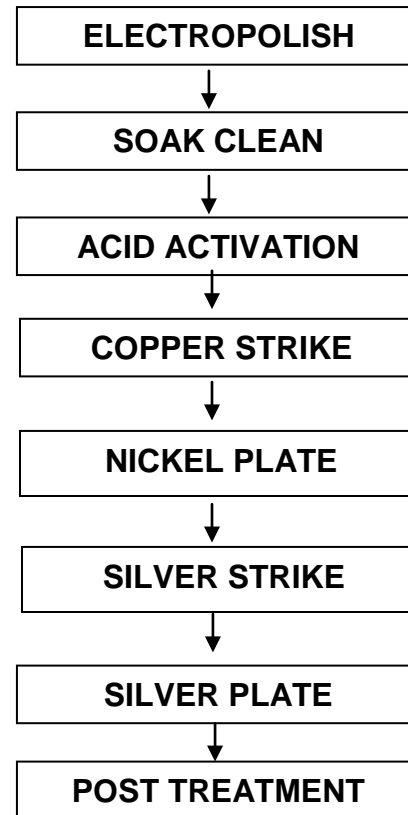
PROCESS APPLICATION GUIDE

LED SUBSTRATE PLATING

PLEASE NOTE: This document is for guidance only.
Please refer to the appropriate Technical Data Sheet for additional information.

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Process Flow



LED SUBSTRATE PLATING – RECOMMENDED PROCESS SEQUENCE

Process Step	Recommended Process	Description	Process Makeup	Temp.	Current Density	Dwell Time	Recommended Control and Replenishment Schedule	Comments
Electropolish	TechniPolish 3212	Electropolish	TechniPolish 3212 Concentrate: 300 ml/l Phosphoric Acid (75%): 700 ml/l	20- 60°C	5-40 ASD	5-120 sec	When specific gravity drops below 1.55 g/cc, add TechniPolish 3212 Conc until the SG falls within the proper operating range.	Phosphoric acid based anodic electropolishing process used for the treatment of copper, steel and stainless steel alloys
Soak Clean	Technic TEC 1016	Soak cleaner	Technic TEC 1016 30 – 45 g/l DI water: balance	60-71°C	NA	5-20 sec	Maintain by volumetric titration	Alkaline low foaming; chelated. Rapidly removes oils, grease, and other contaminants
Acid Activation	Techni ACT 9600	Mild descaler	ACT 9600 Salt: Cu alloys: 50 g/l Allioy 42: 150 g/l DI Water: balance	18-29°C	NA	20-60 sec	Replenish based on analysis; dump when Cu content exceeds 2 g/l	Acidic, non-foaming, mildly aggressive etch rate (1-3 μ-in/min). Effectively removes oxides & heat scale
Copper Strike	Techni Copper C	Cyanide copper plating process	Potassium cyanide: 28.5 g/l Potassium copper cyanide 160 ml/l Potassium hydroxide 22.5 g/l Copper “C” Brightener (optional) 20 ml/l Rochelle salts: 45 g/l DI water: balance	54-71°C	0.5 – 6 ASD	Dependent on thickness requirements	Maintain all components by analysis.	Recommended as a copper strike on difficult to plate metals for improved deposit adhesion and surface activation.

Process Step	Recommended Process	Description	Process Makeup	Temp.	Current Density	Dwell Time	Recommended Control and Replenishment Schedule	Comments
Nickel Plate	Goldeneye Nickel	High speed proprietary nickel plating process	Goldeneye Nickel Conc: 300 ml/l Goldeneye Makeup Solution: 550 ml/l Boric acid: 50 g/l Goldeneye Nickel Stress Reducer: 20 ml/l HN-5: 5 ml/l DI water: Balance	60-65°C	5-30 ASD	Dependent on thickness requirement ~3µm/min @ 15 ASD	Replenish based on analysis	A low stress/highly corrosion resistant process which exhibits superior thickness distribution, higher line speeds/yields and lower waste treatment costs.
Silver Strike	Techni Silver® Strike	Conventional silver strike for use in combination with the nickel underplate	Potassium Cyanide 90 g/l Potassium Silver Cyanide 3.75 g/l Deionized (DI) water: Balance	16-27°C	1.5-2 ASD	10 seconds	Replenish based on analysis	-Required for use in combination with Goldeneye Nickel to insure good adhesion -Must use live entry with anodes close to entry point -Good rinsing required between nickel and silver strike -Complete silver coverage over nickel underplate is critical to insure good adhesion

