VERZINKSHOP
ELECTROFORMING MANUAL

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Introduction

Electroforming is the electrical deposit of pure copper on a non-conductive object, or material, that has been made conductive.

It applies a shiny layer of copper to various objects that you can polish, patinate or use as a base for further metal finishes such as nickel, bronze or chrome.

This manual describes the complete process with V-Brite 200 copper electrolyte, from preparation to finishing.

Read the manual completely once; After that, you can use the quick-start section as a short workflow.

Important information before you start

Electroforming is a fun and creative process, but you work with acidic chemicals that can cause harm if used incorrectly. Therefore, work neatly and responsibly: provide ventilation, wear PPE (goggles/gloves/apron), keep children and pets away, and read the product information. Label and store everything safely and prevent spills.

- Work in a well-ventilated area.
- Always wear PPE: safety glasses or face shield, chemical-resistant gloves and apron; with spraying/airbrush also respiratory protection.
- Keep children and pets away; Work on a stable work surface with a drip tray to prevent leaks and spills.
- Use only clean, chemical-resistant containers; Label all bottles and kegs clearly.
- Neutralize spilled splashes with baking soda and clean immediately.
- In case of skin or eye contact: rinse immediately with water for a long time.
- Read the safety information of products you work with during the process before use.
- Do not mix the electrolyte with bleach, ammonia, or other chemicals.
- Have emergency supplies on hand: plenty of clean water, absorbent cloths, and a drip tray.
- Dispose of liquid residues, rinse water and used filters as small chemical waste; Never down the sink.

Quick Start

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

1. **Degrease workpiece – if necessary.**
2. **Rinse thoroughly with clean water.**
3. **Porous/organic first seal completely; Allow layers to dry/cure completely.**
4. **Place anchors (ring/eye pin/copper wire) in front of the conductive paint.**
5. **Apply conductive paint and let it dry completely.**
6. **If necessary, weigh down so that the workpiece remains underneath.**
7. **Prepare the galvanizing bath.**
8. **Check the electrolyte level and top up if necessary.**
9. **Wrap anodes in PP anode filters.**
10. **Hanging anodes in 2:1 ratio opposite each other in the bath.**
11. **Connecting anodes together.**
12. **Turn on circulation or air agitation.**
13. **Calculate workpiece area in cm².**
14. **Hang workpiece with unvarnished copper wire on the nylon rod.**
15. **Black minus wire on the workpiece, red positive wire on the anodes.**
16. **Set starting current: approx. 0.2 Ampere per 10 cm² total surface.**
17. **Start at ~10–20% of the calculated current; wait until copper is visible; step by step up to the calculated current value.**
18. **± 15-30 minutes or more electroplating until the desired result.**
19. **Spray the workpiece above the bath with demi/DI water.**
20. **Dip briefly in baking soda solution to neutralize residual acid.**
21. **Rinse well again with clean water.**
22. **Dry at room temperature or with blow dryer/heat gun on low setting.**
23. **If necessary, apply a patina or other metal.**
24. **Protect: apply sealer, clear coat (1k/2k) or wax/oil in thin layers according to product label.**
25. **Close bath with lid; workplace cleaning.**

Supplies

Supplied in every electroforming kit:

- Bucket
- Galvanizing shop V-Brite 200 acid copper electrolyte
- Galvanizer copper rinse aid V-Brite X with dosing syringe
- 2 × copper anode
- 2 × anode filter cloth
- Connection cable for the anodes
- Circulation pump
- Nylon rod with clamps for hanging objects
- 2 meters of 0.5mm copper wire
- 2 meters of 0.25mm copper wire
- 2 × 20 cm copper wire 2 mm for hanging anodes
- 2 × 3D Printing Test Plate
- 2 meters nylon thread to weigh down objects
- Brushes for the conductive paint
- Stirrers for the conductive paint
- About 10 connecting rings copper
- About 10 eye pins copper
- Fine sanding sheet
- Liquid filters for filtering contaminated electrolyte
- Baking soda for neutralization plus bucket
- Gloves
- Power supply (if it was ordered)

Conductive paint depending on the kit chosen:

- Galvanizing shop Carbon
- Galvanizing shop Conserve
- Galvanizer Conserve 3D
- Caswell Conductive Copper Paint
- Conductive Graphite Spray

Useful extras: (not included in the kit)

- Plant sprayer or pressure sprayer to spray objects with distilled or demi water.
- Bucket / container with rinsing water (distilled / demi) to immerse and rinse objects between steps.

