CASWELL COPY CAD ZINC ELECTROLYTE INSTRUCTION MANUAL

Manual for electrolyte and complete kit

The step-by-step plan in this manual is written for the complete kit, in which all necessary materials are included. If you only have the electrolyte, you can use this step-by-step plan as an example.

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Quick Start

Use this step-by-step plan as a quick reference once you have read the manual completely.

1. **Degrease workpiece with an alkaline degreaser.**
2. **Rinse thoroughly with clean water.**
3. **(optional) remove any rust/contamination mechanically.**
4. **(optional) etching / activating – then rinse thoroughly.**
5. **Prepare the electroplating bath.**
6. **Check the electrolyte level and place a mark.**
7. **Wrap anodes in PP anode filters.**
8. **Hanging anodes in 2:1 ratio opposite each other in the bath.**
9. **Turn on circulation or air agitation.**
10. **Hang workpiece with unvarnished copper wire on the nylon rod.**
11. **Black minus wire on the workpiece, red positive wire on the anodes.**
12. **Calculate area in cm².**
13. **Set starting current: approx. 0.15 a per 10 cm² total surface.**
14. **± 15-30 minutes electroplating until the desired result.**
15. **Spray the workpiece above the bath with demi/diwater.**
16. **Rinse well again with clean water.**
17. **Possibly passivate.**
18. **Rinse well again with clean water.**
19. **Dry at room temperature or with blow dryer/heat gun on low setting.**
20. **(optional) Protect: Apply sealer, clear coat (1K/2K) or wax/oil in thin layers according to product label.**
21. **Close bath with lid.**

Important information

What is Caswell Copy Cad Zinc Electrolyte

Caswell Copy Cad is a chloride zinc bath based on ammonium and potassium chloride and is a professional product of high quality.

This electrolyte provides high-quality, corrosion-resistant protection for a variety of metals.

Zinc has a sacrificial effect: it prefers to corrode rather than the underlying metal and therefore provides protection. Damage or scratches in the zinc layer usually heal on their own because zinc (oxide/hydroxide/carbonate) forms again, so that the substrate remains protected.

As standard, the zinc layer has a dull appearance that resembles cadmium. By adding the zinc glazing agent to the electrolyte, the zinc gets a very bright finish. The process takes about 20 minutes and the galvanized parts offer excellent corrosion resistance.

Works at room temperature; Optimal operation around 27 °C.

The electrolyte is suitable for direct galvanizing of:

- Steel
- Iron
- Cast Metal
- Zinc
- Nickel
- Copper
- Brass
- Bronze

Required equipment

The following materials are required for use of the Caswell Copy Cad zinc electrolyte:

(these materials are included in the kit and can be ordered separately on the webshop)

Always work in a well-ventilated room or use an extraction system.

Needed for the tank

- **Tanks/baths**: acid-resistant PVC, PE or PP. Large tanks should be reinforced to prevent bulging. Also suitable: steel tanks with rubber or plastic (pp/pvc) inner lining.
- **Zinc anodes**: 99.99% pure zinc.
- **Anode filter**: polypropylene filters to limit contamination of the bath.
- **Thick titanium wire**: hang the anodes in the electrolyte with this.
- **(filter) pump**: use a circulation pump or filter pump for agitation and filtration for a smooth, clear zinc deposit. Minimum throughput: one tank turnover per hour.
    - The pump can be replaced by a filter pump where you replace the sponge in the housing with a 5 or 10 µm polypropylene filter cloth for continuous filtering.
    - Filter parts must be acid-resistant (PE, PP or stainless steel 316). Do not use cellulose filters.
- **Agitation**: Required to avoid roughness, burning, or streaking. Possible via air pump or circulation pump.
- **Hanging system**: hang workpiece on a nylon or copper rod with copper wire or wire hooks.
- **Power supply**: adjustable DC power supply.

