Model 4069E User's Manual

ChambIR® Series
Infrared Heaters

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Another quality product from:

RESEARCH INC.
PROVIDING CONTROLLED ENERGY
DRYING ▲ CURING ▲ HEATING

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Dear Valued Customer:

Thank you for purchasing a Model 4069E ExtrudeIR® infrared heater. We believe it is the finest heating system of its type and are confident you will think so also.

This instruction manual has been carefully prepared to ensure you will be able to easily install and operate the Model 4069E curing system and to fully realize all its inherent capabilities. We invite your comments as well as any issues you may have regarding this manual or the Model 4069E.

Requirement	**Appropriate Contact**
Additional information regarding application of the Model 4069E system or other Research Inc. products.	Your local sales representative.
Ordering additional Research Inc. products or Manuals.	Your local sales representative or Research, Inc. Customer Service (952) 949-9009
Technical assistance and training.	Research Inc. Factory Service (952) 949-9009

Once again, let us welcome you to the growing family of Research Inc. customers. We look forward to working with you in the future.

Sincerely,

Terry Nigon
President
Research Inc.

Section **page**

DIMENSIONS AND SPECIFICATIONS

Introduction

General Description

The Model 4069E ExtrudeIR curing System uses high intensity infrared lamps and polished aluminum reflectors to deliver heat precisely where it is needed for many curing and drying applications on extrusion lines. It can be used effectively to provide a surface cure to rubber extrusions, dry adhesives and coatings on rubber or metal, and provide in process curing between layers of multi layer cable. Depending on the model selected, diameters as small as ¼ inch or a large as 4 inches can be processed. This system includes, along with the Model 4069 ChamberIR heater, an operator interface pedestal with a Watlow PID controller, a split quartz liner, height adjustment with plus/minus 15 degrees of tilt off horizontal, and convenient connection points for power, water and air. Optional features that can be ordered with the unit include an optical pyrometer to monitor product temperature, product break sensing to shut power down if the line brakes, and an air nozzle kit to provide forced air inside the heating chamber to increase efficiencies in curing and drying.
The single chamber models are an efficient solution for most applications and the dual chamber models provide additional product support to allow fragile product to run through the system without breaking or drooping

Typical applications for the Model 4069E include:

- Surface cure on rubber extrusion
- Drying adhesives and coatings on rubber or metal
- Soften and Cure between multi-layer extrusions
- Cast and hold the shape extrusion
- Flash cure coatings between operations

Standard Features

Heater Module –A circular array of individual parabolic polished aluminum reflectors direct the infrared energy generated by the quartz lamps towards the center axis of the heater. Each heater houses either 12 or 18 reflectors, depending on the model. The 12 reflector model accepts product sizes up to 2 inches in diameter while the 18 reflector model accepts products up to 4 inches in diameter. Heated lengths of 10, 16, 25, and 38 inches (254, 406, 635, and 965 mm) are offered for the Model 4069E. For applications prone to product sagging a dual heater system with two 10” heated length chambers and a intermediate product support between them is available. The chamber’s clam shell design offers easy access for liner cleaning and lamp servicing by simply releasing the latches on the front of the chamber and lifting the upper half. Gas springs are provided to assist with the left gas spring having a integral extension lock. The factory installed ceramic end seal T3 style lamps provide precise levels of power to the product in the chamber. The lamps generate infrared energy at a peak wavelength of 1.2 microns at rated voltage. This wavelength is commonly known as short wavelength or NIR, (Near Infrared). The lamps reach 90% of full operating temperature within three seconds of a cold start. Radiant energy is dissipated to 10% five seconds after power is shut down. Additional lamps can be ordered separately from the heater.

Standard Features

Heater Positioning – The chamber is mounted to actuators at each end allowing for variations on product elevation. Each actuator can operate independently allowing for up to 15° off chamber tilt. This can be useful when product sagging is occurring.

