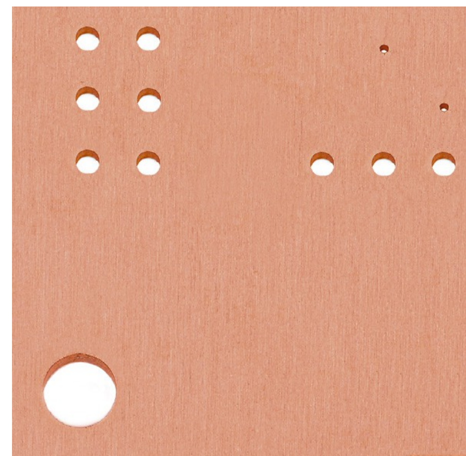
Bungard Plating System

Translation of the Original Instructions



Inhaltsverzeichnis

General....2
Safety Regulations....2
Bath Setup....4
Process Flow....5
Plating System Step1: Cleaner/Conditioner DS270....6
Plating System Step 2: Pre-Dip DS400 7
Plating System Step 3: Activator DS500....8
Plating System Step 4: Intensifier DS650 9
Plating System Step 5: Copper bath CU400....10
Disclaimer of Warranty....12

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General

Bungard Plating System

- Superior conductivity, through hole resistance <= 1 Ohm
- Perfect adhesion; produce PTFE without special treatment
- Selective, no barriers and pure copper-to-copper bonding
- The only Direct Plating System with perfect result in both vertical and horizontal applications
- Environmentally friendly with no chelators and low water consumption

High resistance is one of the key problems with today's Direct Plating processes. This is rather amazing as conductivity must be regarded as one of the first priorities of a Plating Through Hole process.

The through hole conductivity generates the throwing power in the electrolytic plating baths and insufficient throwing power leads to thin copper deposition in the holes.

Safety Regulations

General

Please read the following instructions carefully and pay particular attention to information on operating safety and set up.

Keep these instructions at a safe place. It contains information which also refer for later maintenance and cleaning. Carefully read the material safety data sheets of every chemical.

Chemistry may only be used in specially equipped rooms and be setup only by qualified staff.

Chemicals

Before Setup please check whether the materials of the machine possess sufficient resistance against the chemicals used.

Mix the chemicals outside the machine. Use a suitable container to prepare the chemicals.

Personal safety regulations

The following safety precautions should always be observed when handling chemicals (etching agent, acids, lyes, etc.):

a) Wear goggles and protective gloves for all work. When setting up copper bath with 98% sulphuric acid take extra protection measures: Wear protection overall and full face protection shield

b) If necessary only work under an extractor hood or at least in well ventilated rooms.

c) Avoid contact with skin, eyes and mucous membranes at all costs.

d) Take off clothing soaked in caustic substances immediately.

e) Rinse splashes on skin immediately with copious amounts of water.

f) In the event of accidents or feeling unwell, always consult a doctor.

g) Observe the safety instructions of the manufacturer or the supplier.

Bungard offers a laboratory starter set with useful equipment for setting up chemicals.

Electricity

Machine must be switched off, when setting up chemicals !

The chemicals have a high electrical conductivity. Any contact of the liquid with live parts therefore constitutes a serious threat to electrical safety. In such a case, the machine must be immediately disconnected from the mains and the defect must be eliminated immediately and professionally. This applies correspondingly with leaked or spilled chemicals.

Exhaust

An exhaust of air in the area above the machine body is recommended with regard to possible corrosive fumes.

Environmental protection

Dispose used etchant according to your local regulations. Pay heed to the material safety data sheet (MSDS) of your chemicals.

Setup

Make sure all canisters are well labelled. If in doubt, contact us !

Arrange canisters according to setup table

Keep buckets, sponges, paper towel, measuring cup, canister spout for 5 and for 25 L canisters at hand.