Tap water can be used but is not recommended because it contains contaminants and metals. If too much of the tap water ends up in the electrolyte, it can unbalance the electrolyte or cause problems in the final finish.

Important information

V-Brite 200 Copper Electrolyte

The electrolyte used is Verzinkshop V-Brite 200 acid copper electrolyte.

The electrolyte gives a thin, clear and shiny copper deposit due to the added glazing agent and is very suitable for fine details.

The applied copper layer is soft and ductile with a low internal voltage, which makes it extremely suitable for copper-plating plastic and other non-conductive materials after applying a conductive coating.

In addition to using it for electroforming, you can use this electrolyte to apply a layer of copper to copper, nickel and brass.

The V-Brite 200 glazing agent

The V-Brite 200 copper electrolyte uses the V-Brite 200 brightener system

This consists of:

- V-Brite 200S (starter glazing agent)
- V-Brite X (Rinse Aid Maintenance)

These are added when making the electrolyte. The electrolyte is therefore delivered ready-to-use. When preparing a new bath, **no** rinse aid needs to be added.

The V-Brite X rinse aid is consumed during the process and must then be refilled periodically after you start using the bath.

V-Brite X provides the high shine. If there is too little V-Brite X, surfaces become matte, while edges and corners are still shiny.

Dosage

Dosage: 1 ml V-Brite X per liter of electrolyte.

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

- For a 3 liter bath, start with an addition of 1-2 ml
- For a 6-litre bath, start with an addition of 3 ml

Do not over-dose; Too much polish can cause problems and make the copper brittle. If the copper does not become shiny after adding sufficient glazing agent, another cause must be considered.

Calculating the consumption of the rinse aid

V-Brite X is consumed: approximately 1 ml per 2 Ampere hours.

Calculation tool consumption = Ampere × hours ÷ 2.

Example:

- 4 A × 3 hours = 12 Ah
- 12 / 2 = 6 ml of V-Brite X 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 V-Brite 200S and V-Brite X again.

Temperature of the electrolyte

The electrolyte works at room temperature.

- Working temperature between 21–32 °C.
- Ideal temperature is 24–28 °C.

Heating the electrolyte

You can heat the electrolyte when necessary.

- **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 tray 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.

Calculating area and setting current

The V-Brite 200 copper electrolyte operates on ± 0.2 Ampere per 10 cm² of object surface.

Before you start, you must first calculate how big your object is in cm².

Calculating surface examples

- Rectangle: length × width
- Square: side × side
- Circle/circle: 3.14 × (diameter/2)²
- Disc: 2 × 3.14 × (diameter/2)²
- Cube: 6 × side²
- Block/prism: 2 × (ch×w + ch×h + w×h)
- Cylinder (side only): 3.14 × diameter × length
- Cylinder (total, with both ends): 3.14 × diameter × length + 2 × 3.14 × (diameter/2)²
- Bulb: 4 × 3.14 × (diameter/2)²
- Half sphere (hood only): 2 × 3.14 × (diameter/2)²
- Cone (sheath only): 3.14 × (diameter/2) × angled length
- Cone (total, with bottom): 3.14 × (diameter/2) × angled length + 3.14 × (diameter/2)²

With 3D prints, the software indicates how many cm² the object is.

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:

- Walnut = sphere
- One flower = shaft (cylinder) + head (disc + edge)
- Shell = circle

Anode & cathode ratio

It is important to hang enough anode in the electrolyte.

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.

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 copper 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) × 0.2 Ampere

Example with an object of 280 cm²:

- 280 cm² ÷ 10 = 28
- 28 × 0.2 Amps = 5.6 Amps adjust 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 steps (e.g. 0.05 Amps per 10 cm²) and assess the result after 15–30 minutes to determine the best value for your bath.

