User Manual for the Professional Electroforming Station

General Description:

This Electroforming Station is a professionally constructed high performance plating/forming station designed to plate, form, strip and clean multiple items using electrochemical method. The station is a state of the art set of equipment (appliance) incorporating principles of modern design. It is entirely suitable for any type of electrochemical work with both conductive (metals) and non-conductive (glass, plastic, wood etc) materials. Electrochemical processes are widely used in many industries, electronics, machinery, decorating, crafts, jewellery, arts, etc. **The** station is suitable for professional coating of all sorts of materials.

Principles of electroforming & electroplating processes:

Processes of electro plating are defined as covering any electricity conducting material with an adherent and durable film of metal. This is achieved by placing an object in a tank containing a solution of a specific metal and then performing an electrolytic action with the purpose of covering the object with the metal film. If the object you wish to plate is conductive then it can be plated directly.

The electrochemical station uses natural conductivity of the material to complete the electrolytic action that allows the plating process to work.

If however, your object is non-conductive (i.e. glass, plastic, wood etc) the object must first be painted with: Graphite (soft materials), Copper (some types of plastic) or Silver (all materials) conductive paint so that the electroplating process can work to do an electroforming.

Once the cathode (the object to be treated) and the anode are submersed in the tank and covered by the solution and the station is turned on an electric current flows through the solution causing the formation of an electric circuit and initiates the process of moving the metal ions from the solution to the cathode resulting in coating of the cathode (namely, the object to be plated) by the atoms of the metal. At the same time, an equal amount of the same metal is discharged from the anode into the solution. For electroforming process you will require only about 0.2 A/inch that is why this station has a 10-turns potentiometer to regulate any range of amperage inside a solution. This station also has a 5000 Mf filter to get a best possible quality of forming surface and can works 24/7.

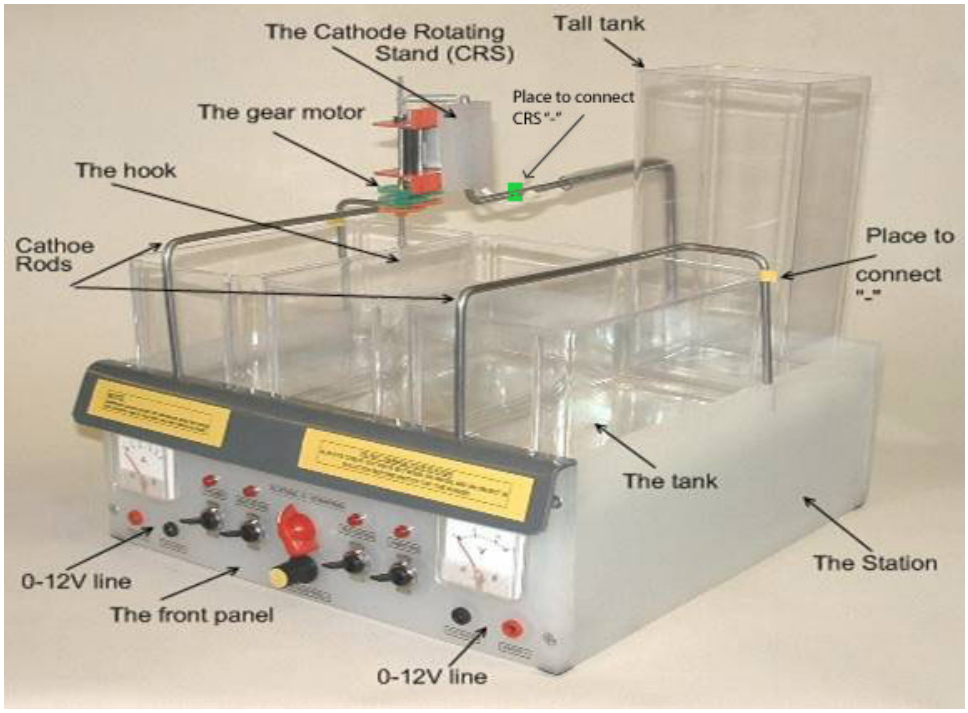
Station Technical Specification:

Model	**HSEPS**
Power Supply	**220V – 240V ac / 110V – 120V ac**
Regulated Amperage (DC)	**0 A - 10 A**
Power	**500 Watt**
Plating lines	**2**
Plating line parameters	**0-15Vdc / 0-10Adc=7V**
Heater	**1 x 1500 Watt**
Air pump	**1 x 72 L/Hour**
CRS (Cathode Rotating Stand)	**1**
CRS speed	**3-4 RPM**
Horizontal tank	**3 (150W x 70D x 70H mm)**
Vertical tank	**1 (95W x 80D x 205 mm)**
Dimensions of station (mm)	**315W x 335D x 280H**

Weight	**4.4 Kg**

Performance:

The station can be used on either 220V-240V or 110V-120V on request. It uses current from 0A (dc) to 10A (dc) and produces a voltage of up to 15V. It allows cleaning, plating or forming of gold, rhodium, copper, nickel, zinc, brass, bronze, silver, bismuth, and other metals and alloys.



Delivery Specification:

Please check the delivery includes the following components:-

- The station;
- Black and red leads with **crocodile connectors** (clamps)(for Anode & Cathode);
- 1 stainless steel anode for gold, silver plating/stripping and cleaning processes;
- 3 horizontal plating tanks;
- 1 tall tank;
- Two years warranty on a 1500 Watt heating element (heating system), air pump (agitation system) and CRS motor (Cathode Rotating Stand).

If the station that you receive looks different from the model you have seen before please do not worry. You can be assured that any changes that have been made are solely made with the purpose of improving quality, appearance and specifications of the plating station in accordance with our commitment to a continuous improvement process which is based on the feedback provided to us by our clients.

Terminology for beginners:

Throughout the User Manual we refer to the terms **Anode and Cathode** a lot. Please do not be put off by this. Quite simply the Anode is the piece of metal in the tank which should be connected to the plus "+" or positive power and the Cathode is what your object to be plated and that should be connected to the minus "-"or the negative power.

CRS (**Cathode Rotating Stand**) is a motor with a small hook on a metal arm in the middle of this station. It is widely used to rotate an object to be plated in a tank with solution. The Cathode Rotating Stand will allow to obtain the best finish possible with this station. The principle is simple, i.e., instead of the object remaining static in the tank it is rotated slowly in the solution ensuring even coverage and spectacular finish. To connect the CRS plug the negative (black) wire into the left or right black socket on the front panel and clip the **crocodile clip** clamp to a screw on the top of the motor's stand (please see pictures below). Please also do not forget to plug in a positive (red) wire into a left or right red socket. Using crocodile clip **clamp** connect this red wire to an anode (in a tank that is placed under this CRS motor). Use this rotating stand when you require a high quality plating surface or for electroforming process. Make sure the object is fully immersed into the solution and does not touch the anode whilst rotating.
Air agitation system consists of a small air pump and a clear PVC tube 8 mm diameter with a plastic plug and micro-holes on its end that should be placed in the tank with the solution. Air from a small air pump (previously installed inside the station) goes via this tube to the end with micro-holes and small bubbles will be seen formed in your solution. It is a very important option that allows you to mix a solution in process (and to perform this process much faster). This option also allows your chemicals to work longer and to achieve better result using less time.

Heating system – This new model is supplied with an integral heating element located under the top metal lid for a heating option. This heating element is more powerful than the previous one and allows you to maintain a solution in tank warm. It is indeed a very safe heating option as it is provided with an automatic cut-off switch that disconnects this heating element automatically should the temperature reach more than 70C. This will protect your station, plastic tanks and solutions from overheating by keeping them at an optimal operating temperature at all times.

DC power cut-off system - this model has an overload DC power cut-off system that allows the station to remain in full working order if an accidental shortcut occurs. (Connect an anode and cathode together in a solution for period of up to 20 seconds).

Coating Quality - is a complex function and depends on the electric current, voltage, solution temperature, exposure time, correct position in the solution, distance between an object and an anode, shape of plating/forming object, solution quality and your experience so you may require additional training or skills to plate/form some materials.

Installation and Operation:

Installation and operation of this station does not require in-depth professional knowledge or specific training. Just install a CRS on back panel (please see "Assembly") and connect this station to a power supply. Now it is ready to use.

