
Auto Electro-Melt Furnace

OPERATION MANUAL AND PARTS LIST *Series 1258*

| <u>Voltage</u> | <u>Item No.</u> |
|----------------|-----------------|
| 120 | 31809 |
| 230 | 31808 |

Table of Contents

IMPORTANT INFORMATION

This manual contains important operating and safety information. The user must carefully read and understand the contents of this manual prior to the use of this equipment.

| | |
|----------------------------------|----|
| Safety Information | 3 |
| Alert Signals..... | 3 |
| Warnings | 3 |
| General Specifications | 5 |
| Environmental Conditions | 6 |
| Declaration of Conformity | 6 |
| Introduction..... | 7 |
| Unpacking | 8 |
| Installation | 9 |
| Operation | 10 |
| Operating Tips | 11 |
| Single Setpoint Controller | 12 |
| Maintenance and Servicing | 16 |
| Conditioning a New Element | 17 |
| Exploded View | 18 |
| Replacement Parts..... | 19 |
| Limited Warranty | 20 |

Safety Information

Alert Signals



Warning

Warnings alert you to a possibility of personal injury.



Caution

Cautions alert you to a possibility of damage to the equipment.



Note

Notes alert you to pertinent facts and conditions.



Hot Surface

Hot surfaces alert you to a possibility of personal injury if you come in contact with a surface during use or for a period of time after use.

Important Information

This manual contains important operating and safety information. You must carefully read and understand the contents of this manual prior to the use of this equipment.

Your Auto Electro-Melt Furnace has been designed with function, reliability, and safety in mind. It is your responsibility to install it in conformance with local electrical codes. For safe operation, please pay attention to the alert signals throughout the manual.

Warnings

To avoid electrical shock, this furnace must:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Be disconnected from the power supply before servicing.
3. Have the door switch operating properly.

To avoid burns:

1. "Caution: Hot Surface. Avoid Contact." Do not touch the exterior or interior surfaces of the furnace during use or for a period of time after use.

To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials — fire or explosion may result. This device contains components which may ignite such material.
2. Refer servicing to qualified personnel.

SAFETY INFORMATION

Please note the following WARNINGS:

WARNING

This warning is presented for compliance with California Proposition 65 and other regulatory agencies and only applies to the insulation in this product. This product contains refractory ceramic, refractory ceramic fiber or fiberglass insulation, which can produce respirable dust or fibers during disassembly. Dust or fibers can cause irritation and can aggravate preexisting respiratory diseases. Refractory ceramic and refractory ceramic fibers (after reaching 1000°C) contain crystalline silica, which can cause lung damage (silicosis). The International Agency for Research on Cancer (IARC) has classified refractory ceramic fiber and fiberglass as possibly carcinogenic (Group 2B), and crystalline silica as carcinogenic to humans (Group 1).

The insulating materials can be located in the lid, the hearth collar, and in the heating chamber of the product. Tests performed by the manufacturer indicate that there is no risk of exposure to dust or respirable fibers resulting from operation of this product under normal conditions. However, there may be a risk of exposure to respirable dust or fibers when repairing or maintaining the insulating materials, or when otherwise disturbing them in a manner which causes release of dust or fibers. By using proper handling procedures and protective equipment you can work safely with these insulating materials and minimize any exposure. Refer to the appropriate Material Safety Data Sheets (MSDS) for information regarding proper handling and recommended protective equipment. For MSDS copies, or additional information concerning the handling of refractory ceramic products, please contact the Customer Service Department

General Specifications

Dimensions

Exterior

Width: 8.25" (209 mm)

Depth: 6.50" (165 mm)

Height: 13.50" (343 mm)

Chamber

Inside Diameter: 1.75" (45 mm)

Inside Depth: 5.625" (145 mm)

Crucible

Inside Diameter: 1.375" (35 mm)

Inside Depth: 4.125" (105 mm)

Shipping Weight

6.8 lbs. (3.0 kg)

Load Capacity

Gold: 930g (30 troy oz.)

Silver: 775g (25 troy oz.)

Brass: 680g (24 avoirdupois oz.)

Aluminum: 227g (8 avoirdupois oz.)

