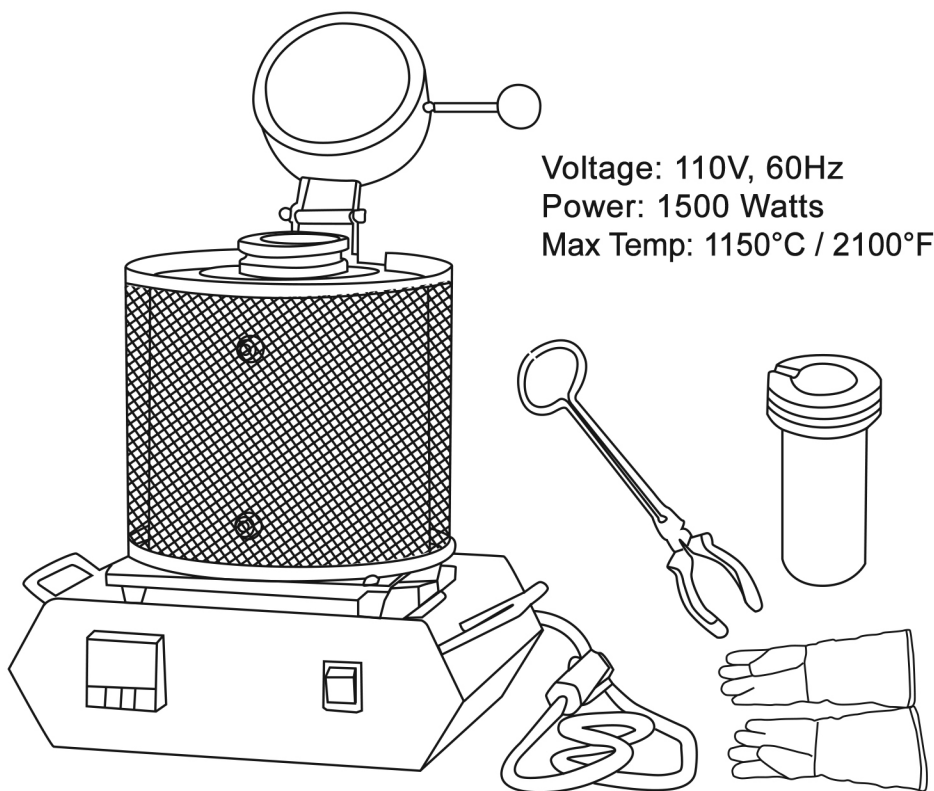




# **TABLETOP MELTING FURNACE**

## **OPERATING MANUAL**



Voltage: 110V, 60Hz  
Power: 1500 Watts  
Max Temp: 1150°C / 2100°F

**CE**

**HD-334MF**

**SAFETY AWARENESS**

- The operator of this furnace must ensure strict compliance with all the safety guidelines to prevent physical injury from burning & electrocution.
- Read all the instructions carefully and ensure you've fully understood each guideline.
- During operation, always keep this manual in close proximity so it's available when needed.
- Only use grounded power sources which are capable of yielding the requisite voltage as labeled on the furnace and don't use a damaged power cable in any circumstance.
- If the operator is in doubt, he should employ an electrician to assess the quality of furnace setup in terms of optimal safety and operation.
- Keep the solar radiation unit sealed and always use the furnace in safe location to prevent the equipment and people in close vicinity from any danger.
- During long operational periods, let the furnace cool after every 2 hour use and keep it away from any other equipment that may produce heat.
- Maintenance and cleaning must only be done when the furnace is at room temperature and disconnected from the power source, a damp cloth should be used for cleaning.
- Never use a detergent for cleaning and ensure that water or any other liquid doesn't enter the unit.
- If the furnace is being used to melt any metal with acidic or alkaline properties or substance, keep the top cover open during the melting process to prevent possible corrosion of the heating element.
- Internals of the furnace don't need any operator maintenance; therefore, the unit must not be opened without prior approval from us. Acting otherwise will void the unit's warranty.

**GENERAL SAFETY GUIDELINES FOR FURNACE USAGE**

- Keep this operator manual close to the furnace so it is easily accessible to any user of the equipment. If you have employees interacting with the furnace, instruct and train them for safe and adequate operation of the furnace.
- To dissipate the heat during the melting process, allow at least 24 inches of space between the furnace and any surrounding combustible surfaces or items. Heat emitted from the furnace requires at least this much open space to dissipate in order to avoid possible fire hazard.
- Periodically, ensure that emergency exit routes are clear and hurdle free.
- Keep a functional fire extinguisher close by for emergencies.
- Do not operate the furnace without thermal insulating safety gloves.
- Never use combustible supports for the furnace and keep combustible materials away from the furnace setup. (Combustible material means a substance that can easily catch fire.)
- During the melting process, don't leave the furnace unattended.
- To prevent liquid overflow during the melting process, never overfill the crucible.
- Always add solid materials that need to be melted slowly and gently into the hot liquid mass.

