EUCLID KILNS

INSTALLATION
OPERATION
MAINTENANCE

Replacement parts always available, for all makes and models.

Maintenance or repair service: call **800-296-5456**, or visit **www.euclids.com**, to access our kiln service directory.

EUCLID KILNS

Oakville, Ontario, Canada, L6L 2X4
www.euclids.com
(800) 296-5456
Fax (905) 849-0001

SAFETY

Please read the following instructions and safety procedures before operating your kiln.

Burn Hazard Do not open the kiln while it is firing. The exterior surface may also become hot enough to cause burns - do not touch while firing.

Electrical Make sure there is an adequate electrical supply available for the kiln chosen (see page 2). Install a disconnect or other shut-off device within 4 metres of the kiln. Ensure that the electrical supply is properly grounded.
Always disconnect power while servicing.

Shock Hazard Exposed elements are an electrical shock hazard while the kiln is firing.

Ventilation There are no immediately harmful emissions from most firings, but it is recommended that all kilns be vented outside to eliminate the risk of potential long term health hazards, and possible odours. We recommend a system that vents directly from the firing chamber (Orton KilnVent, for example).

Clearance The outside of the kiln will be hot while firing. Do not lean anything against the side of the kiln. Do not place flammable materials above the kiln. Ensure that the location allows adequate clearance (see page 2). For kilns with top vents, be sure to provide adequate ventilation for the hot air being vented.

Temperature Never exceed the maximum recommended temperature for the particular model kiln. Please refer to the section Element Life, on page 8.

Monitoring Always be present while firing, to monitor the operation of kiln controls, and/or shut off devices, to make sure that a firing has been successfully completed.

Lids Lids of top load kilns (R models) are designed to stay in the open position without the need of chains or supports. A secondary restraint (such as a hook over the handle, anchored to the wall or ceiling) is advised, as a precaution against the lid being bumped. Lid springs can be a pinch hazard – keep clear when opening and closing lid.

Stands Top load kilns (R models) should only be used with the stands provided. The floor under the kiln should be of a non-flammable material.

Glass Firing When top load kilns (R models) are being used for glass work there should be a metal plate installed between the kiln bottom and the stand (it is possible that glass could melt through the brick, and it should not fall onto the floor below).

This instruction manual is an important part of your kiln and should always be available to the operator and service personnel.

Unpacking

Carefully remove any packing material from the outside and from within the firing chamber. Remember to check for items that may have been packed with the kiln - refer to the packing slip to account for all items shipped. When the firing chamber is empty it must be carefully cleaned to remove bits of packing material and dust. Use a vacuum cleaner with a crevice nozzle, being careful to clean out element grooves.

The kiln was carefully packed at our factory, but it is possible that it has been damaged in transit. If so it is important that you:

Call the freight agent and request an inspection immediately (hidden damage may sometimes be claimed at a later date) - you will need their bill of lading number.

Save all packing materials for the carrier's inspector.

Contact the dealer who sold the kiln and provide the details.

Location

There should be:

A non-flammable floor surface, with bearing capacity for the weight of the kiln.

An area large enough to provide at least 30cm/12" on all sides - 45cm/18" at the rear for front-loading models, to allow sufficient access for servicing.

Space to allow the door or lid to open freely.

Ventilation to exhaust any combusted products of the firing.

Protection from outdoor atmosphere, to protect the kiln from moisture.

Electrical Supply

The kiln must be connected to the correct electrical supply - the design voltage and amps are printed on the specification label.

The kiln should have its own circuit, with a shut-off device (disconnect, or plug and receptacle) within 4m/12'. This gives the ability to shut off the power in the event of a problem, or for servicing. The current (amp) draw must not exceed 80% of the capacity of the fuses, or circuit breaker, protecting the circuit (confirm with your local utility).

The supply should be installed by an electrician, and must be of the correct gauge for the load. The supply must be properly grounded, to protect against electric shock. The supply cable should not touch the sides of, or pass underneath, the kiln.

