

XIII. Specifications

Model	USS-HFIH000 01-110V	USS-HFIH000 01-220V	USS-HFIH000 11-110V	USS-HFIH000 11-220V	USS-HFIH000 03-480V	USS-HFIH000 03-380V
Max. Inductive Power	15 KW				25 KW	
Max. Input Power	7 KW				16 KW	
Output Current	200-600 A				200-1400 A	
Turns Ratio	16:1		16:2		18:1	
Input Voltage	110V, Single Phase	220V, Single Phase	110V, Single Phase	220V, Single Phase	480V, Three Phase	380V, Three Phase
Fluctuating Frequency	30-80 KHz					
Max. Heating Temperature	1200°C (2192°F)					
Time Settings	01 to 99 seconds					
Product Dimensions	22" x 9" x 19"					
Product Weight	25 kg (55 lbs)					
Water Temperature Protection Point	40°C (104°F)					
Flow Rate of Cooling Water	≥ 7.5 L/min					
Min. Water Pressure	0.3 MPa					
Head of Cooling Water	≥ 30 m (98 ft)					
Min. Wire Gauge	9 gauge					

HIGH-FREQUENCY INDUCTION HEATER

USS-HFIH00001

USS-HFIH00011

USS-HFIH00003

This manual shall be made available to all users of this high-frequency induction heater. To ensure the best results and maximum durability of this U.S. SOLID LLC (hereafter U.S. SOLID or The Company) product, read and follow all instructions carefully. Failure to do so may lead to serious bodily injury and catastrophic damage to the heater, supplies, or surrounding area. All safety suggestions must be followed closely and precautions must be taken to guarantee this heater is only used by qualified personnel who have understood this guide.

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Parts

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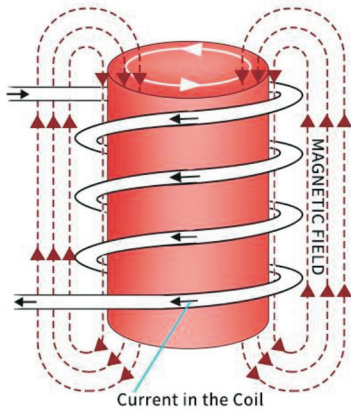


No.	Part	Quantity
①	Foot pedal	1x
②	Fuse	3x
③	Clamps (stainless steel)	4x
④	Tubing (copper) to <i>connect</i> your own coil	2x (each ~0.5 ft long)
⑤	Tubing (copper) to <i>create</i> your own coil	1x (~5 ft long)
⑥	Coil (copper)	1x (~3.3 ft long)
⑦	Hose (rubber)	1x (~32 ft long, 3/4" diameter)
⑧	High-frequency induction heater	1x

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I. Operating Principles

Induction heating is a contact-free heating process which uses high-frequency electricity to generate heat. When an alternating current (AC) flows through the coil while a workpiece is positioned inside, an electromagnetic field is generated. Once the current alternates (i.e., changes) direction, the direction of the electromagnetic field also changes. Because this new electromagnetic field contradicts the initial magnetic field, this process produces an eddy current (sometimes referred to as Foucault's current). Based on Joule's first law,¹ Joule heating is then generated. As time passes, the density of the workpiece increases, leading to growing resistance,² which in turn generates more Joule heating, causing the workpiece to get incrementally hotter.



¹ Joule's first law: $Q = I^2RT$

Q: Joule heating

I: Eddy current

R: resistance

T: time

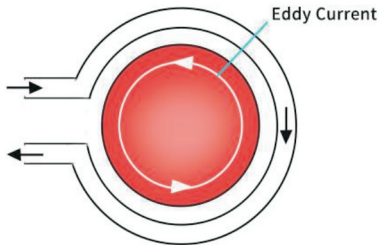
² Resistance: $R = \rho \frac{L}{S}$

R: resistance

ρ : resistivity of the metal

L: length

S: cross-section



II. Getting Started

Thank you for purchasing the U.S. SOLID high-frequency induction heater. To ensure smooth and safe operations, please review this full manual and refer to our website for an explainer video on how to operate this premium product:

www.ussolid.com/induction-heater.html

Changes in technology happen often and rapidly, which is why our team at U.S. SOLID reserves the right to modify the specifications and procedures for this high-frequency induction heater immediately and without notice. The Company will not assume responsibility for equipment damage or malfunction due to improper operation, incorrect repairs, or use of unauthorized parts.