Water Cooling – Each reflector is designed with an internal coolant passageway to allow coolant to flow through its entire length during operation. Water lines run from the fittings on the base of the cart to the heater. Adequate cooling water is required during operation of the Model 4069E. Required cooling-water flow rates are listed in Specifications**.**

Air Cooling – A cooling fan is designed into the Model 4069 housing and provides ambient airflow through the heater body. This airflow helps to prevent air-borne contamination from depositing on the reflector surfaces. It also provides cooling to the quartz halogen lamp end seals.

Split Quartz Liner – A split quartz liner is included with the Model 4069 and provides contamination protection for the aluminum reflectors. When installed in the heater, the quartz liner protects the aluminum reflector and lamp from contaminants released in the heating process, resulting in maximum efficiency of the heater.

Operator Interface – The operator interface includes a Watlow PID controller for setting the power level to the lamps, On/Off switch, indicator light, actuator adjust switches and a fast stop.

Power Control Cabinet – A NEMA 12 cabinet containing components to accurately control power to the system.

Optional Features

Product Motion Detection – An optional low torque roller providing rotational feedback can be positioned at either end of the chamber to signal product stoppage. If no signal is detected the system immediately will shut down power to the chamber thus reducing the incidence of the product burning in the chamber. When motion is restored, the lamp voltage will be re-applied to a the preset value.

Air Curing Nozzles – Optional twin air curing nozzles can be attached to the input end of the heater. These nozzles force air down the length of the quartz liner and provide a convective component to the curing process. This option includes a fitting for house air, a filter and regulator in addition to the nozzles.

Exhaust Hood – An optional exhaust hood attaches to the exit end of the single chamber system or between chambers on a dual chamber system to collect smoke and gasses given off during heating the process. 3 inch diameter is used all 12R units and a 4” diameter is used on all 18R units.

Pyrometer – The optional pyrometer is useful for monitoring product temperature in sensitive areas. The mounting bracket provides multiple sensing positions for full product coverage. This option includes a fitting for house air, a filter and regulator in addition to the pyrometer.

Booster Pump – An optional booster pump is available when plant water pressure is too low to provide adequate flow rate for proper cooling of the chamber. Pump will raise the water pressure up-to 50 PSI

Electrical

General

Safety

The Model 4069E heater is designed for safe operation. Nevertheless, installation, maintenance, and operation of the heater can be dangerous for a careless operator or maintenance person. For your safety and the safety of others, read the instructions in this instruction manual and follow these safety practices to help prevent accident or injury.

INFRARED RADIATION - CAUTION! Continuous exposure to high-intensity infrared radiation at close proximity could be harmful to eyes or skin. Although infrared lamps emit negligible ultra violet electromagnetic radiation, harmful burns can still result if an operator is in close contact with lamps being operated at high intensity.

Because of the brilliant light emitted by infrared lamps at full intensity, it is recommended that eyes be shielded from the glare if observing the lamps for an extended period of time. Use suitable shaded lenses or dark glasses.

Gas Shock

A latching shock is installed on the left side of the model 4069 heater. The latch will prevent the heater from closing should the gas strut fail. When closing the heater pull the knob to release the latch while closing. Failure to release latch can cause damage to the heater if forced closed.

High Temperatures

Parts of the heater may exceed 500°F (260°C). Contact with the lamps, reflector, or metal parts near the lamps may cause severe burns.

WARNING!
NEVER place hands under or in front of the heating elements.
ALWAYS allow heating element to cool at least three minutes before touching the lamps or adjacent parts.

There is danger of electrical shock when servicing the heater.

CAUTION! Observe all applicable local and national electrical codes and ensure that a safe electrical ground system is installed before attempting to operate the heater. Refer to the Section 5 for proper installation procedures.

WARNING!
ALWAYS disconnect the external power lines prior to servicing the heater.
ALWAYS disconnect the power lines AND any optional interlock circuits before installing or changing lamps.
NEVER operate the heater with end covers removed.