**TECHNICAL SAFETY GUIDELINES FOR FURNACE USAGE**

- To maintain the durability and optimal performance of the furnace, don't use the unit for periods exceeding 2 hours in one session. During long operational periods, let the furnace cool for at least 30 minutes after every 2 hour use.
- Assess the integrity of the crucible regularly to prevent heating element from any damage.
- The furnace is designed to operate safely up to a maximum temperature of 1150 °C or 2100 °F. Do not work the furnace above that temperature limit.
- Metals with alkaline and/or acidic properties such as recycled gold or silver tend to corrode the heating element. In any such case, to prevent the heating element from corroding, it is recommended to uncover the melting chamber at regular intervals to let the corrosion causing substances evaporate.

## **CONTROL SYSTEM: PID MODULE**

PID module serves two purposes: determining and controlling the temperature. At regular intervals, temperature of the heating element is measured and transmitted to the PID as most recent temperature value. If the value transmitted to the PID module is lower than the preset temperature value determined by the operator, the PID module increases the heat. If the value transmitted is equal to or higher than the preset temperature value, the PID module stops the heating process.

The process of measuring and controlling the temperature is extremely precise as the cycle repeats itself every 2 seconds. The PID module provides many advantages over a regular thermostat including increased precision, flexibility and efficiency thus ensuring optimized power consumption and material fatigue compensation.

## **HOW DOES THE METAL MELT?**

The integrated PID module administrates the power flux to the heating element through an electronic circuit. When the circuit is complete, the heating element heats up and transmits the heat to the crucible, where it is transmitted to the metal. Metal keeps absorbing the heat until its temperature reaches the melting point and liquefaction begins. This method is called passive heating as it occurs without any direct contact between the heat source and the metal.

## **SETTING UP THE MELTING FURNACE**

1. Gently unpack the shipping package and ensure that all components of Auto-Electric Melt Furnace are present including crucible, power cord and user manual.
2. Check the furnace and accompanying accessories for any damage that might have occurred in transit. In case of any shipment issues, contact Hardin Industrial without any delay. Also ensure that inside of heating chamber is debris-free.

Note: Hardin Industrial Furnace recommends its users to store the box and packaging material as it may come in handy if the unit needs to be returned for servicing and/or repairs.

3. Pick an appropriate and safe working space to operate the furnace. Make it certain that the area you are working on is made of ceramic, slate, metal or any other incombustible material that won't catch fire in the event of liquid metal spill.

**CAUTION!** Make sure there is at least 24 inches of distance between the melting furnace and any combustible material or item that may be present in the immediate surroundings. This is the minimal space needed to safely dissipate the heat generated by the furnace to avoid a potential fire hazard.

4. Once you have set up the unit in a safe and appropriate working space as instructed above, ensure that the unit's power switch is turned OFF before plugging the melting furnace into a grounded 110/120V power socket.

**Notice:** Furnace operator must use the fuse with correct rating if there is a need to replace electrical system's fuse.

## **OPERATIONAL SAFETY**

Hardin Industrial Auto Electro-Melt Furnace is engineered and designed to operate in a safe and efficient manner. However, because of the involvement of extremely high temperatures and liquefied metals during the melting process, operator must employ extreme caution and intensive care to avoid any personal and/or property damage. Keep the following warnings in mind before proceeding:

**CAUTION!** Only use grounded power sources which are capable of yielding the requisite voltage as labeled on the furnace and don't use a damaged power cable in any circumstance to avoid electrocution.

**CAUTION!** During the operation, always use adequate safety equipment such as safety glasses, heat resistant gloves, fire proof apron and safety boots. Liquefied metal can cause severe burns and injuries if handled without due care.

**CAUTION!** During the melting process, keep your body parts and loose clothing away from the chamber. Avoid letting sweat or any other type of moisture drip into the liquefied metal as it can cause a violent reaction. Never touch the furnace with any body part during the operation and afterwards until it has cooled down. It usually takes up to 3 hours after the furnace has been switched off. Always exercise caution as extreme heat is a fire hazard.

**Notice:** Before every use, assess the integrity of the crucible and check it for wear and tear or any type of deterioration. Because of the extremely high heat inside the crucible, the manufacturing material sloughs off with every use gradually thinning the walls and the base. Thinned exterior is prone to leakages that could result in heating element and thermocouple failure.