This induction heater has passed rigorous testing and extensive research and development. Like all of our products, it is made with quality materials at a reasonable price. This induction heater is suitable for heating a variety of metals in different sizes.

You have 30 days from the date of delivery to return this product. If the returned item has been opened, a 15% restocking fee will be applied. We provide a 12-month warranty from the date of the sale. Within the warranty window, we are responsible for any replacement parts needed caused by quality issues. If you want to return a defective item, please contact our customer service team to receive a free prepaid shipping label for your return. To expedite the warranty process, please describe the issue and include the following information: purchase date, order number, name of the original purchasing entity, delivery address, and serial number. After the 12-month warranty period, we offer to replace parts at current retail cost, but complete product returns will not be accepted.

The warranty will only be in effect if all instructions in the manual are followed. The warranty does not cover damage caused by force majeure (e.g., natural disasters such as hurricanes, floods, or earthquakes).

This manual includes basic safety precautions and instructions for installation, operation, and maintenance.

III. Safety Instructions

- This machine should only be operated by adults who have read and fully understood this manual.
- Always make sure the machine is grounded.
- Keep the area around the machine clean and free of debris.
- Place the heater on a stable and level surface.
- Only use original parts from the manufacturer to ensure your safety and the best product performance.
- Do not touch any of the electrical connections while the machine is plugged in or turned on to avoid risk of electrocution.
- The heater is designed to be used in an industrial environment with an ambient temperature of 1-45°C (34-113°F).
- Make sure that the coil is properly fitted with an insulation sleeve to limit sparks and the risk of fire.
- Turn off and unplug the machine when making any adjustments, repairs, or when storing the machine.
- Remove all metal from your hands and arms when operating this machine, including rings and watches. Metal may heat up if exposed to the coil and could lead to serious bodily injury.
- Place heated materials in a safe place after heating to avoid fire or injury.
- Since the induction heater generates a magnetic field, anyone with a **pacemaker** or other medical device should not work or be in the immediate vicinity of the device. Other sensitive equipment, such as wrist watches, magnetic carriers, or electronic circuits, might also be affected. A safe minimum distance of 0.5 meters (20") is recommended.
- Circulating cooling water: High-quality circulating cooling water can expand the life of the high-frequency induction heater. Poor water quality may cause rust, scrap, and blockage inside the equipment, which will damage the machine. The following water is recommended (in order of priority): distilled water, softened water, pure water, filtered water.

IV. Setting Up

When first receiving the induction heating machine, be careful when removing the machine from its box. This product is a heavy piece of equipment. The machine comes with one assembled coil, and one piece of copper tubing to create your own coil.

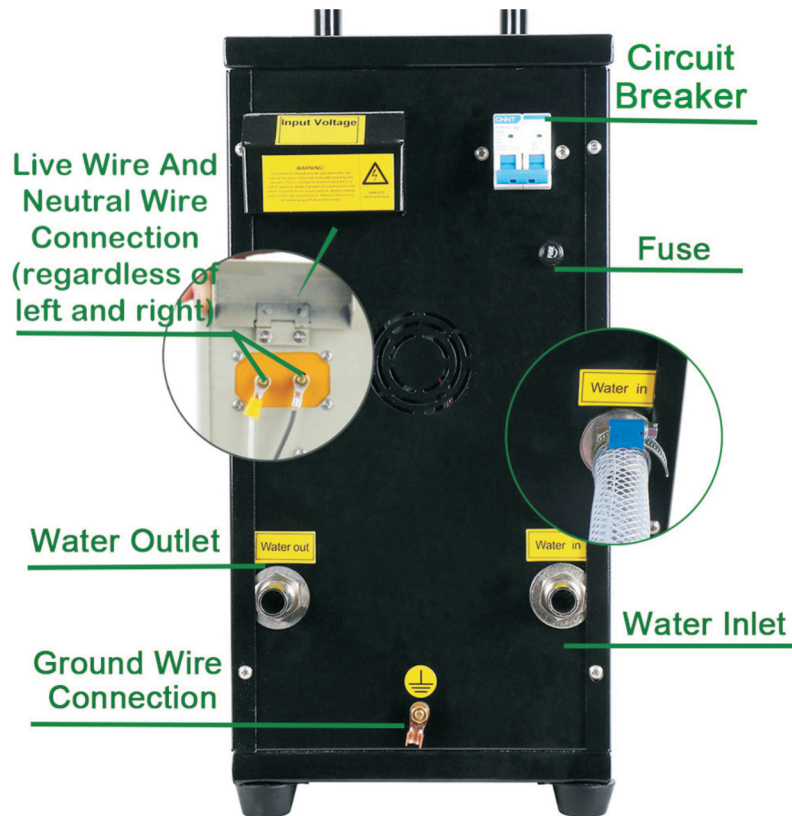
Start by connecting the assembled coil to the machine. It is important that it is screwed in tightly, as water will be running through the coil. Use a wrench to tighten the connecting bolts.