Put on protection clothing and gloves, control that all tanks are clean, turn on ventilation

Mix chemicals according to table below

Copper bath: fill in DI water and CU400C. After that slowly add sulphuric acid 98%. Wear face protection. Solution will heat up !! Give it time to cool down

Operation

Makes sure to close lids directly after every use

Avoid to drip chemicals from one bath into the other !!

Compensate evaporation losses with DI water (DS500: Compensate evaporation losses with DS 400 and DI water in ratio 2/8)

Production pause

If you will not be using the Compacta for a long time, it may be useful to fill the activator into a clean, airtight canister. This slows down the natural decomposition of the activator.

In addition, the anodes should be removed from the copper bath.

If the anodes remain in the copper solution, the anodes may polarize and block the material transfer between anode and cathode. If the anodes are passivated (gray color) or if the deposit is deficient, it is often helpful to remove the anodes from the bath and clean them (for example with a wire brush). Thereafter, the anodes must be reactivated (see section Anode Preparation (Activation)).

Bath Setup

Bath	Quantity	Quantity	Quantity		Replenish	Unit
Product	**for 10 l**	**for 20 l (C40)**	**for 10 l (H23)**	**for 20 l (H34)**	**for 10 m²**	**content**
	Compacta 30	**Compacta40 2 CU**	**Hitec 2030**	**Hitec 3040**		
Bath 1						
DI Water	9.7 l	19.4 l	9.7 l	19.4 l		
DS270	0.3 l	0.6 l	0.3 l	0.6 l	30 ml	500 ml*
Bath2						
DS400	10 l	20 l	10 l	20 l	2 l	20 l*, 5l
Bath 3						
DS400	9.5 l	19.0 l	9.5 l	19.0 l	2 l	see above
DS500	0.5 l	1 l	0.5 l	1 l	50 ml	500 ml*, 250 ml
Bath 4						
DI Water	4.6 l	9.2 l	4.6 l	9.2 l		
DS650 L	4.3 l	8.6 l	4.3 l	8.6 l	430 ml	5l*
DS650 P	1.0 l	2.0 l	1.0 l	2.0 l	100 ml	5l*
DS650C	0.1 l	0.2 l	0.1 l	0.2 l	10 ml	500 ml*
Bath 5	**for 30 l**	**For 2x 60l**	**for 30 l**	**For 1x 60l**		
CU 400 D ready made solution 2020	30.0 l	120.0 l	30.0 l	60.0 l		30 l*
CU 400 A	120ml	480 ml	120ml	480 ml	1l / 8000 Ah	1 l*, 5 l
DI Water	fill up to 30 l if needed	Fill up to 2 x 60 l if needed	fill up to 30 l if needed	Fill up to 1 x 60 l if needed		

- = content of one Starter Set for Compacta 30

Exothermic reactions are possible when mixing chemicals! Mix in a suitable container outside of the machine. Do not give water on acid! Always give the acid to the water! Wear protective clothing! Mix slowly

Please double check the bath size of your machine. Divergent tank sizes possible!

DI water is not part of delivery and need to be obtained locally !

Process Flow

Step	Process	Time	Temp. °C	Remarks
1	DS270	7 min	65-70	Cleaner Conditioner
R	Static Rinse	1 min		
	Spray Rinse	1 min		
2	DS400	1 min	20-25	Pre-Dip
	No rinse!			
3	DS500	7 min	20-25	Activator
R	Static Rinse	1 min		
	Spray Rinse	1 min		
4	DS650	4 min	45	Intensifier
R	Static Rinse	1 min		
	Spray Rinse	1 min		
5	CU 400	23 min	20-25	18 µm Cu plating, 0.8µm/min, 3A/dm²
R	Static Rinse	1 min		
	Spray Rinse	1 min		

Plating System Step1: Cleaner/Conditioner DS270

Cleaner / Conditioner DS 270 is an alcaline cleaner-conditioner to be used in the Plating System process to thoroughly prepare and condition any substrate used in the PCB manufacturing. It contains conditioning agents which activate glass fibres and dielectric, allowing for a reliable absorption of the catalyst. DS270 can be easily removed from the copper surface in the following rinse steps, making the process selective.