Additional

- **Sinks**: tank or container with demi/di water for rinsing between steps. (not supplied in the kit)
- **Workpiece wire**: unpainted copper wire for hanging small parts.
- Anode connection cable
- **Filter Media**:
    - Liquid filters.
    - PP filter media (5–10 µm). (not supplied in the kit).
    - Activated carbon (do not apply activated carbon during production, this removes the glazing agent, not supplied in the kit).
- **Personal protection**: chemical resistant (nitrile, pvc or neoprene).
- **Heating (optional):** immersion or aquarium heater to bring the electrolyte to the ideal process temperature; use chemically resistant version (PP/PTFE/titanium) with thermostat, never run dry. (not supplied in the kit)

Caswell Copy Cad Gloss System

The Caswell Copy Cad zinc electrolyte uses the Copy Cad glazing system.

Without adding the polish, the zinc has a cadmium look finish.

By adding the Copy Cad polish, the zinc will get a very bright finish. The rinse aid should be refilled periodically after you start using the bath.

Dosage

Dosage: 1 ml rinse aid per liter.

In case of decreasing shine: dose in small steps, test, and only then dose again.

- Add 0.5-1 ml per liter of electrolyte if the shine decreases.

Do not over-dose; Too much rinse aid can cause problems. If the zinc does not become shiny after adding sufficient glazing agent, another cause must be considered.

Consumption and calculation

Copy Cad rinse aid is consumed: approximately 1 ml per 10 ampere hours.

Calculation tool consumption = ampere × hours ÷ 10.

Example: 4 to × 3 hours = 12 ah is approximately 1.2 ml consumed.

After standstill

After a longer period of downtime, a small dose may be required to reactivate the rinse aid. Test on a test piece first and assess the gloss. Then dose in small steps, briefly electroplating and re-assessing in the meantime. Repeat this until the finish is evenly high gloss again. Don't overdose.

After filtering with activated carbon

Activated charcoal removes brightener because this is an organic product. After filtering with activated carbon, always add the rinse aid again in small steps.

Temperature of the electrolyte

The electrolyte works at room temperature.

- Working temperature between 21–50 °c.
- Ideal temperature is 27 °c.

Heating the electrolyte

- **Immersion heater**: for PP/PE plastic baths, a glass or titanium immersion heater with thermostat is suitable. Preferably choose a titanium immersion heater and place it in a place with current.
- **Water jacket**: put the pp/pe process tank in a larger container with warm water and regulate it with an immersion heater.
- **Increase room temperature**: a warm workspace reduces the cooling of small baths.

Passivation

Zinc can be finished with a passivating agent, allowing you to color the finish and give it extra protection.

- Immerse the galvanized part in the solution.
- Remove the part and rinse with distilled water.
- Then let it dry.

Carry out these instructions according to the supplied passivating agent manual.

Cast iron

If you want to apply zinc to cast iron, it is wise not to treat the object with an acid. Prepare the object by means of. Sandblasting or sanding.

Preparation

Metal cleaning, degreasing & etching

Use an alkaline degreaser. It removes oil, grease, coolants and drawing compounds, polishing paste and similar contamination. This type of cleaner is recommended as a standard step before metal surface treatments.

- Examples (practically available): st. Marc, blue wonder, dasty
- Professional: kärcher rm 31, zep industrial purple degreaser

Apply generously, leave on briefly and then rinse thoroughly with clean water.

Perform a **waterbreak test** : a clean surface allows water to flow evenly. In the event of grease or other contamination, the water will break up.

Rust removal

Make sure that the object to be treated is completely free of rust, dirt and grease. This is very important to get a good result. Parts that are rusty can be derusted with:

- Mechanical processing
- Verzinkshop Metal Activator (flash rust)

Etching services, metal

Remove oxide and get an active, clean metal surface.

Zinc

- Sulfuric acid 5–10% at room temperature, 3–8 seconds; then rinse.
- Citric acid 5–10% at 40–60 °C, 20–40 seconds; then rinse.
- Verzinkshop Metal Activator 30–120 g/l, 20–40 seconds; then rinse.

Copper

- Sulfuric acid 10–20% at room temperature, 5–20 seconds; then rinse.
- Citric acid 5–10% at 40–60 °C, 30–60 seconds; then rinse.
- Verzinkshop Metal Activator 30–120 g/l, 30–60 seconds; then rinse.

Brass

- Sulfuric acid 10–20% at room temperature, 5–15 seconds; then rinse.
- Citric acid 5–10% at 40–60 °C, 30–60 seconds; then rinse.
- Verzinkshop Metal Activator 30–120 g/l, 30–60 seconds; then rinse.