Once the coil is connected, water input and output can start being routed. One hose is provided, but it is possible more hoses will be needed (found at any hardware store). A water circulator pump or a water chiller may be used as a cooling device. You can also connect the heater to a tap water outlet. In this case, it is important that the tap water is clean and has enough water pressure. Dirty water will lead to the machine breaking down. Please make sure the flow rate of the cooling water is at least 7.5 L/min, the water pressure is more than 0.3 MPa, and the head should be more than 30 m (98 ft).

Next, set up the wires. Make sure the wiring used is at least 9 gauge wire. Connect the ground, live and neutral wires to their designated spots on the back of the machine. Check that no wire is exposed from the connections, as this could present a potential fire or electrocution hazard.

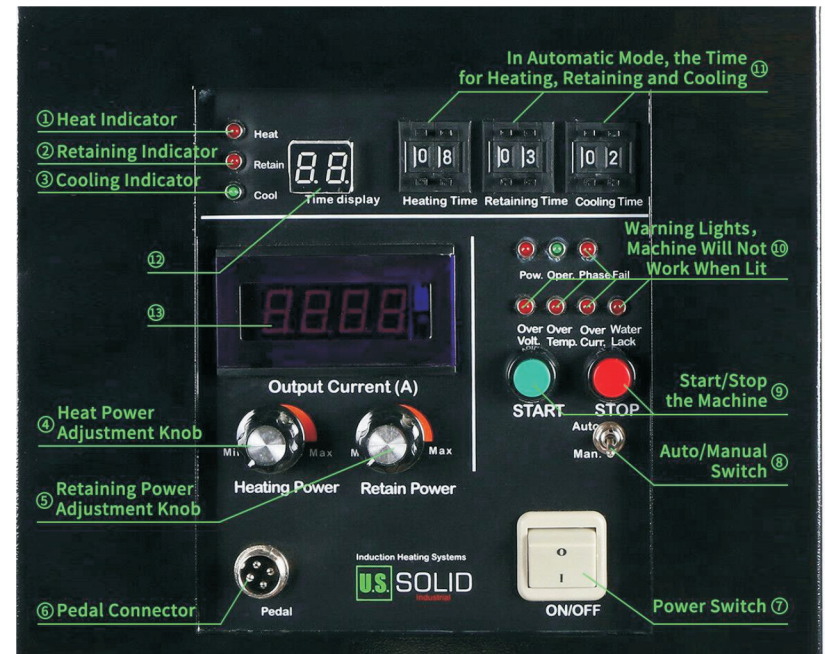
It is important that the machine is set up in a place free of debris and clutter. Make sure hoses and wires for the machine are secured to avoid tripping hazards.