Specification

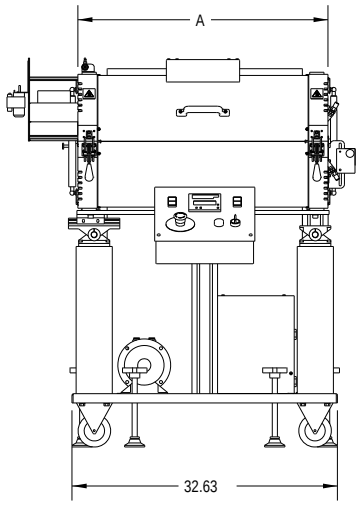
Model Number*	Lamp Lighted Length, Inches (mm)	Lamp Wattage	Lamp Type	Lamp Part Number	Lamp Rated Voltage	Wattage Heater, kW	***Water Flow GPM (LPM)	Pressure Drop Through Heater @ Required Water Flow, psi +/- 5psi	Total Weight, Pounds (kg)
4069E-12R-10L-12kW-480V	10 (254)	1000	QIH240-1000RI2	103390-003	240	12.0	1.2 (4.5)	10	501 (227)
4069E-12R-16L-19kW-480V	16 (406)	1600	QIH240-1600RI2	103390-005	240	19.2	1.8 (6.9)	16	515 (234)
4069E-12R-25L-30kW-480V	25 (635)	2500	QIH480-2500RI2	103390-007	480	30.0	2.8 (10.6)**	31	535 (243)
4069E-12R-38L-46kW-480V	38 (965)	3800	QIH480-3800RI2	103390-010	480	45.6	4.2 (15.9)**	63	564 (256)
4069E-12R-10L-DUAL-18kW-480V	10 (254)	1000	QIH240-1000RI2	103390-003	240	24	2.4 (9)	20	575 (261)
4069E-18R-10L-18kW-480V	10 (254)	1000	QIH240-1000RI2	103390-003	240	18.0	1.7 (6.5)	15	523 (237)
4069E-18R-16L-29kW-480V	16 (406)	1600	QIH240-1600RI2	103390-005	240	28.8	2.7 (10.2)	29	550 (249)
4069E-18R-25L-45kW-480V	25 (635)	2500	QIH480-2500RI2	103390-007	480	45.0	4.2 (15.7)**	61	588 (267)
4069E-18R-38L-68kW-480V	38 (965)	3800	QIH480-3800RI2	103390-010	480	68.4	3.1 (11.9)**	37	639 (290)
4069E-18R-10L-DUAL-36kW-480V	10 (254)	1000	QIH240-1000RI2	103390-003	240	36	3.4 (13)	30	619 (281)

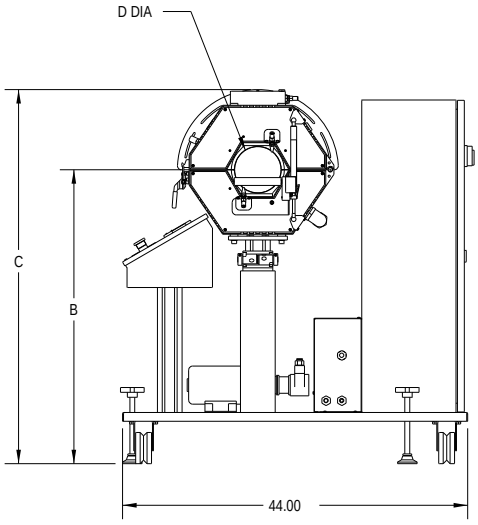
* Recommended maximum product diameter for 12-reflector models is two inches.
Recommended maximum product diameter for 18-reflector models is four inches.