Bronze

- Sulfuric acid 10–20% at room temperature, 5–15 seconds; then rinse.
- Citric acid 5–10% at 40–60 °C, 30–60 seconds; then rinse.
- Verzinkshop Metal Activator 30–120 g/l, 30–60 seconds; then rinse.

Nickel

- Sulfuric acid 10–20% for 10–30 seconds; then rinse.
- Citric acid 5–10% at 40–60 °C, 30–60 seconds; then rinse.
- Electrolytically activate in 10% sulfuric acid at 2–5 a/dm², 10–30 seconds; then rinse.

Steel / iron

- Sulfuric acid 10–20% at room temperature, 10–60 seconds; then rinse.
- Citric acid 5–10% at 40–60 °C, 30–60 seconds; then rinse.
- Electrolytically activate in 10% sulfuric acid at 2–5 a/dm², 10–30 seconds; then rinse.

do not use hydrochloric acid in this step; often too aggressive.

Do not let dry between steps; directly through to the bath to prevent oxidation.

Acid neutralization

Residual acid from the etching agent can cause oxidation if it is not properly rinsed and neutralized.

If you are going to electroplate immediately after an acidic pre-treatment, do not neutralize but rinse thoroughly and go straight to the bath.

- Dissolve 1–2 tablespoons of baking soda in 2 litres of water.
- Briefly immerse the object in the solution a few times and leave it in the solution for 10-30 seconds.
- Then rinse it thoroughly with clean water.

Do not allow to dry between steps.

Preparing the galvanizing bath

- Prepare the box provided.
    - Make sure it is dust-free and clean.
- Attach the separate circulation pump to the bottom or side of the bucket or place it in loosely.
    - The loose parts in the box of the pump do not need to be used.
- Carefully pour the electrolyte into the bath. (watch out for splashes)
    - Mark the waterline with a marker.
    - The water from the electrolyte can evaporate by heat - when you have finished the electroplating process, fill the bath with distilled or demi water up to the marked line.
- If a glossy finish is desired, add 1 ml of Caswell Copy Cad rinse aid per liter of electrolyte with the syringe provided.
    - For a cadmium look, don't add a brightener.
- Wrap the anode filters around the anodes and attach them with an elastic band.
    - This prevents contamination of the bath.
- Hang the anodes, opposite each other, in the bath so that they hang in the electrolyte.
    - By bending the anode and hanging it in the bucket by the edge.
    - A hole has been drilled through the anode, with which the anode can be hung in the electrolyte with the included thick wire. Try to prevent the wire from hanging in the electrolyte as well.
- Connect the anodes with the included connection cable.
- Make sure the power supply is off and connect the red positive wire of the power supply to the anodes.
- Attach the nylon staff to the bucket. The objects are hung on this.
    - Cut 2 v-shaped notches in the rim of the bucket with a pair of wire cutters where you can put the nylon rod.
    - Use tape to attach the ends of the wand to the bucket.
    - Drill 2 holes at the top of the bucket and put the staff through them.

Tip. Provide an extra drip tray under the electroplating tank, or put the tank in a larger tank. If it ever leaks, the electrolyte will leak into the collection tank and not over the workplace or floor.

Calculating area and setting current

The zinc electrolyte operates at ± 0.15 ampere per 10 cm².

Calculating surface examples

- Slab (both sides): 2 × length × width (cm²)
- Cube (all sides): 6 × side × side (cm²)
- Cylinder (side only): 3.14 × diameter × length (cm²)
- Cylinder (total, with both ends): 3.14 × diameter × length + 2 × 3.14 × (diameter/2) × (diameter/2) (cm²)
- Disc (two faces): 2 × 3.14 × (diameter/2) × (diameter/2) (cm²)
- Disc edge: 3.14 × diameter × thickness (cm²)

Breaking down complex shapes

There is no need to calculate the exact surface; An estimate is sufficient.

- If the power supply is much too low, you will get a dull, salmon-colored finish.
- If the food is much too high, dark burn marks will appear on corners of the object.

Divide the part into simple pieces (plates, cylinders, discs), calculate each piece separately and add up the results.