Building up amperage

Never immediately set the current to the calculated final value; too much voltage has to go through too small a surface. This quickly causes burnt spots and poor adhesion. Start low and build up in short increments as the copper surface area increases.

- Starts at 0.05–0.10 A.
- Let the process run for 5–10 min until you see a clear copper ring at the suspension point and the beginning of the cover.
- Then increase the amperage in 2–4 steps of about 20–30% of the current value each time until you reach the calculated value.
- Check how far along the copper is every 10-20 minutes before turning up the amperage. From 50-75% coverage, you can set the power supply to 75-100%.

Testing with a calibration plate

With a new bath, it is useful to do tests so that you know what the correct setting is for the bath.

You use the included 3D printing calibration plates for this.

Here you test the 0.2 Ampere per 10 cm².

- With the 25cm² picture, you can set the power supply to 0.5 Amps.
- With the 50 cm² picture, you can set the power supply to 1 Ampere.

Go down or up in increments of 0.05 or 0.1 Amps, and assess the result after 15–30 minutes.

- If the setting is too low, the copper will have a more dull finish or will not be shiny throughout.
- If set too high, the copper will develop dark burn marks on edges and structure will develop on the copper.

For example, if the ideal setting is 0.18 Amps, you can use this value for any project.

The example with an object of 280 cm² then becomes:

- 280 cm² ÷ 10 = 28
- 28 × 0.18 Amps = 5.04 Amps on the power supply. (rounding is allowed)

Setting up the electroforming setup

Electroforming bath

- Have the bucket ready.
    - 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 through heat - when you are done with the process, fill the bath with distilled or demi water up to the marked line.
- 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 hanging 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.

The bath is now ready for use.

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.

Neutralization bath

After the seller process and rinsing, there is always some acid left on the object. This must be neutralized to prevent oxidation on the copper.

- Have the extra bucket ready.
- Fill it with about 2 liters of water
- Dissolve the included baking soda in it. (about 1-2 tablespoons)

Preparing items

Clean and degrease the object only when necessary.

- **Plastic, glass, metal, stone, 3D print,** etc.: first dust and grease free. Light sanding or an adhesion primer is only necessary if you notice that a coating is beading away.
- Seal porous and organic material such as a **leaf, flower, wood, bark, textiles, cardboard, bone** completely waterproof before applying a conductive paint.

If the conductive layer does not cover everywhere or has cracks, electrolyte can soak into the object without a sealer.

This causes problems:

- It contaminates the electrolyte because organic material dissolves and ends up in the bath.
- The object sucks itself full, expands and then the conductive paint and the copper layer crack.

Decision rule:

- If it is porous, fibrous or moist → always seal.
- Hard, dry and tight sealing is not necessary →.

Whatever layers you use: let each layer cure completely before continuing; Semi-soft layers continue to vaporize and cause cracks in the conductive layer or in the copper.

Tip: Conserve or Conserve 3D conductive paint works ideally for small and medium-sized items. This is a 2-in-1 conductive sealer; A separate sealer is then not necessary.

Anchors & suspension

Attach rings, eye pins or copper wire before applying the conductive paint. Make sure that the contact surface (where marker/wire touches the object) is also treated with the conductive paint. That's where the cordon starts.

Place the anchor in a place that is not noticeable.

With complex shapes, you can use multiple suspension points to distribute the current and cover it evenly faster.

Hard waterproof materials

For 3D prints, plastic, glass and stone, for example, dust-free and degreasing are sufficient when necessary.

With glass and very smooth plastics, light sanding or a suitable primer can improve adhesion, but often this is not necessary.

For flat surfaces, conductive graphite spray is ideal. Apply several thin layers and let it dry well in between.

In practice, countersink shop Conserve 3D adheres very well to most hard surfaces without additional preparation and builds up a thin, tight film that preserves details.