** Stated flow rates are for each of two flow paths.

*** Maximum inlet water temperature not to exceed 100° F (37°C)

DIMENSIONS





MODEL NUMBER	A	B MIN	B MAX	C MIN	C MAX	D DIA
4069P-12R-10L	16.13 (410)	36.75 (933)	44.75 (1137)	44.97 (1142)	52.97 (1345)	3.22 (82)
4069P-12R-16L	21.75 (552)	36.75 (933)	44.75 (1137)	44.97 (1142)	52.97 (1345)	3.22 (82)
4069P-12R-25L	30.75 (781)	36.75 (933)	44.75 (1137)	44.97 (1142)	52.97 (1345)	3.22 (82)
4069P-12R-38L	43.75 (1111)	36.75 (933)	44.75 (1137)	44.97 (1142)	52.97 (1345)	3.22 (82)
4069P-18R-10L	16.13 (410)	38.00 (965)	46.00 (1168)	47.89 (1216)	55.89 (1419)	5.90 (150)
4069P-18R-16L	21.75 (552)	38.00 (965)	46.00 (1168)	47.89 (1216)	55.89 (1419)	5.90 (150)
4069P-18R-25L	30.75 (781)	38.00 (965)	46.00 (1168)	47.89 (1216)	55.89 (1419)	5.90 (150)
4069P-18R-38L	43.75 (1111)	38.00 (965)	46.00 (1168)	47.89 (1216)	55.89 (1419)	5.90 (150)
4069P-12R-10L-DUAL	38.39 (975)	36.75 (933)	44.75 (1137)	44.97 (1142)	52.97 (1345)	3.22 (82)
4069P-18R-10L-DUAL	38.39 (975)	38.00 (965)	46.00 (1168)	47.89 (1216)	55.89 (1419)	5.90 (150)

IN (MM)

Single Chamber 2 Inch Diameter Profile				
Model	**4069E-12R-10L**	**4069E-12R-16L**	**4069E-12R-25L**	**4069E-12R-38L**
Power Generated	12kW	19.2kW	30kW	45.6kW
Voltage	240 volt 3 phase	240 volt 3 phase	480 volt 3 phase	480 volt 3 phase
Max Current	29 amp	46 amp	36 amp	55 amp
Breaker size	50 amp	60 amp	50 amp	70 amp
Lamp Type	103390-003	103390-005	103390-007	103390-010
Water Flow Requirement	1.2 gpm (4.5 lpm)	6.8 gpm (12.9 lpm)	2.8 gpm (10.6 lpm)	4.2 gpm (15.9 lpm)

Dual Chamber 2 Inch Diameter Profile	
Model	**4069E-12R-10L-Dual**
Power Generated	24Kw
Voltage	480 volt 3 phase
Max Current	30 amp
Breaker Size	50 amp
Lamp Type	103390-003
Water Type Flow Requirement	2.4 gpm (18 lpm)

Installation

This section describes how to wire the Model 4069E power control system. The features and options mentioned here are identified in the model number found inside the enclosure.

WARNING!
Hazardous voltages are present at the main disconnect switch and load terminals.

Always remove AC line voltage from the system before making contact with internal assemblies, line or load wiring, or fuses. Also remove AC line voltage from the system before making connections, equipment changes, or resistance measurements.

WIRING CONNECTIONS

Conduit entry into the system should be made near the right side of the cabinet for power wiring. Assure that metal fragments are not allowed to fall into the equipment while holes are made for conduit fittings. See Figure 1.

Wire Ratings:

Wire Temperature Rating:	75°C or Higher
Line/Load Wiring Voltage Rating (240 VAC systems)	300 VAC Minimum
Line/Load Wiring Voltage Rating (480 VAC systems)	600 VAC Minimum

Allowable Wire Sizes:

Current Rating of System	Line Connections	Load Connections	Ground Connection	Control Circuit Connections
120 Amp	#6-250 MCM	#6-250 MCM	#4-1/0 AWG	22-10 AWG
160 Amp	#6-250 MCM	#6-250 MCM	#4-1/0 AWG	22-10 AWG

Recommended Minimum Wire Sizes:

NOTE:
Wire temperature and connector ampacity ratings are based on NEC 310-16 using 75℃ copper wire de-rated for 50℃ ambient environment.