Example of splitting:

- One dumbbell = two discs + one cylinder
- One bolt = shaft (cylinder) + head (disc + edge)

Anode & cathode ratio

The ideal ratio between the surface of the anode and the object is 2:1. The anode surface is therefore twice as large as the workpiece.

Only include the **anode surface facing the workpiece** (the back contributes little in small arrangements).

Example: For a workpiece of 250 cm², you need an anode area of about 500 cm² .

If there is too little anode surface, the anode current density increases and more brightener is consumed. The anode polarizes, dissolves worse and replenishes the zinc more slowly. The power supply must then supply more voltage to keep the same current. This causes current concentration at edges (burn marks) and poorer coverage.

Set up flow

Calculate the total area of the object in cm².

The sum is: (area in cm² ÷ 10) × 0.15 ampere

Example with an object of 280 cm²:

- 280 cm² ÷ 10 = 28
- 28 × 0.15 amps = 4.2 amps on the power supply.

This is a starting value that often works well. Is the object not shiny everywhere, or do you have dark corners that seem burnt? Due to circumstances such as working temperature, conductivity of the object and the electrolyte, distance of object to anode and the condition of the electrolyte, the ideal value may deviate from this. Go up or down in small increments (e.g. 0.05 amps per 10 cm²) and assess the result after 15–30 minutes to determine the best value for your bath.

Testing with a calibration plate

With a new bath, you can first use a dummy plate as a calibration plate. Take one or more copper plates with a fixed value, for example 20 cm².

- Starting value: 0.15 a per 10 cm² → for 20 cm² = 0.30 a total.
- Electroplated for 15–30 min, assessing gloss/opacity, and watching for burning.
- Adjust the current down or up in increments of 0.05–0.1 a; After each step, test again for 15–30 minutes.
- Choose the best adjustment and convert it to a guideline in a per 10 cm².
- Example: best = 0.4 a per 20 cm² → 0.2 a per 10 cm².
- Apply to part of 280 cm²:
    - 280/10 = 28
    - 28 × 0.2 A = 5.6 A (rounding is allowed).

The electroplating process

Before you start the process, you first set the power supply. Make sure the red positive wire is disconnected.

- Turn on the power supply and turn the ampere knob all the way to the lowest setting.
- Turn the voltage knob (volts) all the way up to the highest position.
- Turn off the power supply again.

As a result, the power supply will automatically supply the necessary voltage required by setting the calculated ampere for the surface of the object.

By adjusting the power supply to 0 amps, you cannot accidentally turn on the power supply with a setting that is too high, which can cause the workpiece to burn.

Step-by-step plan for galvanizing

1 - Hang the object and connect the power supply

- Turn on the circulation pump.
- Attach copper wire to the workpiece (long enough to hang from and fully submerge).
- Hang the workpiece on the nylon rod in the electrolyte. Attach the copper wire to the wand with the clips provided.
- Attach the black wire (min) from the power supply to the copper wire of the workpiece.
- Attach the red wire (plus) from the power supply to the zinc anodes.

2 – Set up flow and start the process

- Calculate the surface of the object in cm².
    - Use 0.15 amps per 10 cm² as the starting value.
    - Example: 250 cm² object
        - 250 ÷ 10 = 25
        - 25 × 0.15 A = 3.75 A
- Turn on the power supply and set to the calculated current. The process starts now.

3 - Time and thickness

- 20 minutes for most applications
- 30+ minutes for heavy-duty applications

4 - Removing and rinsing

- Remove the workpiece from the bath.
- Spray it well with a water spray with demi/di water over the bath. This will cause most of the electrolyte to run back into the bath.

5 – Passivation (optional)

- Treat the object with the passivating agent as described in the manual.
- Rinse the object thoroughly.

6 - Drying

- Let the object dry or use a heat gun/hair dryer on low setting.
- Do not use compressed air from a compressor (risk of oil/water impact and rings).

The object is now ready and can be treated with a patina, another metal or a coating, lacquer or other sealer of your choice.

Dummy plating

The first few times you use the bath, contamination may come out of the electrolyte or anode. This can be visible on the result.