**Notice:** When setting the furnace temperature, never set it higher than the melting point of the metal you're going to melt. Temperatures that high will result in boiling and vaporization of the metal causing severe contamination and damaged heating element.

## OPERATING THE FURNACE

Before using the melting furnace, review the digital interface descriptions given below and make yourself and employees, if any, familiar with its operation.

1. Plug the device in the power source.
2. Press the ON/OFF button.
3. Set the temperature (smelting temperature)  
Press the SET button: SV (=set value) flashes. Every single digit can be set: to select the digit you want to change, press the "<" button. To change its value, use the buttons "√" "∧". To save the selected value, press SET again.

Notice: If you don't save the selected value, the device will automatically go back to the main display mode without holding the value which was set after 30 seconds.

4. The device is starting the heating process. The "OUT" light is lit until the temperature reaches the chosen value.
5. As soon as the temperature is reached, the device stops heating.  
The "OUT" light flashes and the temperature remains constant.
6. Cast the metal into the mold and put the crucible back into the heating chamber.
7. Turn the furnace out as soon as the whole quantity of molten metal was used.



## SETTING THE MELT TEMPERATURE AND HANDLING THE MELT

**Notice:** Before the first use, we recommend to precondition your melting furnace. Ventilate, heat the unit to 1922 °F (1050 °C) for approximately 60 minutes without crucible. It is normal to observe a discoloration of the insulation.

1. Once you have set up the unit in a safe and appropriate working space as instructed above, ensure that the unit's power switch is turned OFF before plugging the melting furnace into a grounded 110/120V power socket.  
**Notice:** Furnace operator must use the fuse with correct rating if there is a need to replace electrical system's fuse.
2. Take the crucible out and wipe the inside area with a paper towel to clean any loose graphite or debris off. Cover the lid and switch on the unit.
3. Cover the lid and switch on the unit, the digital display will show the current temperature of the heating chamber.
4. Push the set button and with 'UP' and 'DOWN' buttons, you can adjust the set point temperature to your liking. Long press on the button enables the operator to change the temperatures quickly.  
**(The up and down buttons are the only adjustment buttons needed for normal usage. The Set and Right (>) button are for internal manufacturer settings only)**
5. As soon as the operator sets the point, the unit will start increasing the temperature quickly to reach the set point. The 3 kg unit takes around 20 minutes to reach up to 1950 °F, however, lead time varies with the set temperature and the quantity and type of metal in the chamber.  
**Notice:** Slight fluctuation of temperature above or below the set point is usual and expected.
6. Lower down the crucible into the heating chamber with extreme caution and care and cover the lid.

**CAUTION!** At this moment, heating temperature is immensely hot. Always proceed with extreme caution and handle the operation wearing heat resistant gloves. Once you add the crucible,

temperature of the furnace will fall down a few degrees but it will regain the set temperature within few minutes to maintain the heat.

7. When operator starts to add metal to the crucible, it is recommended to begin with smaller pieces. At first, fill the crucible up to 1/3rd of its actual capacity. When that quantity is liquefied, you can proceed by adding more metal until you have the desired quantity of molten metal for casting.

**CAUTION!** For handling metal pieces, use high quality caster's tweezers. Never drop big and heavy metal pieces into the crucible because at high temperatures it's vulnerable enough to fracture with shock. **Notice:** In order to avoid cross contamination, it is recommended to use different crucible for different metals.

8. Once the operator has loaded the crucible completely with the metal and the temperature is a few points below the set temperature, stir the metal gently with an adequate stirring rod. As soon as the metal reaches the casting temperature, open the lid completely.
9. Firmly grasp the crucible using the tongs and remove the crucible from the furnace. Now, pour the liquid metal into the mold swiftly but gently. Metal will start to cool down immediately. Repeat the process as described if casting multiple flasks.

**CAUTION!** Never lower the furnace down more than 90° as the crucible may slide out of the unit spilling liquefied hot metal.

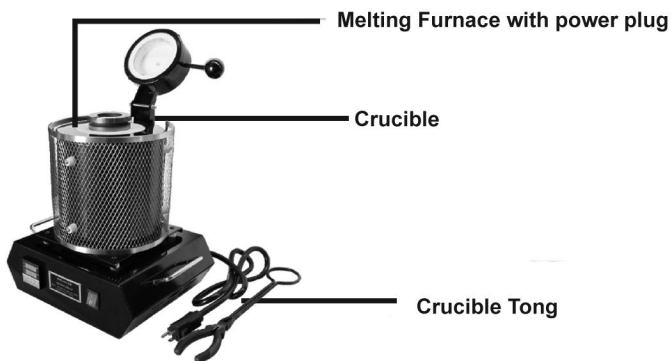
**CAUTION!** When handling hot crucible, never forget to wear heat resistant gloves.