Electrical Specifications

| | <u>Item No. 31809</u> | <u>Item No. 31808</u> |
|-------|-----------------------|-----------------------|
| Volts | 120 | 230 |
| Amps | 6.2 | 3.3 |
| Watts | 750 | 750 |
| Hz | 50/60 | 50/60 |
| Phase | single | single |

Operating Parameters

Temperature Range: ambient to 1120°C/2050°F

Firing Time: 8 minutes to 538°C/1000°F

20 minutes to 982°C/1800°F

29 minutes to 1120°C/2050°F

GENERAL SPECIFICATIONS

Environmental Conditions

Operating: 17°C to 27°C; 20% to 80% relative humidity, non-condensing. Installation Category II (overvoltage) in accordance with IEC 664. Pollution degree 2 in accordance with IEC 664.

Altitude Limit: 2,000 meters.

Storage: -25°C to 65°C; 20% to 85% relative humidity

Declaration of Conformity

Barnstead International hereby declares under its sole responsibility that this product conforms with the technical requirements of the following standards:

| | | |
|---------|--|--|
| EMC: | EN 61000-3-2 EN 61000-3-3 EN 61326-1 | Limits for harmonic current emissions Limits for voltage fluctuations and flicker Electrical equipment for measurement, control and laboratory use; Part I: General Requirements |
| Safety: | EN 61010-1 EN 61010-2-010 | Safety requirements for electrical equipment for measurement, control and laboratory use; Part I: General Requirements Part II: Particular requirements for laboratory equipment for the heating of materials |

per the provisions of the Electromagnetic Compatibility Directive 89/336/EEC, as amended by 92/31/EEC and 93/68/EEC, and per the provisions of the Low Voltage Directive 73/23/EEC, as amended by 93/68/EEC.

The authorized representative located within the European Community is:

Electrothermal Engineering Ltd.
419 Sutton Road
Southend On Sea
Essex SS2 5PH
United Kingdom

Copies of the Declaration of Conformity are available upon request.

Introduction



Caution

It is recommended that the graphite crucible be examined after each use. Should the crucible show excess wear and/or cracks on the surface, it should be discarded and replaced with a new graphite crucible.



Hot Surface

“Caution: Hot Surface. Avoid Contact.”
Avoid contact with the hot furnace heating chamber. Always use the handle.

Intended Use

The Auto Electro-Melt Furnace is designed for convenient electric melting of metals, providing melting temperatures up to 1120°C/ 2050°F. It is an ideal metal melting unit for casting as well as for alloying metals.

The furnace, supplied with a special graphite crucible, features embedded elements in a molded ceramic fiber insulation.

The operating temperatures of the Kerr Auto Electro-Melt Furnace, which range from room temperature to 1120°C/2050°F, are indicated on the built-in controller. The Digital Control allows the furnace to reach and maintain any desired temperature within the specified operating range.

Unpacking

Unpacking

Auto Electro-Melt carton contains the following: (1) Item 31809 or 31808 Auto Electro-Melt furnace, (1) stirring rod, (1) crucible, (1) warranty card and (1) operating instructions manual.

Please inspect your Auto Electro-Melt and accessories for damage. Retain carton and packaging material for repacking in the event your Electro-Melt will need to be returned to Kerr for servicing. If damage is found during your inspection contact the Kerr Dealer from whom you purchased the unit, for service. File claim with the delivery service if damage appears to have occurred during shipment.

Installation



Caution

Be sure ambient temperature does not exceed 40°C/104°F. The recommended ambient temperature is 17°C - 27°C/63°F-81°F. Ambients above this level may result in damage to the controller.



Caution

Allow at least ten inches of space between the furnace and any combustible surface. This permits the heat from the furnace case to escape so as not to create a possible fire hazard.



Warning

To avoid electrical shock, this furnace must always use a properly grounded outlet of correct voltage and current handling capacity.

Site Selection

The working surface should be composed of metal, slate, ceramic, etc., so it will not support fire in the event of a molten metal spill. Place the Electro-Melt in a fume hood if the melting application will emit noxious or unpleasant fumes.

Electrical Connections

The electrical ratings are located on the specification plate on the furnace. Consult the Kerr dealer from whom you purchased the unit if your electrical service is different than those listed on the specification plate. Be sure the front power switch is in the OFF position before connecting the furnace to your electrical supply.

Operation



Caution

When power switch is on and lid is closed, the element will begin to heat to the setpoint (temperature) entered into the controller.

Wear Protective Clothing, consisting of gloves, lab coat or aprons, flame resistant hood, face shield and safety shoes. Your attire must protect you from burns in the event of a molten metal spill.