To remove any contamination from the tub or anodes, it is recommended that you galvanize a piece of dummy metal before starting your own project. For example, hang a 25 cm² piece of copper in the bath and let it electroplated for 30 to 60 minutes at 0.5 amps. This will remove any contamination.

Protecting the zinc

In principle, the zinc does not need to be protected because it is already a protective layer for the underlying metal. However, you can finish it with a sealer for extra protection.

Sealers

- **Verzinkshop DeepSeal**: maintainable transparent, water-repellent and rust-resistant oil-based sealer for zinc and other metals; protects and deepens the color.
- **Verzinkshop Acrylic Sealer**: clear lacquer layer for hard, glossy protection.

Lacquer

- **Clear coat**: (1k or 2k) provides a hard, durable protective layer.

Wax or oil

- **Wax** provides a thin, maintainable protective layer with a natural look.
- **Light oil** or a product such as **wd-40** provides temporary protection.

Application

- Clean and degrease the workpiece.
- Apply thin layers; Allow each layer to dry according to the product label.
- For outdoor or high loads: choose a sealer or 2k clear coat instead of just wax or oil.

Maintenance, contamination & filtering

Dirt in the bath is usually caused by dust, metal particles, loosened oxides or organic contamination from degreasers or the poor preparation of objects.

Most solid contamination sinks to the bottom and has little influence on the electrolyte.

Refilling evaporated water

After use, heating can cause the distilled water to evaporate. Top this up with distilled or demi water up to the marking line that you placed when filling the bath.

Filtering (solid particles)

Pour the electrolyte into:

- Included filters
- 5 or 10 µm polypropylene fine filter

Activated carbon (organic pollution)

If filtering with a fine filter does not help or contamination remains visible, there is a good chance that it is organic contamination. Then filter with activated carbon (this also removes the rinse aid).

Procedure:

- Remove anodes and cables from the bath
- Circulate the bath through a carbon cartridge or use an aquarium filter filled with activated carbon
- Pump for 1–2 hours
- Then filter through a 5 or 10 µm polypropylene fine filter.
    - Important: no activated carbon should remain in the electrolyte.
- Then carefully dose the rinse aid again according to the guideline.

Dissolved metal ions

Mechanical filtering and activated carbon filtering do not remove dissolved metal concentrations. If the bath is contaminated with another metal, remove it with a dummy: hang a piece of metal, for example a 20 cm² copper plate, in the electrolyte and let it galvanize on 1 ampere for a few hours.

Replace

Electrolytes with a lot of organic contamination or dissolved metal ions are not always easy to repair. Replacing is then the best choice.

Keeping the pH value in balance

Ph range: 5.2-5.7

- If the pH value is higher than 6, you can lower it with hydrochloric acid by making very small additions.
- If the pH value is too low, you can increase it by making small additions of ammonia, ammonium hydroxide or potassium hydroxide.

Storage

Store the electrolyte in the electroplating bath sealed with a lid or in sealable, chemically resistant bottles. Label content and date.

After several months of storage, it may be necessary to re-add the rinse aid at start-up.

Will the bath not be used for more than a day? Remove the anodes and pump from the bath and rinse them in a container of clean water.

Save pump

Rinse the pump well with clean water before storing it. Acid residues can attack plastic.

You can put the pump in a bowl of clean water to protect the plastic.

Storing anodes

Rinse and dry anodes, or store them in distilled water so they don't oxidize. Do not leave in the bath as this will increase the zinc content of the electrolyte.

If the anodes are oxidized after a longer period of storage, you can sand them lightly or briefly etch them in a bath of water with 5% sulfuric acid so that they are clean again. Rinse them well and run the bath for 15 minutes on a piece of waste metal to remove contamination from the anodes.

Rinse them well before placing them back in the bath.

Waste & disposal

Never pour anything down the sink. Collect all process fluids and rinse water as chemical waste.

Save

- Use closed HDPE canisters or screw-top bottles (chemical resistant), preferably un-approved.
- Always label: content, date, contact.
- Place bottles or jerry cans in a drip tray/tub.
- Cool, dry, out of sunlight; out of reach of children/pets.

Don't save

- No beverage bottles, glass jars without protection, open buckets or metal cans.
- No fragile PET/PP bottles of consumer products.