Bath Make-Up for 10 litres

De-mineralized water 9.7 litres

Cleaner/Conditioner DS270 0.3 litres

Warm up to working temperature - important to shake the Cleaner/Conditioner drum gently before use.

Process parameters

Temperature 60-70 °C

Treatment time 7 minutes

Agitation Important with board movement. Solution movement is recommended.

Capacity 1 litre ready made solution treat 5 m² surface.

Bath maintenance / Replenishment

To compensate drag out, add 30 ml DS270 for each 10 m². Compensate for evaporation with additions of DI water.

Equipment required (if not using the Compacta Plating Line)

Tanks Stainless steel or PPE tanks are recommended

Hanger Stainless steel acid proof (Steel 316).

Heaters Teflon or stainless steel

Ventilation Recommended

Solution movement Recommended

Rinse Optimal to have a warm static rinse followed by a dual cascade/spray rinse.

Analysis

Cleaner/Conditioner DS270 is maintained by replenishment per m². No special analysis is required here.

Waste Disposal

Waste is to be disposed and/or treated according to local regulations. For more information see safety data sheet.

Safety / Precautions

Avoid contact with eyes and skin. Wear protective gloves, goggles. If swallowed, give immediately something to drink. Do not induce vomiting. Seek medical advice. In case of skin- or eye contact, rinse immediately with water for at least 15 minutes. In case of eye contact seek medical advice.

Physical aspect

Cleaner/Conditioner DS270 gives a clear solution with a characteristic smell.

Storage

Store in original package at room temperature. Close the cap tight after use.

Plating System Step 2: Pre-Dip DS400

Pre-Dip DS400 is used in the Plating System process as a predip before the Activator DS500. It contains a special additive which prepares the panels for the activation process step and prevents contamination of the Activator DS500.

Bath Make-Up Pre-Dip DS400 is a ready-made solution

Process parameters

Temperature 20-25 °C

Treatment time 1 Minute

Agitation Board movement is recommended.

Capacity 1 litre ready made solution treat 25 m² surface.

Bath maintenance

To compensate water drag in, take out 1 l old solution and add 1 l fresh solution DS400 every 5 m²

Equipment required (if not using the Compacta Plating Line)

Tanks PPE or PVC tanks are recommended

Hanger Stainless steel acid proof

Heaters Teflon or quartz

Ventilation Not necessary

Rinse Do not rinse after Pre-Dip!

Let the liquid drip off and take the board to the Activator bath

Analysis

Analysis procedures are available, but we consider them for Experts only and will send them on request.

Waste Disposal

Waste is to be disposed and/or treated according to local regulations. For more information see safety data sheet.

Safety / Precautions

Avoid contact with eyes and skin. Wear protective gloves, goggles. If swallowed, give immediately something to drink. Do not induce vomiting. Seek medical advice. In case of skin- or eye contact, rinse immediately with water for at least 15 minutes. In case of eye contact seek medical advice.

Physical aspect PreDip DS400 is a clear solution with a sweet pleasant smell.

Storage Store at room temperature and in a dark place

Plating System Step 3: Activator DS500

Activator DS500 is a new generation low acid colloidal Palladium bath used in the Plating System process. It creates a dense, uniformed distribution of drill hole activation necessary to achieve the highest conductivity and consistent perfect coverage.

Bath Make-Up for 10 litres

Pre-Dip DS400 9.5 litres

Activator DS500 0.5 litres

Process parameters

Temperature Room Temp. Do not allow temperature to exceed 50 °C

Treatment time 7 minutes

Agitation Slow Board and solution movement is important

Bath maintenance

Add 50 ml of Activator DS500 for each 10 m² . A relative old bath should be analysed periodically to ensure that there is less than 2000 ppm copper in the bath. If copper is present in excess of 2000 ppm, the entire bath should be replaced. Compensate drag out by ready-made solution. *Never add water.*

Equipment required (if not using the Compacta Plating Line)

Tanks PPE or PVC tanks are recommended

Hanger Stainless steel acid proof

Heaters Teflon or quartz, low specific heat, less than 1W/cm²

Ventilation Recommended

Solution movement Important to have solution movement during warm-up

Analysis (Experts only)

The analysis requires a DR 700 colorimeter to measure the concentration of the Activator. Further analysis concern the acidity and tin concentration. We will supply detailed information to experts if required. The normal handling of the bath is done on a base of replenishment by throughput.