To start electroplating / electroforming you will also need the following:

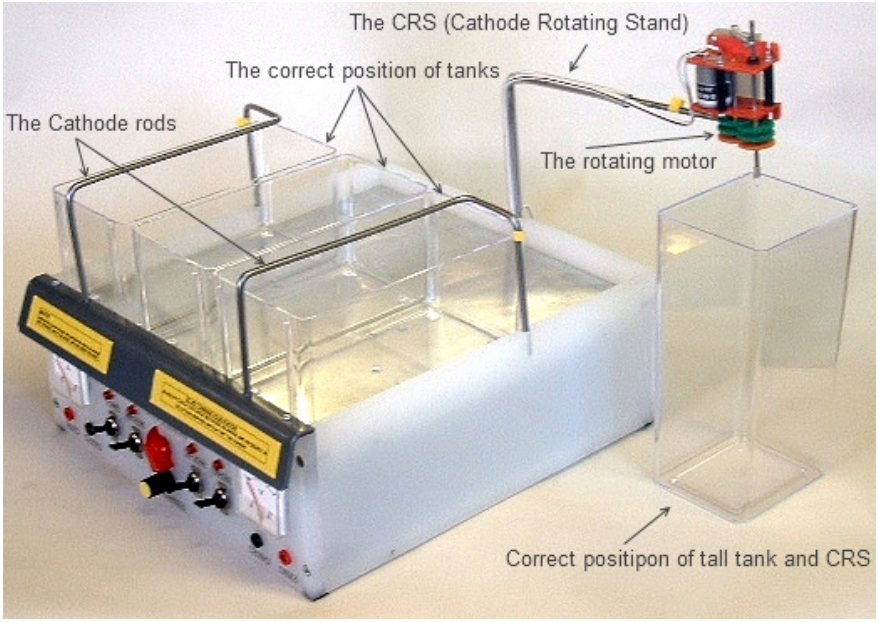
- Sufficient amount of distilled or deionised water (water for car acid batteries is suitable).
- Electro cleaning salt suitable for any plating process.
- Plating/Forming chemicals depending on plating process.
- Copper or aluminium wire to connect objects to the cathode rods or to the CRS hook.
- Rinsing water in glass or plastic containers or, alternatively, easy access to tap water.

Positioning the station:

After making sure that you have all the above mentioned items at your disposal place the station in a suitable level position. Please ensure that the place where you intend to use your station is able to support the entire weight of the station (10 kg). It is best to make sure that a good source of rinsing water is located next to the station and good ventilation is accessible.

Assembly:

Each Cathode Rotating Stand (CRS) is mounted on a steel rod and packed separately. Please note that the CRS is also connected to the station by cable. Please place the opposite end of the rod (one without a motor) into its locating hole (in the middle of the back panel of the station). If you wish to use a tall tank (it can be used only with a CRS) you can place it anywhere around the station because the CRS can be moved around. The right position is when the CRS motor is located on the top of the tank:



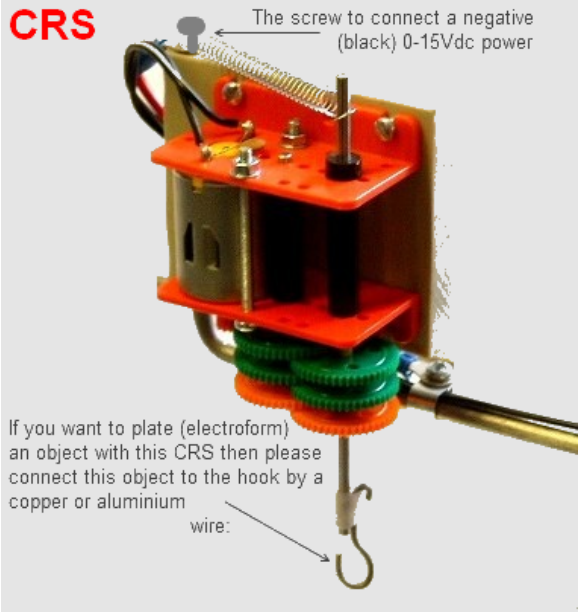
Priming:

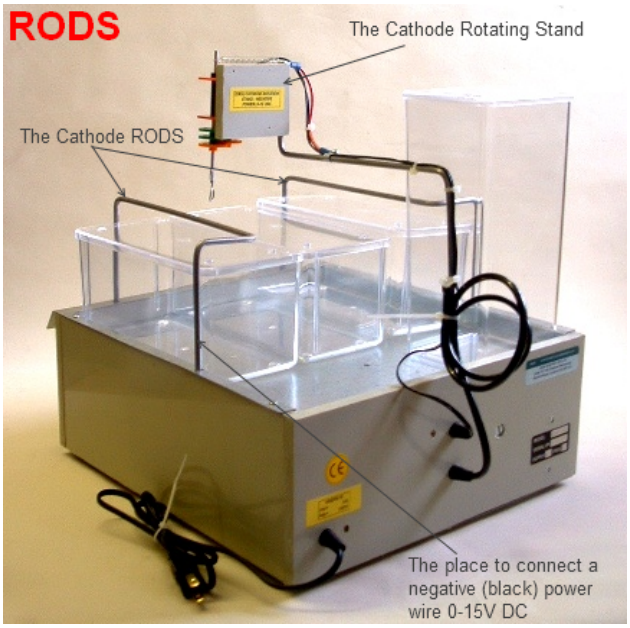
Dissolve the chemicals in a correct amount of warm (about 40-70C) distilled water, stir them very well and pour the solutions into the tanks (capacity of each tank is about 1 L). For example, fill the left horizontal tank ¾ full with the cleaning solution and the second horizontal tank with tap water and the right horizontal tank with the plating solution. (You can also use all tanks in different ways, for example, for cleaning or plating/forming solution in all three tanks). Attach anodes to the walls of these tanks. The station is supplied with a stainless steel anode suitable for gold, silver plating/stripping processes as well as for a cleaning purpose. Simply hook it on the side of the tank immersed into the solution. The rule of thumb is that the anode should be twice the size of the object which is to be plated or stripped and depending on the plating process used (gold, copper, chrome etc) the anode material will vary. If the object you wish to be plated is large then you can use 2 or 4 anodes around the tank.

Top Tip:
NEVER HEAT ANY SOLUTION TO THE TEMPERATURE HIGHER THAN 75 °C. OTHERWISE, IT WILL DAMAGE YOUR CHEMICALS! THE OPTIMAL TEMPERATURE FOR ANY PLATING / FORMING CHEMICAL SOLUTIONS IS ABOUT 40-70° C.

Preparation of objects to be plated:

To prepare your items for electroplating or electroforming it is important to ensure that all oil, grease, paint, old layers or other materials are removed prior to processing. The most common cause of poor quality plating or forming is insufficient preparation. The usage of an ultrasonic cleaner is excellent for the purpose of removal of polishing compounds. However, vigorous brushing with soapy water is sufficient. You can also electro-clean them in your station. This electro-cleaning process takes just from 5 to 30 minutes and this is a very short period of time compared to the time you may lose trying to plate an object which is not sufficiently clean. In order to perform a cleaning process the object which is to be plated should be hung on hooks made of copper or aluminium wire to the cathode rods or CRS and also the cathode wire (black) should be attached to the cathode rod or CRS (please see a picture bellow). Please make sure that all the item(s) are fully immersed in the cleaning solution and have a good contact with the CRS hook or with the cathode rods. Now connect a stainless steel anode (positioned in the tank with cleaning solution) by a **crocodile clip** clamp to a positive (red) wire and plug this wire into a red left or right socket on the front panel then move the main ("Plating – Stripping") switch to the "Plating" position and turn the potentiometer (positioned under this main switch) to a required voltage (usually about 7-9 Volts) and commence the process. You can repeat this procedure as many times as you require and clean up at same time as many objects as can be attached to the cathode rods. **You can place just ONE object on a CRS**.





Starting your work

Prior to switching the station "On" (by "Power" switch) make sure that the potentiometer (i.e. the volume control, the bottom knob on the middle of front panel) is fully turned anticlockwise. To supply a voltage to a cathode rod you need to use the black wire you have received with this station (If you wish to use both electrical lines and cathode rods at same time you will need to order an additional pair of lids). Please plug the black (negative, "-") wire by a **crocodile clip** clamp to a cathode rod and a 4 mm spring-plug on the other end into the right or left black socket on the front panel of your station. You can use any electrical line (left or right) whichever is more suitable for your work (regardless of tanks positions and which tanks you have used).