Mount the Crucible in the Auto Electro-Melt chamber with the pouring spout opposite to the handle. Be careful not to tilt the crucible when inserting into the well as this can cause gouging of the insulation wall. Seat the crucible by inserting until the crucible sits on the ceramic collar.

Open Lid activating lid safety switch which will prevent the heating of the element when power switch is on.

Turn Power Switch “ON.” The switch will light. The controller will turn on.

Enter Setpoint See controller operation

Load the Metal no higher than the bottom of the graphite crucible collar.

Begin the Melt by closing the lid. The chamber temperature will display. When setpoint is reached, power to element will begin to cycle. Initially temperature will overshoot, but within minutes it will stabilize at setpoint. Once stabilized, use the graphite stirring rod to stir the metal to assure a complete melt.

If Not Melted close the lid, increase temperature and **wait until furnace stabilizes** at the new temperature. If scrap or filings were extremely dirty, it may be necessary to add a small amount of flux (use sparingly) and stir with graphite rod.

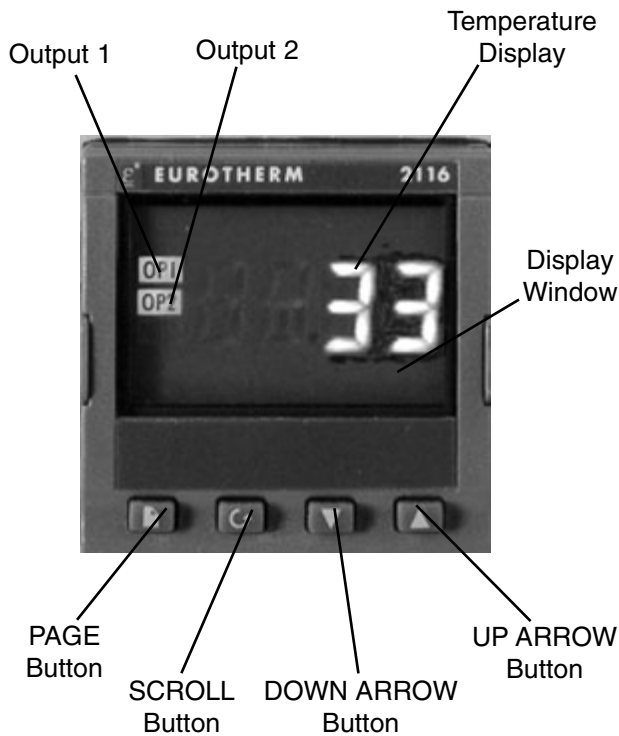
If Melted stir with graphite rod to assure metal is melted throughout, shut unit off, pick up the Electro-Melt by the insulated handle and pour the metal.

When Pour is Completed turn power switch off. Setpoint will remain in memory until changed by operator.

Operating Tips

- Inspect your crucible frequently for cracks, wear and deterioration. The crucible walls and base sloughs off with each use, causing the graphite crucible to become thinner. A leaking crucible can cause element and thermocouple failure.
- Always seat crucible into the well so the shoulder sets on the hearth collar.
- When melting a full crucible it is best to load only 1/4 to 1/2 the metal; once that is melted, add the remaining.
- When loading metal do not drop heavy pieces into the crucible as a fracture may occur.
- For maximum crucible life keep lid in closed position as much as possible.
- The setpoint temperature should be set at approximately 37.8°C/100°F above the melting point of the metal to ensure proper pouring: For example, if the melting temperature of 14K yellow is 963°C/1765°F, you would then set the temperature at 1020°C/1865°F.
- Do not set your furnace temperature grossly above the melting point of your load. This may cause boiling and vaporization of your load, resulting in contamination and failure of the element.
- Use your Auto Electro-Melt in a vented area or fumehood to avoid breathing in noxious fumes.
- Your Auto Electro-Melt is designed for melting metals. Separate contaminating material from your load. Contaminated materials may produce fumes that can saturate the insulation and break down the protective oxide coating on the element wire, resulting in premature failure.
- Operating temperature will affect element life. The melting point of the element wire is 1510°C/2750°F. Service life is halved for every 28°C/50°F increase above 871°C/1600°F. For example, the service life at 982°C/1800°F is approximately 500 hours and at 1093°C/2000°F it is 30 hours or the equivalent of 60 melts.

Single Setpoint Controller



The **single setpoint model** furnace controller is a single setpoint controller which provides a single digital display to indicate the current chamber temperature or setpoint temperature. This temperature controller features sensor break protection and self-tuning capability.