10. When you're done with the melting process, switch off the furnace and don't forget to close the lid over the heating chamber. Always unplug the power cord to avoid accidentally switching on the furnace. Exposing the uncovered crucible to oxygen can cause graphite deterioration, therefore, keep the lid closed enabling the crucible to cool down.

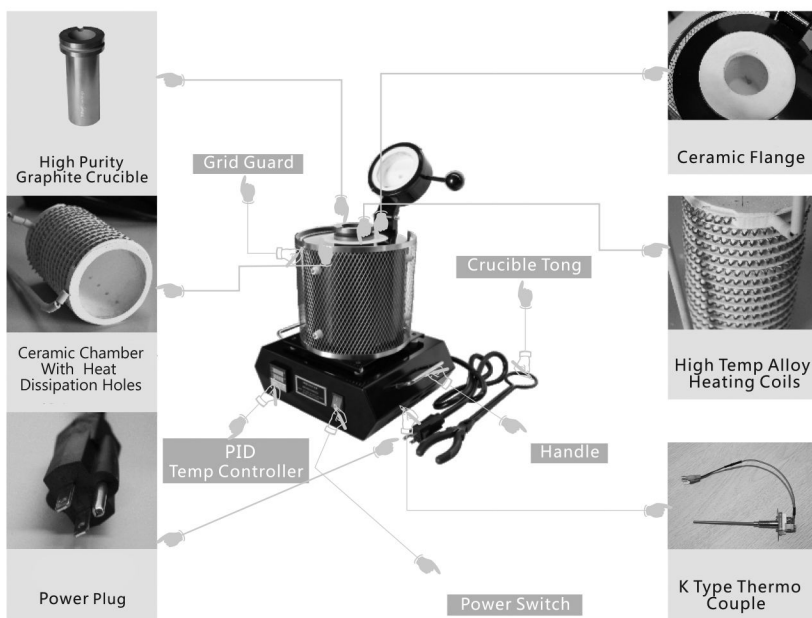
## TECHNICAL DETAILS

Model	HD-334MF
Power input	1500 W
Power supply	50Hz/7A
Max. heating temperature	1150°C
Measurement accuracy	+0.5%FS 0-50°C
Working environment	30-85%RH
Capacity of the crucible	130.35cm <sup>3</sup>
External dimensions of the crucible	Diameter: 6.5 cm Height: 12.5 cm
Internal dimensions of the crucible	Diameter: 6.5 cm Height: 12.5 cm
Dimensions (L x W x H)	31 x 36 x 37 cm
Shipping Dimensions (L x W x H)	38 x 38 x 42 cm
Weight (kg)	11
Shipping weight (kg)	13

## CONTENT OF DELIVERY:



## ASSEMBLY



## INSTRUCTIONS FOR METAL MELTING

**Important:** The graphite crucible is only adapted to melt gold, silver, copper and other noble metals!

List of metal types which can be melted in the crucible provided with the device:

Metal	Symbol	Density	Density Fusion Point
Copper	Cu	8.92 g/cm <sup>3</sup>	1084.62°C
Silver	Ag	0.49 g/cm <sup>3</sup>	961.78°C
Gold	Au	19.30 g/cm <sup>3</sup>	1061.18°C

Please consider that the crucible should not be completely filled to reach an optimal result. If you overflow the crucible, the device won't be able to produce the heat needed to let the metal melt. Moreover, the melting process often produces vapors. If you overflow the crucible, it can lead to overpressure and the use of the device gets dangerous for the user, at the latest by opening the cover.

Please buy an adapted crucible to melt other metals. Always inform yourself about the production of vapors during the melting process to check the compatibility of the device with your intentions.

## HOW TO EXCHANGE THE HEATING COIL

### CAUTION:

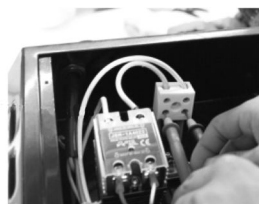
Never open the device without authorization of your seller. This can lead to loss of warranty!

The heating coil may get damaged and you have to exchange it. To do it please follow these given instructions.

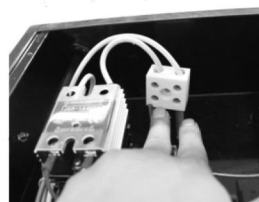
1. First open the bottom of the furnace.