V. Back of the Heater



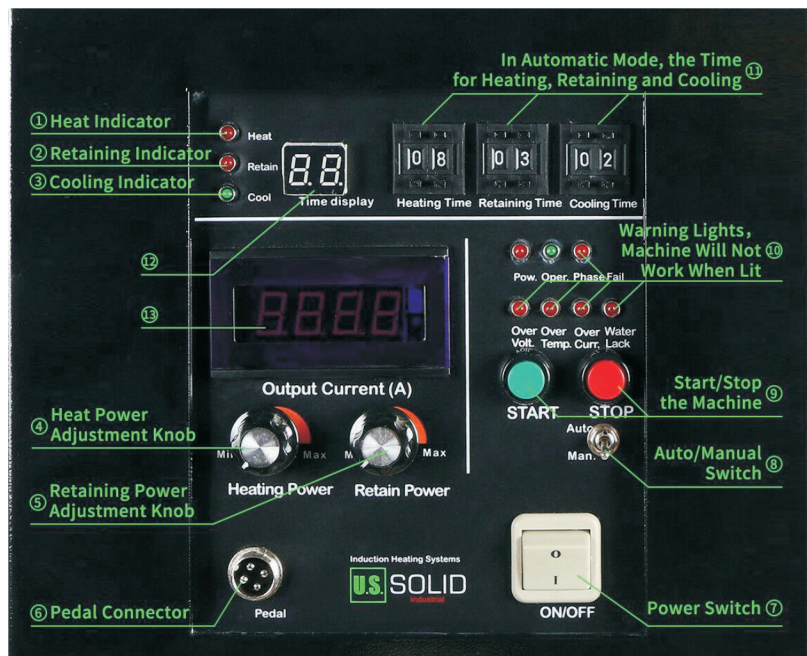
Notice where the water inlet and water outlet in this photo of your heater are located. Also, note the ground wire screw, which is towards the bottom of your machine. In this image, the housing is flipped up to show where to connect the two current-carrying wires.

VI. Front Panel in Auto Mode



- ① Heat Indicator: When lit, the machine is heating the workpiece.
- ② Retaining Indicator: When lit, heat is retained using the current set by the Retain Power Adjustment Knob.
- ③ Cooling Indicator: When lit, current is no longer running through the coil, allowing for the workpiece to cool down.
- ④ Heat Power Adjustment Knob: Controls the current going through the coil in manual mode, and during the heating portion in automatic mode. It is recommended to start at a low current when first turning the machine on, and then slowly increase the current by rotating the knob as the machine warms up. The more this knob is turned clockwise, the higher the temperature of the workpiece will get.

VI. Front Panel in Auto Mode



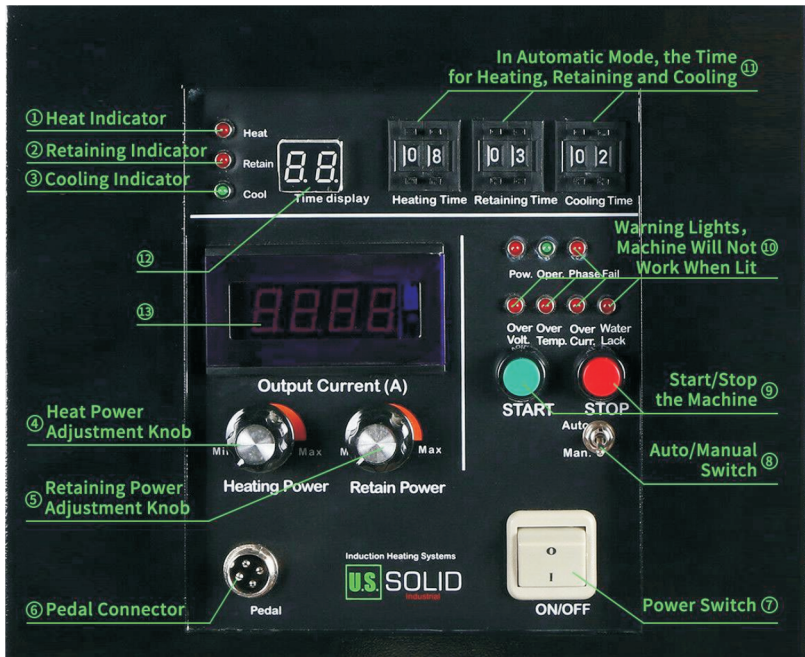
- ⑤ Retaining Power Adjustment Knob: Controls the current when in heat retention mode. This is only applicable when the machine is in automatic mode.
- ⑥ Pedal Connector: If the foot pedal is connected to the machine, the machine can be controlled using the pedal instead of the Start/Stop Buttons on the machine.
- ⑦ Power Switch: Turns the machine on or off.
- ⑧ Auto/Manual Switch: Switches the working mode between automatic and manual.
- ⑨ Start/Stop Buttons: Starts or stops the working process when the pedal is not connected.