Basic Operation

When the controller is turned ON it will perform a short self-test and then display the measured value (process value) in the HOME DISPLAY.

Buttons and Indicators

OP1 (Output 1): Illuminates when the logic output is ON.

OP2 (Output 2): Illuminates when the relay output is ON (will go out during an alarm situation).

PAGE button: Allows you to select a new list of parameters.

SCROLL button: Allows you to select a parameter within a list of parameters.

DOWN button: Allows you to decrease a value.

UP button: Allows you to increase a value.

Single Setpoint Models



Note

If at any time you want to return to the HOME DISPLAY, simultaneously press the PAGE and SCROLL buttons.

To View or Change the Setpoint

To view the setpoint, press and release the UP or DOWN buttons. If you want to change the setpoint, continue pressing until the desired setpoint value is displayed and then release the button. A few seconds after the button is released, the controller will accept the new value and revert to the HOME DISPLAY.

To View the Display Units

From the HOME DISPLAY press the SCROLL button. The display will show the temperature units in °C/F/K and then return to the HOME DISPLAY.

To View the % Output Power

From the HOME DISPLAY press the SCROLL button twice. Press and release the UP or DOWN button to view the % output power. This value is a read-only value and cannot be changed.

Controller Parameters

Home display

°C: Temperature units in Celsius. Temperature units can not be changed without entering the configuration. Contact Customer Service if a different temperature unit is required.

OP: % output power demand.

IdHi: Deviation high alarm.

AI List

IdHi: Deviation high alarm.

Atun List

tunE: One-shot autotune enable.

Pid List

Pb: Proportional band (in display units).

ti: Integral time in seconds.

td: Derivative time in seconds.

ACCS List Code: Access code (Code needed to enter or change the other configuration parameters which are not normally accessible.) Not accessible.



Note

The following alarm messages are factory default settings and may vary if you have changed the configuration of your controller:

IDHi: = 50°C

Alarms

The controller will flash an alarm message in the home display if an alarm condition is detected.

2FSH: Measured value full scale high alarm.

IdHi: Measured value deviation high alarm.

S.br: Sensor break: check that sensor is connected correctly.

L.br: Loop break: check that the heating circuits are working properly.

Ld.F: Heater Circuit fault: indication of either an open or short solid state relay, a blown fuse, missing supply or open circuit heater.

Sensor Break Protection

This controller provides sensor break protection in the event the thermocouple opens. If an open thermocouple condition occurs, the digital display will blink “S.br” and the power to the heating element will be shut OFF

Over-Temperature Protection (OTP)

The OTP will be in effect during any alarm condition when the temperature of the furnace has deviated beyond the limit. The “Deviation High” alarm is the only alarm value which can be changed. To change it, press the SCROLL button until “IdHi” appears on the display. Press the UP or DOWN button to select the OTP value you desire. We recommend a value of 50°C (120°F) above your working temperature to provide protection for your workload.

In addition to over-temperature protection, units containing a single setpoint controller w/OTP feature a mechanical OTP relay device which disconnects power from the elements in an alarm condition (only in furnaces with OTP relay). See models listed on front page.

Tuning

This controller incorporates a self-tuning feature which determines the optimum control parameters for the best temperature accuracy with your load and setpoint. Use this feature the first time you use your furnace and each time you change either your setpoint or the type of load you are heating. It is recommended you use this feature to provide the best temperature accuracy the controller can attain. To use the tuning feature:

1. Adjust the setpoint to your desired value.
2. Press the PAGE button until display reads, "Atun."
3. Press the SCROLL button. Display will read, "tunE."
4. Press the UP or DOWN button to select, "on."
5. Simultaneously press the PAGE and SCROLL buttons to return to the HOME DISPLAY. The display will alternately flash between "tunE" and the HOME DISPLAY while tuning is in progress.
6. The controller will then turn the heating on and off to induce an oscillation. When the measured value reaches the required setpoint the first cycle will end.
7. Tuning will be complete after two oscillation cycles and then the tuner will turn itself off.
8. Normal control function will resume after the controller calculates tuning parameters.

**Note**

Furnace must be at ambient temperature before starting a tune.

**Note**

Tune has completed when "tunE" stops flashing on display.

Maintenance and Servicing

Since the manufacturer has no control over the use or care of this furnace, no service guarantee can be made. In the event that your furnace requires repair, you may service it in either of the following ways:

Product will not be accepted at the Kerr factory without a return goods authorization number from your Kerr Dealer.