The most common cause of a new kiln firing too slowly, or failing to reach temperature, is low voltage. At time of ordering you will be asked to supply the actual voltage available (as checked by a reliable voltmeter). If an error has been made in ordering, and the available voltage is not suitable, we can supply a new set of elements for the correct voltage, at additional cost.

It is usually possible to convert a single phase kiln to three phase, or a three phase to single phase, without changing elements. This will usually require changes to the cable, contactor (or other switchgear), and fuses or breaker.

Controls

The kiln may have one of a wide variety of controls. Separate instruction manuals are provided for the control supplied. These should be read carefully.
Notes on popular controls for hobby kilns:

Switches

- Three Heat (four position) LO, MED, HI, OFF
  This switch operates 2 elements on 220V (some types operate on 120/220V). On LO the two elements are connected in series for 25% power. On MED one element is on full for 50% power.
- Infinite Heat (can be set to any position) LO-HI, OFF
  "Sunvic" Infinite Heat 0-100%, OFF
  Infinite heat switches may operate one or more elements. Sunvic switches may control the whole kiln by switching relays or a contactor. This type of switch turns the full power to the element(s) on and off at a rate determined by the setting. A pilot lamp may be connected so that it is on the whole time the switch is on, or so that it cycles on and off.

Pyrometer

A pyrometer indicates the temperature inside the kiln, but does not offer any control or shut off. Analog types have a needle that moves across a scale. This type is not noted for its accuracy, but is still useful as a guide to the kiln temperature. This type is sensitive to the resistance of the thermocouple - for maximum accuracy make sure that the thermocouple and leadwire are matched to the pyrometer.

Kiln Sitter

Shuts the kiln off as determined by the pyrometric cone, and may be equipped with an automatic ramping function. Before the first firing, check the alignment of the Release Claw to the Trigger Plate, using the Firing Gauge provided. Detailed instructions are provided in the Kiln Sitter manual. The Kiln Sitter manual recommends that a peephole be left open throughout the firing. This recommendation does not apply to kilns using direct venting systems (such as the Orton KilnVent).

Automatic

Bartlett V6-CF,
This control can be programmed to control rate(s) of heating and hold time(s) at temperature. Note that cone values set by the control may not be exactly as experienced by actual cones. It is recommended that test firing be done, with witness cones. This control can be connected to your personal computer - call for more information.

Thermo-couples

Automatic controllers and pyrometers measure the kiln temperature through a thermocouple (t/c), which passes through the wall of the kiln and should protrude into the chamber at least 25mm/1". Type K t/c's will need to be replaced periodically, and will tend to drift over time, so periodic calibration (with cones) may be necessary. Type S should last the life of the kiln. T/c's may be protected by tubes – the tubes will tend to cause the t/c to read low, so firing temperatures should be rechecked if tubes are added or removed. The leadwires connecting the t/c to the control are colour coded - yellow is positive (black for type S), red is negative. It is very important that the leadwire be connected the correct way around at both ends. For type K, the negative leg of the t/c is magnetic, the positive leg isn't.

Safety Switch All "R" model kilns now come equipped with an automatic safety shut off switch. The switch works by shutting off power to the elements if the lid is opened, in order to prevent potential electrical shocks when the kiln is opened while the power is on. This does not prevent the lid from being opened while the kiln is hot, so care must still be taken. The switch has 2 positions that will allow power to reach the elements. Please note that the lid must be centered on the kiln in order for the switch to function properly.

With the lid closed and the latch up is the normal firing position.

With the latch up and the lid resting on the latch (for oval kiln models, R450, R150 & R226, the lid rests on the lid prop, located on the front center of the kiln) allows moisture to escape from the kiln during the start of bisque firings

Lid & Floor Cracking It is normal for hairline cracks to develop in brick lids and floors. This is due to slight differences in the expansion characteristics of the brick and mortar. Cracks may also propagate through bricks. Usually it takes a few months before the cracks become evident, but they may appear while the kiln is quite new. The lid and floor are designed with bands strapped around them, in order to keep the slabs intact, even if they have cracked. Cracks in the floor are more likely to appear wider, as the load of the kiln adds extra pressure. Ensuring that the kiln stand provides even support to the kiln floor is important to reduce cracking. Cracking should not affect the kiln performance, but should be monitored.