VI. Front Panel in Auto Mode



- ⑩ Warning Lights (Over Volt, Over Temp, Over Current, Water Lack, and Phase Fail): When one of these light up, the machine will cease operating. Different lights indicate different issues: Either too much voltage or current is running, the machine is overheating, the water pressure to the machine is not high enough, or the phase power is failing.
- ⑪ Time for Heating, Retaining, and Cooling:
 - Heating Time: Time (in seconds) for heating the workpiece according to the level selected using the Heat Power Adjustment Knob.
 - Retaining Time: Time (in seconds) for heat retention of the workpiece, according to the level selected using the Retain Power Adjustment Knob.
 - Cool Time: Time (in seconds) for cooling. No selection possible.

VI. Front Panel in Auto Mode



⑪ Time (in seconds) given between zero and 99 seconds. Can be increased using the button **below** the numbers and decreased using the button **above** the numbers.

Note: 99 and 00 both represent 99 seconds.

⑫ Time Display: Displays the time of the current phase when in automatic mode. When the Heat Indicator lights up, it shows the heating time. When the Retaining Indicator lights up, it shows the retaining time. When the Cooling Indicator lights up, it shows the cooling time.

⑬ Output Current: When twisting the Heating Power Knob, this shows the heating power. When twisting the Retain Power Knob, it shows the retain power. When the machine is operating, it shows the induced current on the coil.

VII. Operating the Heater in Auto Mode

When the machine is in automatic mode, heating of the workpiece will be controlled by setting the Heating Time, Retaining Time, and Cooling Time. These numbers can be between zero and 99 seconds. Once your desired times are set, simply press the Start Button and insert the workpiece. The coil will be energized at the level selected using the Heat Power Adjustment Knob and will stay at this level for the duration of the selected Heating Time. The Heat Light will be on during this period.

After that time has elapsed, the program enters Retaining Mode. The coil will still be energized, but at the level selected using the Retaining Power Adjustment Knob for the duration of the selected Retaining Time. During this period, the Retain Light will be on.

Finally, the machine enters Cooling Mode. The coil will not be energized for the duration of the selected Cooling Time. Once the program is finished, to run it again, simply press the Start Button again. Automatic mode can be very useful for repeating the same action on different workpieces. Similarly, when soldering, brazing, or otherwise needing two different working temperatures, automatic mode can provide that as well.

Step 1: Flip the On/Off Switch to turn on the machine.

Step 2: Press the - or + button to set the Heating Time, Retaining Time, and Cooling Time.

Step 3: Twist the Heating Power Adjustment Knob to set the heating power.

Step 4: Twist the Retain Power Adjustment Knob to set the retaining power.

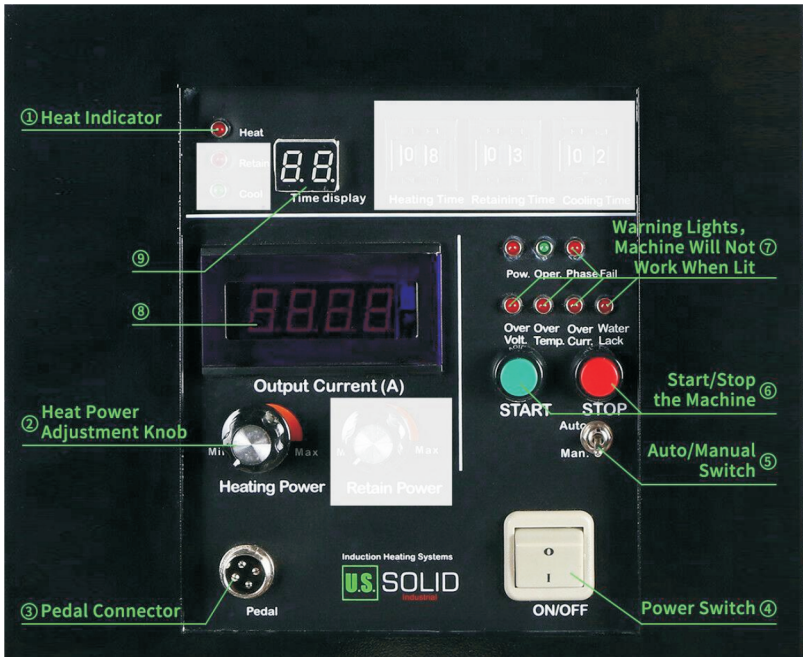
Step 5: Press the Start Button (or press the foot pedal) to start the heating process.