Solid residues

Drain used filters, anode sludge, cloths and gloves, then collect separately in a sturdy, sealable bag/bucket and dispose of as chemical waste.

Drain

- Take everything to the municipal RCA collection or an approved processor. Do not mix waste streams to "dilute".

What to avoid at all costs

- Do not mix with bleach or ammonia (dangerous reactions).
- no compressed air in waste containers; don't build up pressure.

Technical characteristics

Electrolyte	Caswell Copy Cad Zinc Electrolyte
Metal	Zinc
Works on	Steel, iron, cast metal, zinc, nickel, copper, brass, bronze
Tanks/baths	• Acid-resistant PVC, PE or PP. • Steel tanks with rubber or plastic (pp/pvc) inner lining. • Large tanks must be reinforced to prevent bulging.
Anode	• 99.99% pure zinc • Optimal ratio: 2:1 anode:object
Anode filter	5-10 µm polypropylene filter (bags)
Anode hook	• Titanium pendant/basket. • Do not use as a hook: steel/stainless steel.
Recommended Flow Density	• ± 0.15 amps per 10 cm² - (1.5 A/dm²) • Drum ± 0.05 amps per 10 cm² (0.5 a/dm²)
PH value	5,2-5,7
Rinse aid	• 1 ml/l of rinse aid when making a new bath • Add periodically
Time	10 minutes and more
Agitation	• Pump or air • (no unfiltered compressor air due to oil/water)
Operating Range Temperature	21 – 50 degrees °C
Optimal temperature	± 27 degrees °C
Shelf life	Long shelf life with proper maintenance
Metal issued by	Anode
Filter media	• 5-10 µm polypropylene filter • 5-10µm PP Filter Cartridge • Diatomaceous earth (only for an external filter installation)

Problems and solutions

Problem	Cause	Solution
Electrical / Current Density		
General dullness	Too little polish	Dosing and testing the rinse aid in small steps.
	Bath contaminated (organic or particulate)	Filtering (5–10 µm); In case of organic soiling, filter briefly with activated carbon and then add rinse aid again.
	Too low temperature	Heat to ±27 °C (operating range 21–50 °C).
	Too low current (current density)	Increase current slightly; guideline starting value: **0.15 A per 10 cm²**.
	Insufficient agitation	Improve agitation (circulation or air).
	Poor pre-treatment / passive underlayment	Re-clean/activate workpiece; rinse well.
Dark Edges / Burn Marks (High Flow Zones)	Current too high	Reduce current or build it up in steps.
	Anode too close / unfavorable geometry	Increase Anode distance or use screens/power thieves.
	Too little anode surface	Insert additional anode surface (aim **2:1** anode:workpiece, facing the workpiece).
	Insufficient agitation	Improve agitation.
	Low temperature	Heat to ±27 °C.
Dull low in depths (low flow zones)	Too little polish	Dosing and testing rinse aid.
	Anode position unfavorable	Reposition anodes or use auxiliary anodes.
	Too low current	Increase current slightly.
	Insufficient agitation	Improve agitation.

Problem	Cause	Solution
Surface / cleanliness		
Holes / pinholes	Grease/dirt on workpiece	Better cleaning/degreasing of workpiece (waterbreak test).
	Air bubbles / impact	Loading and unloading quietly; avoid air ingress.
	Particles in the bath	Fine filtering (5–10 µm).
	Organic pollution	Activated carbon filtering; Then dose rinse aid again.
Rough/granular surface	Poor filtration	Filter change (5–10 µm) and filter through; Check anode filters.
	Anode Glue or Cracks in Anode Cover	Check or replace anode filters (PP).
	Coarse metal particles	Filtering through (5–10 µm).
	Current too high at edges	Reduce current slightly or increase distance; screens.
Suture		
Poor adhesion / blisters	Insufficient cleaning/activation	Redo pre-treatment.
	Drying between steps	Do not allow to dry; galvanize immediately after rinsing.
Opacity/Geometry		
Uneven opacity / shading	Anode position or distance unequal	Repositioning anodes; make distance uniform.
	Too little anode surface	Insert additional anode surface or auxiliary anodes.
	Large parts without auxiliary anodes	Use auxiliary anodes or screens/current thieves.
Lines / stripes / banding	Insufficient or irregular agitation	Making agitation constant.
	Gas streaks	Move the workpiece slowly; check hanging.
Shine / veil		