Now use the red (positive "+") wire to establish the connection to the ANODE in the tanks. The anode is the metal plate you insert into the solution in the tank and the red **crocodile clip** clamp should be clipped to the metal plate once it has being inserted in the tank and the plug inserted into the red left

or right socket on the front panel of your station. Now just connect the object(s) you would like to plate, clean, strip or to form by hook(s) made of copper or aluminium wire to the cathode rods (or CRS) and make sure that all the item(s) are fully immersed in the solution and have a good contact with the cathode rods or with CRS.

Top Tip:
BEFORE STARTING YOUR WORK MAKE SURE THAT THE ANODE AND THE OBJECT TO BE PLATED ARE FULLY IMMERSED IN THE SOLUTION AND **DO NOT TOUCH EACH OTHER** AS IT CAN DAMAGE YOUR STATION!

Once your solutions (tanks) and objects are ready:

1. Switch the station "On" by flipping the "Power" switch down. The red indicator on the front panel will light.

2. Switch "On" the "Heating" option. It is safe to leave it "On" throughout the day and will keep the solutions at an optimal temperature for best performance all the time. Wait for about 1 minute before you hear a click every few minutes. It means that your heating system has started to work and works properly. The top metal plate on your station (where all tanks are placed) will get hot over time. Please do not touch it with your hands without gloves! Please note that this heating system is designed to KEEP water WARM – not to HEAT it. Hence, the solution will need heating up to 70 C before filling the tank, for instance when you stir water containing chemicals.

3. Now turn the potentiometer (voltage control) clockwise until the correct voltage is shown on the voltmeter (V-gauge). The required voltage for your process can be found on the data sheets for the solution, on internet or by tests.

4. Please do not worry about the Amps. The current will only be shown on the Ampere-meter (A-gauge) when the process is started. Please make sure that your "Plating-Stripping" switch is on "Plating" position and both ANODE and CATHODE must be in the solution.

5. If required, switch "On" the "Agitation" system by placing the end of the plastic tube in the tank and small bubbles in your tanks will be formed by the agitation which will help you to save both your chemicals and your time during the plating process.

Now you may start any electro cleaning, plating, stripping or forming process you choose. Move the central (Plating – Stripping) switch on the front panel to "Plating" (for electroplating, electroforming and cleaning processes) position or to stripping position (for stripping process) depending on which operation you are performing and initiate the process.

If you find cleaning, electroplating, electroforming or stripping processes challenging please feel free to contact us regarding electroplating courses for beginners conducted either on-line or in-person

Stripping

This process is used to remove all residues or unwanted plate from a previously plated object.

For this process you will need to hang the object you are stripping on hooks made of copper or aluminium wire to the cathode rods (CRS) and attach the black wire to the cathode rods (CRS).

Please make sure that all the item(s) are fully immersed in the solution and have a good contact with the CRS hook or with the cathode rods.
There is no need to reverse the polarity of the cables as stated on the data sheets when using the stripping option as the station does this for you. Simply turn the main switch to “Stripping” position and the process starts.

Brushes and Pens

The electrochemical station has two electrical lines (outputs) enabling one to perform two electroplating processes in parallel in two tanks or to use a Pen or Brush plating device on the second output.

Connect the pen (brush) to the “+” (red) and “–“(black) sockets on the front panel using the red lead attached to your external device.
Now connect the black lead to the black socket and by **crocodile** clamp connect it to an object to be plated.
Note that the anode (brush, pen) is always connected to the “+” (red) connection and the object to be plated (cathode) is always connected to the “–“(black) socket.

Safety Instructions

All Electrochemical processes are subject to two main hazardous effects: electrical injuries and poisoning by solutions and their gases. To avoid electrical injuries the user must not touch any exposed leads of the station with unprotected hands. Always use rubber gloves. This will also protect your hands from the harmful effects of the solutions. It will also be necessary to provide a rubber mat to stand on in the operation area. The chemicals which you will work with are hazardous; many of them are deadly poisons and their combinations often produce corrosive and poisonous gases.
Therefore, all general safety precautions should be undertaken when working with them including keeping all chemicals inaccessible to children, wearing eye protection, avoiding skin contact, wearing latex gloves and avoiding inhalation.
Proper ventilation of the work area is essential. The appropriate rules of working with chemicals are provided by the suppliers of every chemical. Please follow all instructions carefully.