Soft/porous/organic materials

Flowers, leaves, wood, bark, textiles, cardboard and other porous or moist material must first be made completely waterproof and sturdy. To do this, use:

- Allow the object or material to dry first.
- Electroforming Sealer (water-based): absorbs, hardens and seals. Then apply a water-based conductive paint, such as Carbon.
- Conserve or Conserve 3D (acetone base): 2-in-1 conductive sealer; preserves and makes directly conductive. Suitable for freshly picked flowers, bark or pebbles. After drying, a strong conductive acrylic layer remains.
- Other products such as a clear coat or 2-component resin.

Galvanizing shop Conserve can be used on slightly damp material such as a fresh tree leaf or a flower. Avoid excessive humidity and oversized objects.

Make the object dust-free and free of loose debris. Submerge, repeat briefly to remove air bubbles, leave on for a few minutes, shake off any excess sealer and allow to dry completely.

Watch for pinholes: each gap allows electrolyte to enter and causes expansion and rupture later.

Please note: organic material cannot be left for days before the process starts. It will start to work and shrink or expand, causing the applied conductive layer to crack. It is best to hang the object in the electroforming bath immediately after it has dried well to copper it.

Baby shoes

Baby shoes are soft, fibrous and hollow: sealing and good preparation are crucial.

Clean the shoe and fix the laces as you like.

The shoe floats in the electrolyte, so you have to weigh it down. This is very important to avoid problems.

This can be done in 2 ways:

Filling up:

- Fill the opening of the shoe with stones/glass/lead and then fill it with resin or plaster up to 1 or 2 cm below the edge of the opening of the shoe.
- Make sure all the air is out of the opening.
- Allow to cure completely
- Attach a piece of nylon thread and immerse the shoe in the Electroforming Sealer. Repeat this a few times to remove air bubbles. Then let it hang in the sealer for 10-20 minutes so that the shoe absorbs the sealer.
- Drain well and shake off excess sealer.
- Now let the shoe dry very well. This can take 1 to 2 days.

Sucking up:

Leave the opening of the shoe open.

- Immerse it in the Electroforming Sealer and repeat several times to remove air bubbles. Then leave it in the sealer for 10-20 minutes so that the shoe absorbs the sealer.
- Drain well and shake off excess sealer.
- Let the shoe dry very well now. Depending on the ambient temperature, this can take 1 to 2 days.

If the shoe has absorbed enough sealer, and most of the air comes out, the shoe will sink into the electrolyte by itself. Doesn't the shoe sink all the way under? Then you can always weigh it down with a weight.

Then apply the conductive paint (Carbon or Conductive Copper Paint) in several thin layers.

Do not use Conserve over the Electroforming Sealer; The solvent (acetone) dissolves the water-based sealer layer again.

Weighing down objects

If an object is hollow or very light, it will want to float on the electrolyte.

You can weigh down these objects and materials in various ways.

- With the supplied nylon thread you can tie a weight, such as a piece of glass, to the object so that it is weighted.
- You can take a nylon stocking or bag and fill it with glass beads and hang it on the object.
- 3D prints can be printed solidly or filled with sand via the leak hole, for example, and then seal the leak hole.
- Leaves/twigs may start floating. Copper build-up makes them heavier and sinks by themselves. Make sure that the leaf or twig has been completely submerged at the start and then let it float on the electrolyte.

Make sure you don't use metals or other materials that can dissolve in the electrolyte.

Making an object conductive

Apply a conductive coating as indicated in the product's manual. This can be by immersing the product, painting it with a brush or spraying it with a conductive paint in aerosol or an airbrush.

Verzinkshop offers various conductive products for different purposes.

Galvanizing shop Conserve

Is a conductive 2-in-1 solvent-based sealer and is ideal for preserving porous and organic material or objects that require a solid coating.

1 immersion is sufficient. A 2nd immersion causes the first layer to burn up. Do you want to apply multiple layers for finer details? Then first dilute the paint with acetone as described in the manual.

- This coating leaves a waterproof conductive flexible acrylic layer, making it possible, for example, to directly immerse a freshly picked flower in this sealer, without having to let it dry first or apply a separate sealer first.
- The coating can be used on almost any object and material.
- This sealer is ideal for immersing various objects.
- Apply via dipping, brush or airbrush.
- Note: acetone-based – first test the material you want to apply it to.
- Dilute according to the product's manual.