Problem	Cause	Solution
No gloss / satin on surfaces (edges are shiny)	Rinse aid used up or removed by activated carbon	Rinse aid dosing and testing; After activated carbon, add rinse aid again.
	Too low temperature	Heat to ±27 °C.
	Too low current	Increase current slightly.
Pitting	Local gassing / pollution / excessive flow	Reduce current density slightly, improve agitation, fine filter.
Bath condition / contamination		
Contamination with other metals	Incorrect suspension/clamps (steel/stainless steel)	Copper, titanium or plastic-coated suspension; no bare (stainless) steel above the acid bath.
	Corrosion of metal parts above bath	Remove source; keep the area clean.
	Introduction from pre-treatment	Improve rinsing.
	Dissolved foreign metals in solution	Dummy plating on waste piece (e.g. copper) for an extended period of time at low-to-moderate current.
Concentration / Level / Chemistry		
Too high a concentration due to evaporation	Water level dropped; components relatively too high	To mark with demi/DI water; check gloss image; Dose rinse aid according to the guideline.
pH too high	pH > 5.7	Carefully return pH with dilute hydrochloric acid; keep within **~5.2–5.7** .
pH too low	Acid drag-in or acid overdose	Raise pH to **~5.2–5.7** with diluted NH_3/amm. hydroxide; check flushing regimen.
Chloride too low	Make-up not up to standard / a lot of dilution	Repair solution according to guideline; chloride.
Chloride too high	Overdose or a lot of evaporation	(Partially) decanting and topping up with DI water; rebalancing.

Problem	Cause	Solution
Zinc metal concentration too low	Anode dissolves poorly / too little surface area	Cleaning/etching anodes; additional anode surface; good electrical connection.
Zinc metal concentration too high	Excessive anode dissolution	Optimize current density and distance; refresh/dilute part.
Efficiency low	Too little anode surface	Add extra anodes.
	Low current or bad contacts	Increase current within working range; Clean/improve contacts.
	Low temperature	Heat to ±27 °C.
Electrical/hanging issues		
Electrical problems	Bad contact points / too thin suspension wire / unstable power supply	Contacts clean and firm; use suitable wire; check power and cables.
Material of hooks / carrying	Steel/stainless steel as a hook in solution	Do not use as a hook: steel/stainless steel. Use titanium (or rubber-lined steel above liquid line); anode filters PP.

Warning!

The electrolyte is slightly acidic. Avoid contact with eyes, skin and clothing. Wear eye protection (goggles, goggles, or face shield), protective rubber gloves, and aprons when preparing solutions and while working with the solutions. Do not mix the electrolyte with cyanide or alkaline materials, or other chemical substances. The electrolyte is toxic when used internally.

- Do not work with the electrolyte or other products without first reading and understanding the safety information.
- The safety data sheet can be found on the product page or can be requested from verzinkshop.nl by e-mail: info@verzinkshop.nl
- Do you have any questions? Contact us via:
  - Mail: info@verzinkshop.nl
  - Whatsapp or call: +31 6 28090022
  - www.verzinkshop.nl

Safety

- Always wear a dust mask, respirator, gloves, and apron when necessary.
- Always treat any chemical as if it could kill you.
- Always label buckets and storage containers with a permanent marker so that you and others know what's inside.
- Never pour water into acid; it can heat up and explode. Always pour acid into water.
- Never leave electroplating baths or other systems that use power unattended. These products may cause a short circuit and cause a fire.
- Never come into direct contact with chemicals. They can cause serious burns or other damage and are very dangerous substances if not treated with respect.
- Never think you can get away without taking safety precautions! That is not possible!
- Never leave the lids off the tanks when not in use.
- Always work safely and ensure good protection and ventilation.
- The safety data sheet can be found on the product page or can be requested from verzinkshop.nl by e-mail: info@verzinkshop.nl

Disclaimer

Did you find an error or something unclear in the manual? Please let us know via info@verzinkshop.nl

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