Warning

Disconnect the furnace from the power supply before servicing. Refer servicing to qualified personnel.

2. Order genuine factory parts for self-servicing. Replacement parts may be ordered from a Kerr Dealer. When ordering, specify the part number and the model number of your furnace.

ELEMENT REPLACEMENT

1. Disconnect the power supply.
2. Set the furnace on its top.
3. Remove the 4 feet and 1 screw from the bottom of the unit.
4. Remove the 2 screws from the thermocouple terminal block and pull the thermocouple straight up.
5. Inspect the condition of the thermocouple and replace if necessary.
6. Note the locations the element leads are attached to the control and disconnect.
7. Set the furnace back onto its base.
8. Remove the 4 screws connecting the baffle plate assembly to the base.
9. Lift the element assembly straight up.
10. Remove the 3 screws from the bottom and the 2 screws from the side of the element assembly.
11. Separate the element from the baffle and replace with the new element.
12. Reverse steps 6-10 to reassemble. Insure the screws pass through the insulators.
13. Reinstall the thermocouple and secure the leads to the terminal block. Keep the lead marked “+” and the black wire together.
14. After reinstalling the thermocouple check the distance between the hearth plate and the tip of the thermocouple is 4-1/16 +\ -1/16”. Adjust the thermocouple bend as necessary.
15. Replace the 4 feet and the 1 case screw.

Conditioning a New Element

It is essential to preoxidize the element wire at 1050°C (1922°F). Remove the graphite crucible from the element chamber before conditioning. Fire your Auto Electro-Melt according to the following schedule.

| <u>Item No.</u> | <u>Voltage</u> | <u>Firing Time at 1050°C/1922°F</u> |
|-----------------|----------------|-------------------------------------|
| 31809 | 120V | 3 hours |
| 31808 | 230V | 2 hours |



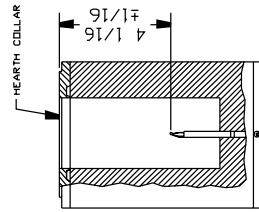
Note

If the control temperature display moves downward, the thermocouple leads are reversed.

THERMOCOUPLE REPLACEMENT

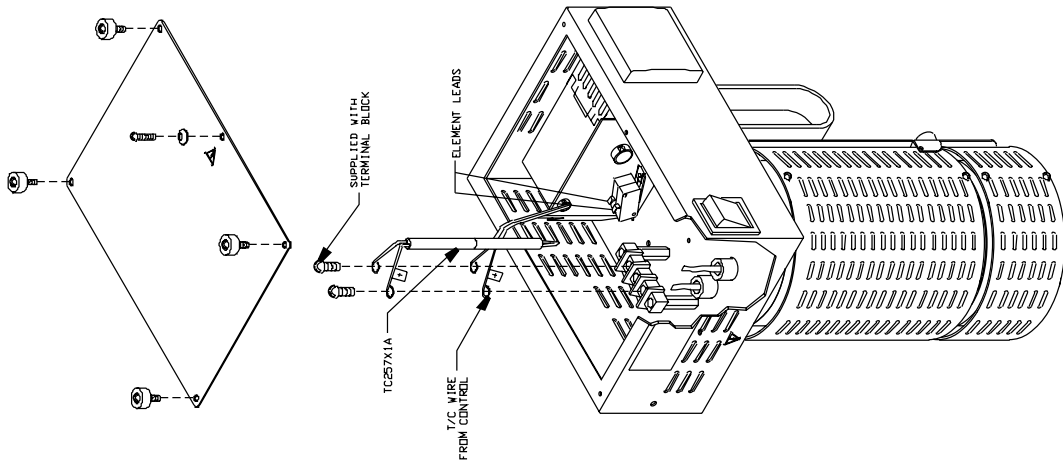
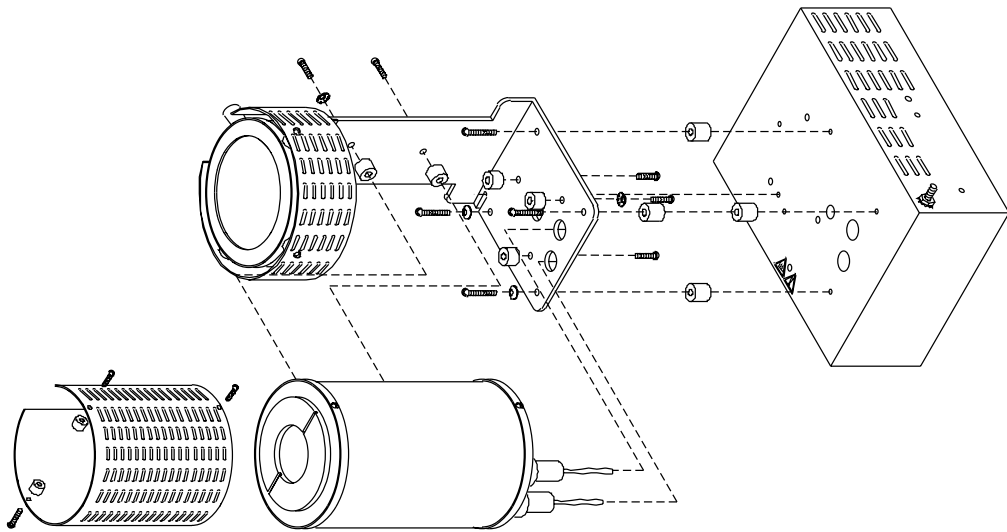
1. Disconnect the power supply.
2. Set the furnace on its top.
3. Remove the 4 feet and 1 screw from the bottom of the unit.
4. Remove the 2 screws from the thermocouple terminal block and pull the thermocouple straight up.
5. Inspect the condition of the thermocouple and replace if necessary.
6. Reinstall the thermocouple and secure the leads to the terminal block. Keep the lead marked “+” and the black wire together.
7. After reinstalling the thermocouple check the distance between the hearth plate and the tip of the thermocouple is 4-1/16 +\ -1/16”. Adjust the thermocouple bend as necessary.
8. Replace the 4 feet and the 1 case screw.