Galvanizer Conserve 3D

is a thin, solvent-based conductive coating ideal for 3D prints, solid materials and dry organic material.

1 immersion is sufficient. A 2nd immersion causes the first layer to burn up. Do you want to apply multiple layers for finer details? Then first dilute the paint with acetone as described in the manual.

- This coating leaves a thin waterproof conductive flexible acrylic layer suitable for fine details.
- The coating can be used on almost any object and material.
- This sealer is ideal for immersing various objects.
- Apply via dipping, brush or airbrush.
- Note: acetone-based – first test the material you want to apply it to.
- Dilute according to the product's manual.

Galvanizing shop Carbon

is a water-based conductive paint with a high carbon content for low resistance.

- This is a water-based conductive paint that can be used over the Electroforming Sealer
- This conductive paint is easy to apply with a brush or airbrush.
- The sealer works on any material where normal water-based paint does not cause any problems.
- Apply via dipping, brush or airbrush.
- Dilute according to the product's manual.

Graphite 33

is a conductive coating in solvent-based aerosol can.

- Ideal for a very fine and detailed finish on, for example, 3D prints or model building parts.
- Needs multiple layers.
- Do not apply over Galvanizing Shop Electroforming Sealer
- Aerosol

Caswell Conductive Copper Paint

is a conductive water-based and copper paint for very low resistance.

- This is a water-based conductive paint that can be used over the Electroforming Sealer
- This conductive paint is easy to apply with a brush or airbrush.
- The sealer works on any material where normal water-based paint does not cause any problems.
- Apply via brush or airbrush.
- Dilute according to the product's manual.

Step-by-step plan for electroforming

Before you start the process, you first adjust the included power supply. Make sure that the red positive wire is disconnected from the electroforming bath.

- Turn on the power supply and turn the Ampere knob all the way to the lowest position.
- 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.

Do you want to take the workpiece out of the bath in the meantime to have a look? Then first turn off the power supply and disconnect the red positive from the anodes. If you don't, all the current will flow through the last small point of contact of the copper with the electrolyte when removing or hanging back, resulting in dark burn marks. Do not turn the power supply back on until the object is in the electrolyte and reconnected.

Prepare

- Make materials dust and grease free.
- Porous/organic first seal completely: let layers dry / harden completely.
- Insert rings/eye pins/copper wire before coating.
- Apply the chosen conductive paint and let it dry completely.
- If necessary, weigh down with a small non-conductive weight of nylon thread.

Preparing a bath

- Install circulation pump.
- Electroforming bath filling with V-Brite 200 electrolyte.
- Level marking
- Wrap anodes in the anode filter, hang them in the electrolyte and connect them together.
- Connect the red positive wire to the anodes.
- Placing a nylon bar

Calculating current value

- Calculate the surface area in cm². Start rule: 0.2 Amps per 10 cm².
- Anode:object ratio approximately 2:1 (only the anode face facing the workpiece counts).
- Example object of 200 cm²
    - 200/10 = 20

- 20 × 0.2 A = 4 A current rating.

Hanging and connecting the object

- Attach copper wire to the object.
- Hang the object on the nylon rod in the middle of the bath. Use the included clamps to hold the copper wire onto the nylon rod.
- Connect the black wire to the copper wire of the object.

Starting on low current

- Turn on the power supply and start at 0.05–0.10 A.
- Let run for 5–10 minutes until you see copper around the suspension point and the coverage is underway.
- Now you can increase the amperage to 20-30% of the calculated current value.

Building Power

- Check after 10–20 minutes and increase again if there is enough extra coverage.
- In 2–4 steps to the calculated current value.
- After 50-75% of the object is covered with a layer of copper, you can set the full calculated current value.
- If you see dark spots or a lot of structure in the copper, adjust the power supply a little lower.

Duration and thickness

- Guide value V-Brite 200: approx. 0.01–0.025 mm per hour at conventional settings.
- For thick padding, prefer V-Brite 100.
- If the object has a satin or matte finish, the power supply is probably set too low. You can adjust the power supply a little higher. Wait at least 20-30 minutes to reassess the layer.