Step 6: Turn off the machine and unplug the heater when not in use.

Notes:

- If the pedal is connected to the machine, you can only start the machine by pressing foot pedal.
- The light of Oper. flashes and the machine beeps when the machine is in use.

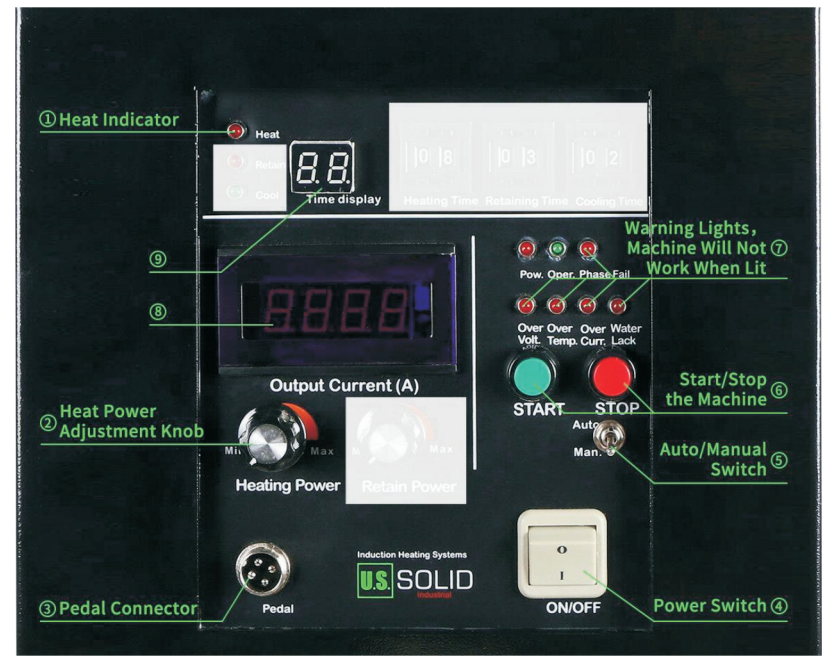
VIII. Front Panel in Manual Mode



- ① Heat Indicator: When on, it indicates that heating is taking place.
- ② Retaining Indicator: When lit, heat is retained using the current set by the Retain Power Adjustment Knob.
- ③ Pedal Connection: If the foot pedal is connected to the machine, the machine can only be controlled using the pedal instead of the Start/Stop Buttons on the machine.
- ④ Power Switch: Turn the machine on or off.
- ⑤ Auto/Manual Switch: Toggles between working modes.
- ⑥ Start/Stop Buttons: Start or stop the working process when the pedal is not connected.

For questions or concerns, email: service@ussolid.com

VIII. Front Panel in Manual Mode



- ⑦ Warning Lights (Over Volt, Over Temp, Over Current, Water Lack, and Phase Fail): When one of these lights turns on, the machine will cease operating. Different lights indicate different issues. Either too much voltage or current is running, the machine is overheating, the water pressure to the machine is not high enough, or the phase power is failing.
- ⑧ Time Display: Shows the working time (in seconds). This increases as time passes.
- ⑨ Output Current: When turning the Heating Power Knob, this displays the heating power. When the heater is working, it shows the induced current on the coil.