Caution Always be present when the kiln is being fired, regardless of the automatic controls being used. Any mechanical equipment can malfunction. The operator is responsible for monitoring, adjusting and maintaining the kiln and controls.

The kiln warranty does not cover the effects of overfiring, regardless of the cause. Make a habit of checking shut-off devices for proper operation, and turn all switches to OFF after each firing. A malfunction could result in the kiln overfiring, causing extensive damage.

Our staff is always available for advice or assistance - don't hesitate to call, just to make sure.

Warranty Euclid kilns carry a one year warranty (two years for 'R' models) on parts and labour (not including travel or transport costs) against defects in components or workmanship. Warranties on individual components will extend only to the manufacturer's limit. The warranty period begins at date of delivery and payment terms must be met.

The warranty extends only to furnace and control components and, in the event of a malfunction, does not include the furnace contents, or any other resulting damages. Instructions must be followed and safety precautions observed. The kiln's maximum temperature must not be exceeded. Damage caused by reduction firing or other processes which affect the firing atmosphere are not covered. Damages caused by improper installation, handling or storage, or improper usage, are not covered. Heating elements and K type thermocouples are considered to be consumable parts and are not necessarily covered, depending upon the circumstances. Also see the above note on lid/floor cracking.

Preparation Before using the kiln for the first time, it is important to make sure it is dry throughout.

The insulation can absorb moisture during shipping/storage - if necessary this should be removed by heating to ±150°C/300°F and holding as long as required.

First Firing The first firing will serve to test the control function. The firing need only be to a relatively low temperature - 020 cones should be supplied with a Kiln Sitter, or automatic controls can be set to 650°C/1200°F. The kiln should not contain greenware, or newly kiln-washed shelves, so that element oxidization is not affected. For multi-zone controls, there must be furniture in place for correct control operation.

The initial firing can also be used for the optional process of element conditioning, whereby a protective oxide coating is built up on the elements. This is particularly important if the kiln will be normally fired to in the range of 1200-1300 °C (2200 -2400°F), or under a reducing atmosphere. This is not recommended if normal use will not exceed 1050°C (1922°F), or for fibre lined kilns. Please refer to information on page 8, regarding life expectancy and element conditioning.

Furniture The bottom kiln shelf should be supported at least 15 mm above the floor, and each level of shelves above must be supported at at least three points with props of equal size and height. Make sure that props in successive levels are placed directly above each other. The shelves must allow 20 mm clearance from kiln walls, to allow for circulation and to reduce the risk of kiln damage. All shelves for glaze firings should be coated with kiln wash (on the top side only, do not use kiln wash on any part of the kiln itself).

Bisque Firing Greenware may be stacked two or three pieces high, provided they are well supported, to avoid warping - this is best done by placing like sizes rim to rim and bottom to bottom. Smaller items can be placed inside of larger ones, but allow for shrinkage.

Generally a bisque firing should rise slowly to 650°C/1200°F. Set switches to LO (infinite heat to 3, Sunvic to 25%), with the lid propped open, for about 1½ hr to ensure thorough drying. Then increase to MED (5, or 50%) for an hour, which should bring the kiln through 650°C/1200°F. Switch to HI (100%) to complete the firing. For automatic controllers use a single ramp of 140-200°C/250-350°F per hour, or use multiple ramps to simulate the above procedure (Bartlett V6-CF 's are preprogrammed for some firings - see the separate manual). These are general recommendations only - adjustments should be made to allow for thick walled ware, very heavy (or light) loading, and for personal experience. One peephole should be left open throughout the firing (unless a direct venting system is used).

Glaze Firing No two pieces should touch, and glaze should not contact kiln shelves. Stilts can be used for earthenware and other low temperature firings. For porcelain and stoneware the bottoms should be free of glaze, so that they can be placed directly on shelves. This minimizes the risk of distortion during firing.