Removing and rinsing

- Turn off the power supply.
- Remove workpiece from the bath.
- Spray above the tank with demi/DI water so that electrolyte runs back.

Neutralize and rinse

- Immerse the object several times in the baking soda solution and leave it in the solution for about 20 seconds to neutralize the remaining acid.
- Then rinse again with clean water.

Dry

- Dry at room temperature or with a blow dryer/heat gun on a low setting.
- Do not use compressor air due to oil/moisture and rings in the finish.

Post-treatment

You can treat the object in various ways.

- Polish.
- Apply patina.
- apply another metal such as nickel, chromium or bronze.
- Finish with sealer/lacquer such as the Electroforming Sealer, Galvanizing Shop DeepSeal or another lacquer or wax of your choice.

electropolishing

This is useful when a copper layer comes out of the bath mat or is slightly oxidized and has difficult shapes that prevent it from being mechanically polished.

Electropolishing is "reverse electroplating": instead of applying copper, the current dissolves microscopic particles of copper. As a result, peaks (structure) disappear faster than valleys and a dull or uneven layer gets a tight, shiny surface.

You use an acid-resistant container with electropolishing liquid, the workpiece on the positive (anode) and a counter plate on the minus (cathode). The process requires a high current density, about 1-3 Amps per 10 cm^2, so a heavy power supply is needed.

The patina, sealers and electropolishing products can be ordered on the webshop.

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 at 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.

Storage

The electrolyte is acidic and metal objects on and around the bath will oxidize.

Store the electrolyte in the electroplating bath closed 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 V-Brite X 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.

Do not leave metal parts hanging in or above an acidic bath to prevent oxidation. Also, do not place other metal objects directly next to it.

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

Anodes should be rinsed and dried, or stored in water with 5% sulphuric acid so that they do not oxidise. Do not leave in the bath as this will increase the copper content of the electrolyte.

If the anodes are oxidized after a longer period of storage, you can lightly sand or 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	Copper V-Brite 200
Metal	Copper
Works on	Copper, brass, nickel
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	Phosphorous copper 0.03 % – 0.05 % phosphorus Optimal ratio: 2:1 anode:object
Anode filter	5-10 µm polypropylene filter (bags)
Anode hook	Copper or titanium pendant/basket. Do not use as a hook: steel/stainless steel.
Recommended Flow Density	0.2 Amps per 10 cm² - (2 A/dm²) Range: 0.01–0.75 Amps per 10 cm²
pH value	<1
Rinse aid	Add 1 ml/l V-Brite X rinse aid periodically
Time	10+ minutes
Agitation	Pump or air (no unfiltered compressor air due to oil/water) 1-2 bath revolutions per hour
Operating Range Temperature	21–32 °C
Optimal temperature	± 25 °C
Shelf life	Long shelf life with proper maintenance
Metal issued by	Anode
Filter media	5-10 µm polypropylene filter 5-10 µm PP filter cartridge Diatomaceous earth (only for an external filter installation)

Electroforming problems and solutions

Problem	Cause	Solution
Electroforming		
Slow start/no coverage further from suspension point	Conductive paint layer too thin → high resistance	Apply 1–2 more very thin coats for continuity; check resistance with multimeter; possible second point of contact; only then increase current.
Blistering/detachment during or after plating	Sealer or conductive paint not completely dry/cured	Allow layers to fully cure (hours/days, depending on product); Remove and rebuild defective areas.
Dull, blotchy areas and rapidly increasing brightener consumption	Organic contamination due to poorly sealed objects (material leaks in the bath)	Filter bath with activated carbon; then add 200S + X again; remove the cause (seal better, let layers dry).
Peeling/Creasing of Conductive Layer	Solvent-bonded Conserve applied over water-based sealer	Do not combine: Conserve only directly on substrate; or water-based sealer with water-based conductive paint. Recovery: Remove layers and rebuild them correctly.
Edge line/one-sided coverage for floating objects	Light object floats, only edge in contact	Weighting/tethering workpiece (glass beads/PP net, PTFE/PP clip-weights, copper weights); or fully submerge and maintain agitation.
Pitting/holes on porous material	Air in pores/fibers; Insufficient sealing	Dip several times and gently shake/tap; deep seal and dry completely; Then apply a conductive layer.
No start of deposition	Contact patch suspension point not co-coated or poor electrical contact	Contact point co-coating/bare copper contact; Clean the clamp and wire and clamp it well.