Exploded View



OUTAWAY VIEW OF FURNACE

INSTALL T/C SO THAT THE DISTANCE FROM THE CENTER OF THE T/C TO THE HEARTH COLLAR IS $4 \pm 1/16$. THIS MUST BE DONE TO ENSURE PYROMETER ACCURACY.



Replacement Parts

Auto Electro-Melt Item
No. 31809 - 120 V Item
No. 31808 - 230 V

| <u>Item No.</u> | <u>Description</u> |
|-----------------|---|
| 13996 | Graphite Stirring Rod |
| 29478 | Graphite Crucible |
| 31833 | Control |
| 31831 | Cordset 230 V |
| 31830 | Cordset 120 V |
| 14003 | Lid |
| 31822 | Heating Element 120 V |
| 31823 | Heating Element 230 V |
| 22602 | Insulators, Chamber (6 Req'd) and Lid (5 Req'd) |
| 22602 | Insulators, under Chamber (3 Req'd) |
| 14000 | Hearth Plate |
| 31824 | Power Switch 120 V |
| 31825 | Power Switch 230 V |
| 31832 | Safety Switch, Lid |
| 13999 | Thermocouple |
| 31819 | Fuses 8 amp (2 Req'd) - 120 V |
| 31818 | Fuses 6.3 amp (2 Req'd) - 230 V |

Limited Warranty

Limitation of Liability

Technical advice whether verbal or in writing, is designed to assist customers in using this product. Such advice does not expand limited warranty or relieve customers of testing products to determine their suitability for the intended uses and procedures. The customer assumes all risk and liability for damages arising out of the improper use of products. In no event shall Seller be liable for any indirect, incidental, or consequential damages.

This product is fully warranted against defects in material and workmanship for a period of 90 days following the date of purchase*. In the event of a defect in material or workmanship, The seller reserves the option to limit liability to replacement of the defective product or part thereof, or reimbursement of the actual cost of the defective product. Should this product require servicing within the warranty period, return it to the Dealer from whom purchased. This warranty gives you specific legal rights which may vary from state to state.

Heating elements and crucibles must be considered expendable and replacement can be expected. The life of heating elements is affected by overheating and/or contamination. Since use conditions vary, the manufacturer cannot be responsible for damage to these parts. For maximum crucible life keep the lid in the closed position as much as possible.

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

*You must return the Warranty Registration card, within 15 days of purchase to validate your Warranty.

SERVICE:

In the event your equipment requires repair, you may service it in either of the following ways.

1. Return the equipment to your Dealer.

2. Order genuine factory parts for self-servicing.

Replacement parts may be ordered from a Kerr Dealer. When ordering, specify the item number and model number of your equipment.