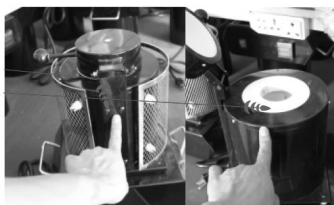
2. Check the resistance of the heating coil like this: if 110V, the resistance is about 8Ω. If 220V the resistance is about 30Ω. If the resistance is infinite that means the heating coil is broken, then you need to change the heating coil.



3. Take off the screws here



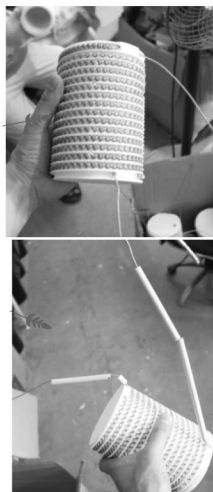
4. Take off the protecting sleeve.  
Then take off the screws on the furnace body here.  
There are also screws here, take them off, then you can take out the flange.



5. After taking out the flange, you can take out the furnace chamber, here is the furnace without furnace chamber.



6. Take off the broken heating coil and wind a new heating coil on the furnace chamber.  
Don't forget the insulating rod! This is the finished furnace chamber with heating coil.





## **WARRANTY**

Melting Furnace has a limited warranty for 90 days from the date of purchase to the original purchaser. If any defects in workmanship or material appear during this time, Hardin Industrial Tools will replace or repair defective parts. Written proof of purchase with date is required. Warranty repairs are normally handled through the dealer from whom the furnace was purchased. Otherwise, the purchaser may obtain an RMA number and return the defective part to Hardin Industrial Tools 929 Poinsettia Avenue # 105 Vista, CA 92081 along with the RMA number, serial number, model number, proof of purchase date, and statement of what is thought to be wrong with the product. If a defect is confirmed, a new or repaired part will be shipped, postage paid by Hardin Industrial Tools. A Hardin Furnace may be returned for warranty work to Hardin Industrial Tools. All transportation costs will be borne by the purchaser. Before shipment, the purchaser will notify Hardin Industrial Tools that we may help advice in order to keep costs at a minimum, should it not be necessary to ship the entire furnace to us. Repair or replacement of defective furnace parts shall be considered as complete fulfillment of this warranty. No cash refunds will be issued.

This warranty does not include: furnace damaged by over-firing (exceeding the melting temperature of the material being fired) regardless of cause; furnaces damaged by transporting, abuse, improper use, reactive materials being fired (i.e. reduction, salt firing, or carbon contamination), moisture, contents other than ceramic materials, glass, or heat treating clean metals; damage to wire, furnace furniture or contents, or furnace elements. Melting crucibles, crucible tongs, gloves, ceramic fiber shelving is not included in the warranty scope.

Hardin Industrial Tools is not responsible for consequential damage to contents being fired. Hardin Industrial Tools does not authorize any wholesaler, retailer, or employee to assume any other obligation or liabilities in regard to Hardin Melting Furnaces.

Hardin Industrial Tools' technical advice, whether verbal or in writing, is designed to assist dentists, laboratories, and/or jewelers (collectively, the "Users") in using Hardin Industrial Tool products. The user assumes all risk and liability for damages arising out of the improper use of Hardin Industrial Tools' product. In the event of a defect in material or workmanship, Hardin Industrial Tools' liability is limited, at Hardin Industrial Tools' option, to replacement of the defective product or part thereof, or reimbursement of the actual cost of the defective product. In order to take advantage of this limited warranty, the defective product must be returned to Hardin Industrial Tools. In no event shall Hardin Industrial Tools be liable for any indirect, incidental, or consequential damage, injury or death incurred as a result of using this product.

**EXCEPT AS EXPRESSLY PROVIDED ABOVE, THERE ARE NO WARRANTIES, BY HARDIN INDUSTRIAL TOOLS, EXPRESS OR IMPLIED, INCLUDING WARRANTIES WITH RESPECT TO DESCRIPTION, QUALITY, OR FITNESS FOR A PARTICULAR PURPOSE.**

### **CALIFORNIA PROPOSITION 65**

Some dust produced by power polishing, sawing, grinding, drilling, and other construction activities contains chemicals known (to the State of California) to cause cancer, birth defects or other reproductive harm. Some examples of these chemicals are:

- Lead, from lead based paints
- Crystalline silica, from bricks and cement and other masonry products
- Arsenic and chromium, from chemically treated lumber

Your risk from these exposures varies depending on how often you do this type of work. To reduce your exposure to these chemicals, work in a well ventilated area and work with approved safety equipment, such as those dust masks that are specifically designed to filter out microscopic particles.