Operating Conditions	Range	Optimum
DS500	3,5-5%	5%
Pd	210-300 ppm	300 ppm
Sn^{2+}	10-14 g/l	13 g/l
HCl	11-15 g/l	14 g/l

Waste Disposal

Waste is to be disposed and/or treated according to local regulations. See safety data sheet.

Safety / Precautions

The Activator contains hydrochloric acid and could cause burns to skin and eyes. Avoid contact with eyes and skin. Wear protective gloves, goggles. If swallowed, give immediately something to drink. Do not induce vomiting. Seek medical advice. In case of skin- or eye contact, rinse immediately with water. In case of eye contact seek medical advice.

Physical aspect Activator DS500 is a black solution with a sweet pleasant smell.

Storage Store at room temperature and in a dark place

Comments

Close lid after processing a board

Do not drip intensifier into the activator

Stirr solution before use

Compensate evaporation losses with DS 400 and DI water in ratio 2/8)

Plating System Step 4: Intensifier DS650

Intensifier DS650 is used the Plating System process after the activator step. It strongly improves board platability by creating a conductive metallic layer inside the holes. The solution is made up from three parts, the names ending with L, P and C

Bath Make-Up for 10 litres

DI water 4 litres

DS650 L 4.3 litres

DS650 P 1 litre

DS650 C 0.1 litre

Important to follow the above sequence when setting up the bath. Top with DI water up to level.

Process parameters

Temperature 45 °C

Treatment time 4 minutes

Agitation Board movement, do not use air agitation

Capacity 1 litre ready made solution treat 100 m² surface

Density 1.18-1.22 g/cm³

Equipment required (if not using the Compacta Plating Line)

Tanks PPE or PVC tanks are recommended

Hanger Stainless steel acid proof

Heaters Teflon or stainless steel

Ventilation Recommended

Solution movement Important

Filtration Recommended

Bath maintenance

For each 10 m² surface add 430 ml DS650 L, 10 ml DS650 C, 100 ml DS650P

Analysis (Experts only)

The Analysis requires a DR 700 colorimeter to measure the concentration of the Intensifier. We will supply detailed information to experts if required. The normal handling of the bath is done on a base of replenishment by throughput.

Safety / Precautions

The Intensifier is an alkaline solution and could cause burns to skin and eyes. Avoid contact with eyes and skin. Wear protective gloves, goggles. If swallowed, give immediately something to drink. Do not induce vomiting. Seek medical advice. In case of skin- or eye contact, rinse immediately with water. In case of eye contact seek medical advice.

Waste Disposal

Waste is to be disposed and/or treated according to local regulations. See safety data sheet.

Physical aspect DS650 L and P are clear solutions, DS650 C is deep blue.

Storage Store at room temperature and in a dark place. Avoid contact with acids.

Plating System Step 5: Copper bath CU400

Plating System CU400 is a high throw, high speed, bright acid copper plating process especially designed for direct plating. It produces highly levelled, bright smooth copper deposits on properly prepared and conductive PCB at both high and low current density levels. When correctly operated, CU400 bath will produce hole wall to surface ratio of 1:1. CU400 is particularly suited to pattern-plating and to high aspect ratio fine line PCB. By it's properties and operating conditions, it suits perfectly the Compacta plating lines.