Glaze firings of pre-bisqued ware can be fired relatively quickly. Set switches at MED (5, or 50%) for one hour, to protect against thermal shock. Then set to HI (100%) to complete the firing. One peephole should be left open (unless a direct vent is used).

It is always advised that test firings be done to determine correct firing rates for individual requirements.

Troubleshooting

Problem	Causes	Solution
Kiln will not heat	Not connected to power Fuses blown/breaker tripped Kiln Sitter reset button out Kiln Sitter timer off No control power Supply cable burned	Check cord/plug and main supply switch Replace fuse(s)/reset breaker With weight set, push button in Set timer ½ hour more than firing Check control switch or fuses Call for service
Elements not heating	Element connection burned (in series connection one element out will affect others) Element coil burned through Switch not working (check other elements on same switch) Control alarm/error	Replace connector (element may also require replacement), tighten others Replace element Replace switch Refer to control manual
Uneven heating	Element not heating Incorrect heat distribution	See above Contact supplier
Fuse blows/breaker trips during firing	Fuse/breaker rated too low Inadequate supply wiring Poor connection - at element, switch, cable or supply wiring	Should be 25% more than amps on kiln specification label Call electrician Check all connections (look for signs of overheating/burning)
Cable or plug becomes hot	Inadequate supply wiring Loose connection in plug or Receptacle	Call electrician Clean and tighten connections - replace if noticeably overheated
Kiln not keeping up with automatic con	Control ramp rate set at more than kiln can keep up with	Adjust control settings
Increase in firing time	Aged elements Poor connection Change in supply voltage (check with electric utility)	Replace elements See above May be necessary to change elements
Control or pyrometer reads negative	Thermocouple connection reversed	Correct thermocouple connections (**be careful not to reverse thermocouple leadwire at both ends**)
Pyrometer does not indicate	Burned out thermocouple	Replace thermocouple
Analogue control goes to top of Scale	Burned out thermocouple	Replace thermocouple

For service Please call **800-296-5456**, or check **www.euclids.com** for our service directory. Before calling for service, please have kiln model and serial number, kiln voltage, and position of element (if applicable) on hand.

Ordering Parts

Please specify make, model, serial number and voltage.
For elements, please specify location. For top load kilns start with number 1 at the top, and count down. For front load kilns count down the left side, across the bottom, and up the right side (elements across from each other will be the same).

Wiring Access

In order to make servicing your kiln easier, our top load kilns have a hinged wiring cover (gutter).
If you have purchased a kiln with a Bartlett controller:
remove the screws from the right-hand side of the wiring enclosure and the wiring cover can be hinged.
If your kiln has a kiln sitter the procedure is as follows:
remove the mounting screws from the wiring enclosure, followed by the hinge pins on the left-hand side;
pull the enclosure straight out of the kiln until the tube assembly is completely outside of the kiln;
the hinge pins can now be put back in place, leaving the gutter open and easily serviceable.

Replacing Elements

Elements will drop in power after the first couple of firings, and then be quite steady for a long time, until their age catches up with them. If a kiln's firing time is gradually getting slower and slower, it is probably old elements (an abrupt slowing in firing time, with all elements working, may be your supply voltage - check with your power company).

Many people prefer to replace all elements at once. This is not strictly necessary, as the new element will not affect the other elements in the kiln (unless the new element is connected in series with other elements - in this case the older elements will tend to be worked harder, which will shorten their life even more). That said, If all elements are old when one element fails, it is generally desirable to replace all of them, rather than face another element failure (and incomplete firing) in the future.

Element replacement is not difficult and most people do their own:

Top Load Kilns

1. Disconnect the power supply to the kiln and remove wiring cover.
2. Make note of correct connection sequence.
3. Disconnect element from connector or terminal.
4. Straighten tail and pull out from inside kiln.
5. Pull coil from groove, being careful to minimize brick damage. Needle nose pliers may be helpful.
6. Carefully chip any foreign matter from groove, and vacuum.
7. Bend one element tail at 90^0 to the coil, and insert through kiln wall.
8. Feed element into groove. Be sure to push coil well into the groove. Open coil slightly and bend, to suit corners.
9. If element is not long enough, stretch out the last few feet of the coil as necessary.
10. Bend second tail at 90^0 and insert through wall.
11. Connect the two tails to the supply wires, and snip off excess wire.
12. Check condition of other element and switch connections, and tighten as required.