Note: Indicators and knobs covered by a gray box in the picture means they do not affect the heater when in manual mode.

For questions or concerns, email: service@ussolid.com

IX. Operating the Heater in Manual Mode

Adjust the Heat Power Adjustment Knob to the desired level, then press the pedal to energize the coil. Insert your workpiece into the coil to begin heating. The further the Heat Power Adjustment Knob is turned clockwise, the hotter your workpiece will get.

- Step 1: Flip the On/Off Switch to turn on the heater.
- Step 2: Twist the Heating Power Adjustment Knob to select the heating power.
- Step 3: Press the Start Button or press the foot pedal to start heating.
- Step 4: Turn off and unplug the heater when not in use.

Note: If the pedal is connected to the machine, you can only start the machine by pressing foot pedal.

X. Other Factors

In actual use, many factors will determine the speed and temperature of the heating process. While the adjustment knobs do control current, the heating power also depends on the material of the workpiece, the thickness of the workpiece, the shape of the coil, the number of turns in the coil, and the area of the turns within the coil. When using your own coil, it is recommended to try different heat settings to ensure the heater is correctly calibrated for your exact use case.

XI. Potential Applications

Application Type	Notes
Brazing	Hybrid welding of different materials. Clean the surfaces to be used. Dimension of the workpiece should be less than 1.2 x 1.2 x 1.2 ".
Diathermy	The diameter of the workpiece should be less than 5 mm (3/16").
Sealing	This can be used to seal and cap different machines. Be aware of the metal type used in the seal.
Hardening	Many metals can be heat-treated to induce hardening. Most often, this process requires quenching right after heating, so have a quenching station available.
Annealing	Some heat-treated metals will end up softer. Be aware of the type of metal you are heat-treating; results can differ.
Soldering	Much like brazing, clean the surfaces to be used. Be aware that solder can melt very quickly.
Smelting	Many metals can be smelt, e.g., copper, silver, and gold. Please note the total metal weight should be less than 1 kg (2.2 lbs).

XII. Troubleshooting

<p>Problem: Over Temperature Light comes on.</p> <p>Causes:</p> <ul style="list-style-type: none"> • Machine overheated. • Water is too hot. <p>Solutions:</p> <ul style="list-style-type: none"> • Allow the machine time to cool off, then restart. • Ensure the water temperature is less than 40°C (104°F) before it enters the machine. Remember to always use cool, clean water.
<p>Problem: Over Voltage Light comes on.</p> <p>Cause:</p> <ul style="list-style-type: none"> • The machine is not hooked up to the proper voltage. <p>Solution:</p> <ul style="list-style-type: none"> • Make sure the machine is hooked up to the appropriate voltage, based on the model.
<p>Problem: Over Current Light comes on.</p> <p>Causes:</p> <ul style="list-style-type: none"> • Internal issue. • Coil design issue. <p>Solutions:</p> <ul style="list-style-type: none"> • Contact us for help. • Ensure the coil does not have too many turns, covers too much space, or other issues.

XII. Troubleshooting

<p>Problem: The machine will not power on.</p> <p>Causes:</p> <ul style="list-style-type: none"> • The circuit breaker is tripped. • The fuse is blown. • The connections between the power supply and the machine are loose. • The outlet does not have power. <p>Solutions:</p> <ul style="list-style-type: none"> • Reset the circuit breaker. • Replace the fuse. • Unplug the machine and tighten all connections. • Check that electricity is reaching the machine.
<p>Problem: Machine beeps when attempting to start the machine.</p> <p>Causes:</p> <ul style="list-style-type: none"> • Coil not properly connected. • Improper coil design. <p>Solutions:</p> <ul style="list-style-type: none"> • Check the connection between the coil and the machine. • Ensure the coil does not have too many turns or covers too much area enclosed within it.
<p>Problem: Water Lack Light comes on.</p> <p>Causes:</p> <ul style="list-style-type: none"> • Lack of water pressure. • Leak in hoses. <p>Solutions:</p> <ul style="list-style-type: none"> • Ensure the water source is pressurized. • Fix any leaks in the water hoses.