Operating conditions	**Range**	**Optimum**
Copper sulphate	80-100 g/l	90 g/l
pentahydrate		
Sulphuric acid	180-210 g/l	200 g/l
Chloride (as Cl -)	50-80 mg/l	70 mg/l
CU 400 A	4-8 ml	6 ml
Temperature	20-30 °C	27 °C
Current density	0,1-8 A/dm²	2-3 A/dm²

Agitation	Air or mechanical agitation
Plating rate	0,8 µ/min at 3 A/dm² with air agitation
Replenishment	1 litre of brightener for every 8000 Ah
Anodes	Phosphorised copper
Anode bags	Polypropylene
Heaters	Teflon or titanium
Filtration	If required, on PP filters only

Solution Make-Up for 30 litres

1. Add 25 litres DI water to well cleaned plating tank
2. Add 4 g sodium chloride NaCl
3. Fill up with DI water to nearly 30 l
4. Check the temperature 20-25 °C
5. Run the bath with a dummy PCB for 2 to 3 hours at 1 A/dm²
6. Add 120 ml of brightener CU 400 A.

Solution Maintenance

Chloride: To promote smooth deposit and increase the CU400 bath’s tolerance to impurities, the chloride concentration must be maintained above 60 mg/l. An out of balance chloride level causes burning and irregular deposit in the current density areas.

Agitation: The CU400 solution should be agitated by air. The air tubes should be directly under the board. Clean, low pressure air, not compressed air, should be used to avoid impureties getting into the bath.

Temperature: It is recommended that the CU400 solution should be operated at between 20-30°C. Loss of brightness and levelling occurs at temperatures above 30 °C.

Filtering: Filtration over activated carbon is not recommende, as this removes the brightener from the bath.

Anodes: Phosphorised anodes with a minimum of 0,02% phosphorus should be used in the CU400 solution. Other anodes may cause excessive brightener consumption, poor levelling, and roughness. The anode areas should be twice the cathode area and napped polypropylene anode bags should be used.

Troubleshooting

Problem: Burning and roughness

Cause	Correction
Copper concentration too low	Adjust copper sulphate level.
Acid content to high	Dilute bath with water.
Temperature to high	Cool solution.
Anode bags contaminated	Clean or replace anode bags.
Poor agitation	Increase air flow. Agitate cathode if possible.
Too high current density	Decrease current.
Brightener out of balance	Filter over active carbon to reduce brightener concentration
Chloride content too low	Replenish as required.

Problem: Voids in holes

Cause	Correction
Particles in solution	Filter bath. Spray rinse boards prior to electroplating.
	Check all solutions for suspended matters.

Problem: Lack of response to brightener

Cause:	Correction
Anode polarisation	Balance copper suphate ratio: (add DI water and run test at low A rating)
	Check for metallic contamination, i.e. iron, nickel, zinc.
	Check anode bags for blocked pores, or too tight bags.
	Check chloride content. Low chloride content will cause anode polarisation.
Chloride out of balance	May be indicated by narrow bright range. Maintain the solution level.
Temperature too high	Cool solution.
Solution needs carbon treatment	Filter solution over active carbon

Problem: Poor metal distribution

Cause	Correction
Air agitation to low or too high	Adjust air flow.

Mechanical agitation too fast	Reduce agitation rate.
Temperature too high	Cool solution.
Phosphorus content of anodes bad	Replace anodes.
Anodic current density too high	Reduce current density.
Anode to cathode ratio too small	See requirements for Anodes.
Heavier deposit on one side of panel	Balance anode area to cathode area.
Poor levelling	Increase current density. Increase cathode area.
	Filter bath. Check rinse quality

Problem: Matt deposit

Cause	**Correction**
Current density below 2 A/dm2	Increase current density.
Temperature too high	Cool solution.
Lack of brightener	Replenish as necessary
Air agitation too low	Increase air.
Loose anode contacts	Check for proper contact.

Disclaimer of Warranty

This instruction was carefully edited. Nevertheless we cannot give any warranty. Read the safety regulations in the manual of your plating machine and the material safety data sheets of the chemistry!

Specifications are subject to change on the part of the manufacturer

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