Process Step	Recommended Process	Description	Process Makeup	Temp.	Current Density	Dwell Time	Recommended Control and Replenishment Schedule	Comments
Silver Plate	Techni Silver® LED OR	Full bright silver for rack, barrel and medium speed/ reel to reel/flood plating applications	<p><u>For Rack/BBL:</u> Sodium Cyanide: 190 g/l Potassium Silver Cyanide: 37 g/l Techni Silver® LED LS Brightener: 100 ml/l Techni Silver® LED LF Primary: 2 ml/l Deionized (DI) water: Balance</p> <p><u>For Med Speed Reel to Reel/Flood:</u> Sodium Cyanide: 120 g/l Potassium Silver Cyanide: 111 g/l Techni Silver® LED MS Brightener: 130 ml/l Techni Silver® LED Primary: 13 ml/l Deionized (DI) water: Balance</p>	15-32°C	<p>0.5 – 2.0 ASD (rack) 0.5 – 0.8 ASD (barrel)</p> <p>5 – 10 ASD (med speed reel to reel/flood)</p>	Dependent on application	Replenishment of LS Brightener and MS Brightener is best determined by Hull cell tests	Produces ultra-bright and reflective silver deposits for LED substrate applications

Process Step	Recommended Process	Description	Process Makeup	Temp.	Current Density	Dwell Time	Recommended Control and Replenishment Schedule	Comments
	Techni Silver® EHS 3R	High speed pure silver plating process for high speed/selective plating applications	Deionized (DI) water: 700 ml/l Techni Silver® EHS 3R Makeup: 90 g/l Potassium Silver Cyanide: 120 g/l Techni Silver® EHS 3R Brightener NC: 20 ml/l Techni Silver® EHS 3R Additive R-2: 10 ml/l Additive S-1: 5 ml/l	45-80°C	5-100 ASD	Dependent on application	Replenish silver and free cyanide based on analysis. Adjustment of the Techni Silver® EHS 3R Brightener NC is made on the basis of Hull cell tests. Techni Silver® EHS 3R Additive R-2 should be replenished at 3-5 ml/amp hr, based on dragout. Additive S-1 is replenished at 0.8-1.3 ml/l for each complete bath turnover. The pH can be adjusted upwards with KOH, or downwards with dilute phosphoric acid.	Designed to deposit ultra-bright silver in spot plating and other selective high speed plating equipment for LED substrate applications. Operates at very low concentrations of free cyanide, and is used with inert anodes only. Deposit is exceptionally tarnish-resistant when used in combination with the Techniseal post-treatment process, and both the GAM and reflectance values are maintained during long term storage and/or after high temperature exposure.
Post-treatment	Techniseal OR	Electrolytic post-treatment process	Techniseal Concentrate: 300 ml/l Deionized (DI) water: 700 ml/l	25-45°C	7.5 – 10 ASD	10 – 30 seconds	Replenish based on UV/VIS Analysis	Electrolytic post-treatment process that provides a transparent, nano-scale protective coating on LED silver deposits. Improves corrosion resistance and minimizes GAM degradation. Improves reflectivity.
	Tarniban® LED	Immersion post-treatment process	Tarniban® LED Makeup Solution: 140 ml Tarniban® LED Concentrate: 140 ml Deionized (DI) water: Bal	38-54°C	N/A	Rack/barrel: 2-5 min Reel to reel/ high speed: 5-15 sec	N/A	Recommended when immersion process is required.

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