Front Load Kilns

1. Disconnect the power supply to the kiln and remove wiring cover.
2. Make note of correct connection sequence.
3. Disconnect element from connector, being careful of other element connections.
4. Draw the element to be replaced from inside the kiln.
5. Carefully chip any foreign matter from groove, and vacuum.
6. Element legs must lie flat and parallel. Check that the hairpin dimension is correct, allowing both legs to lie flat in their grooves.
7. Slide new elements into the grooves, guiding the tails through the back wall. Push the tails all the way through, with the legs lying straight in the grooves.
8. Prepare jumper wires and/or supply wires for reconnection.
9. Place the connector over the tail, and pull the tail from the end to provide tension on the coil. Tighten the connector and cut off any excess tail length.
10. Check condition of other element and supply connections, and tighten as required.

Element Life

There are too many variables for the wire manufacturer to be able to provide definite life expectancies for elements. In general, as operating temperatures go up, life expectancy goes down. Harmful atmospheres will also reduce element life. Element wire can be damaged by some foreign materials, such as glaze splashes. Debris in element grooves can shorten element life by reducing the element's ability to radiate heat.

The following guide has been provided by one wire manufacturer (Kanthal) to illustrate the effect of operating temperature (the figures are for wire temperature; kiln temperature will be approx. 28^{O}C/50^{O}F lower):

Element Temperature, ^{O}C/^{O}F	Proportional Life, %
2100/1150	100
2200/1200	46
2300/1260	22
2400/1315	13
2500/1370	9

Reducing atmospheres, caused by the introduction of gas, charcoal, wood, paper, or other, will strongly affect life expectancy, by impairing the oxidization of the element wire. Foreign materials will also affect oxidization.

Steam from the kiln load will also affect element oxidization, as well as contributing to corrosion of the case. This is why ventilation during the early stages of bisque firing is important.

Element Conditioning

From the Kanthal Handbook, referring to their FeCrAl alloys (i.e. A-1 alloy):

"The durability of resistance alloys in air at high temperatures is greatly increased by an oxide surface layer formed by a reaction with the oxygen of the air. The protective nature of this oxide layer is proportional to its area and depth. Foreign matter usually interferes with the formation of the oxide layer, and this causes a reduced life. ... At high temperatures the protective layer of Kanthal materials consists almost entirely of aluminum oxide. This has a light grey colour and good chemical resistance. At temperatures below 1000^{O}C (1832^{O}F) the oxide layer has a dark colour since the aluminum oxide is impure."

In order to protect elements from the effects of harsh environments, it is very desirable to condition the elements, by pre-oxidizing them. This is accomplished by firing them to a temperature of 1050^{O}C/1922^{O}F and soaking for several hours, 7-10 if possible. The process is enhanced by allowing good air flow into the kiln - leave the peepholes open, or the KilnVent on. If you are doing reduction firings in an electric kiln it is desirable to periodically re-oxidize the elements, for best life expectancy. **This is not recommended if normal use will not exceed 1050^{O}C (1922^{O}F), or for fibre lined kilns.**

The results of element conditioning can be quite dramatic. It may not have much affect for normal, low temperature firings, but can be significant for harsh operating conditions.

More Information

If you are interested in learning more about kiln or element design, contact us and we will be pleased to provide more information.

About Us

Euclid Kilns is a division of The Pottery Supply House Limited (PSH). PSH has been selling and servicing kilns since 1961, and continues to offer complete service and replacement parts for all kilns. We can provide a wide range of kilns, including custom designs and special modifications. We also design and build furnaces for industry. Our emphasis is on reliability - we offer consistent workmanship and excellent service.

Thank you for your purchase of a Euclid kiln. It is a product that we are proud of, and we sincerely hope that it gives you many years of trouble free performance. Please contact us if you have any comments. We appreciate feedback on how well we are doing.