Problems and solutions V-Brite 200

Electrical / Current Density		
General dullness	Too little polish	Dose and test rinse aid V-Brite X in small steps (start: small, reassess).
	Bath contaminated (organic or particulate)	Fine filtering (5–10 µm). For organic: activated carbon; then add rinse aid(s) again (200S + X).
	Too low temperature	Heat to 24–28 °C (operating range 21–32 °C).
	Too low current (current density)	Increase current slightly; starting value 0.20 Ampere per 10 cm².
	Insufficient agitation	Improve agitation (circulation or air; 1–2 bath revolutions/hour).
	Poor pre-treatment / oxide	Re-clean/activate workpiece; Do not allow to dry between etching, rinsing and copper-plating.
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 (2:1 anode: workpiece, facing workpiece).
	Insufficient agitation	Increase agitation/make it more constant.
	Electroforming: too fast to full current (small contact surface)	Start at ~10–20 % of current value; wait for visible copper deposits; in 2–4 steps to calculated flow.
Dull low in depths (low flow zones)	Too little polish	V-Brite X dosing and testing.
	Anode position unfavorable	Reposition anodes or use auxiliary anodes.
	Too low current	Increase current slightly.

	Insufficient agitation	Improve agitation.
Surface / cleanliness		
Holes / pinholes	Grease/dirt on workpiece	Better cleaning/degreasing (waterbreak test).
	Air bubbles / impact	Quiet loading/unloading; avoid air ingress.
	Particles in the bath	Fine filtering (5–10 µm); Check anode filters.
	Residual acid/oxidation after bath	Briefly neutralize in baking soda solution; Then rinse well.
Rough/granular surface	Poor filtration	Filter change (5–10 µm) and filter through; improve continuity.
	Anode Glue or Cracks in Anode Cover	Check or replace PP anode covers.
	Coarse metal particles	Filter through (5–10 µm) to clear.
	Current too high at edges	Reduce current slightly or increase distance; screens.
Suture		
Poor adhesion / blisters	Insufficient cleaning/activation	Re-perform pre-treatment; Do not allow to dry between steps.
	Substrate unsuitable: directly on steel/zinc/aluminium	Not directly in acid copper: first apply alkaline copper strike (bonding layer), then V-Brite 200.
Gloss / appearance		
No gloss / satin on surfaces (edges are shiny)	Rinse aid used up or removed by activated carbon	V-Brite X refill and test; after activated carbon, also add 200S again (variant dependent).
	Too low temperature	Heat to 24–28 °C.
	Too low current	Increase the current slightly (towards 0.20 A/10 cm²).
Brittle/powdery deposits	Too much polish	(Partially) refresh or filter with activated carbon; then V-Brite X carefully in small steps; reduce the current slightly.

Opacity/Geometry		
Uneven thickness / shading	Anode position or distance unequal	Repositioning anodes; make distance uniform.
	Too little anode surface	Insert additional anodes 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.
Bath condition / contamination		
Contamination with other metals	Incorrect suspension/clamps (steel/stainless steel)	Copper/titanium or plastic-coated suspension; no bare (stainless) steel over 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		
Too high a concentration due to evaporation	Water level dropped; components relatively too high	To mark with demi/DI water; check gloss image; Dosing rinse aid according to the guideline
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.
Anodes / hardware		
Wrong anode material or no anode cover	Granular/crude deposit and excessive anode sludge	Use phosphorous copper DHP (0.025–0.06 % P) in PP covers;

		Conditioning/replacing anodes in case of contamination.

Warning!

The conductive paint is toxic if used incorrectly. 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 work with the 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. They will fall over!
- 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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