Current Rating of System	Line Connections	Load Connections	Ground Connection	Control Circuit Connections
120 Amp	1 AWG	6 AWG	6 AWG	16 AWG
160 Amp	2/0 AWG	4 AWG	6 AWG	16 AWG

Electrical Inputs:

Heater open interlock switch	Contacts Rated for 120 VAC at 2.0 A
Cooling flow interlock switch	Contacts rated for 120 VAC at 100 mA
Heater over-temp. thermoswitch	Contacts rated for 120 VAC at 100 mA
Remote interlock switch	Contacts rated for 120 VAC at 100 mA

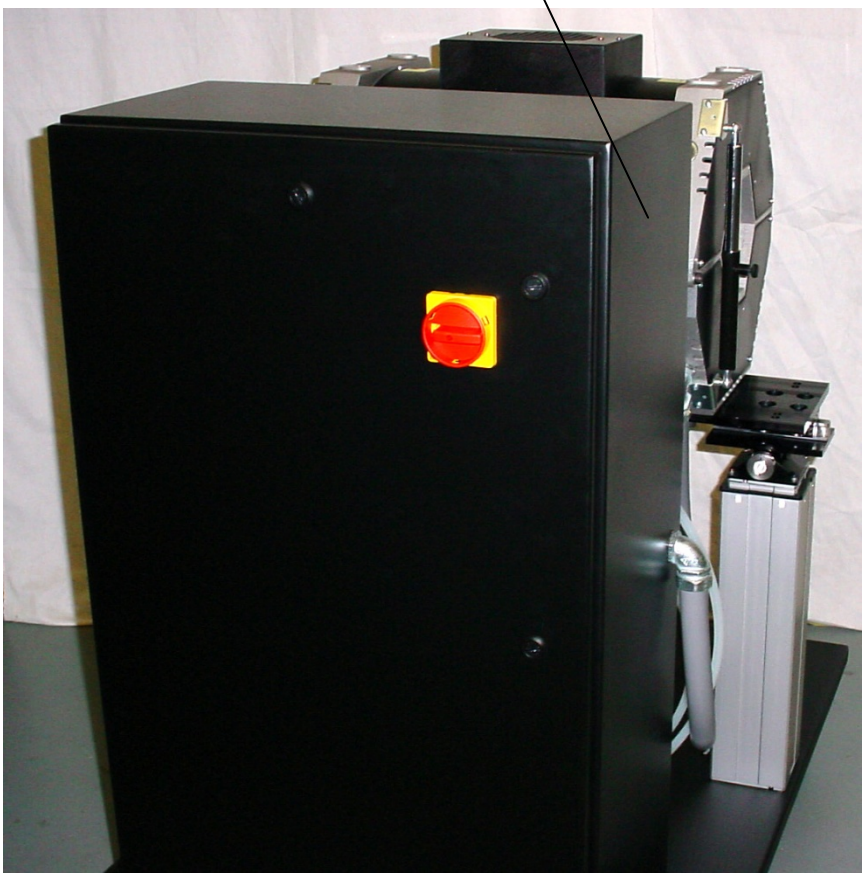


Figure 1.

Power Wiring Connections

Line Connections

Referring to the wiring specification in Table 3-1, connect the external power lines to the top of the disconnect switch.

Load Connections

The model 4069E control system has 2 (3-pole) load fuseblocks for distributing the Three-phase power to your process. For the 120 Amp systems, do not exceed more than 60 amps – 3 phase per fuseblock. For the 160 Amp systems, do not exceed more than 80 amps – 3 phase per fuseblock. The heater load should be wired to evenly distribute the number of individual lamps or heating elements to the 2 (three phase) load circuits. It is suggested to balance the load circuits by having the same number and size of lamps or heating elements per phase and per load circuit.

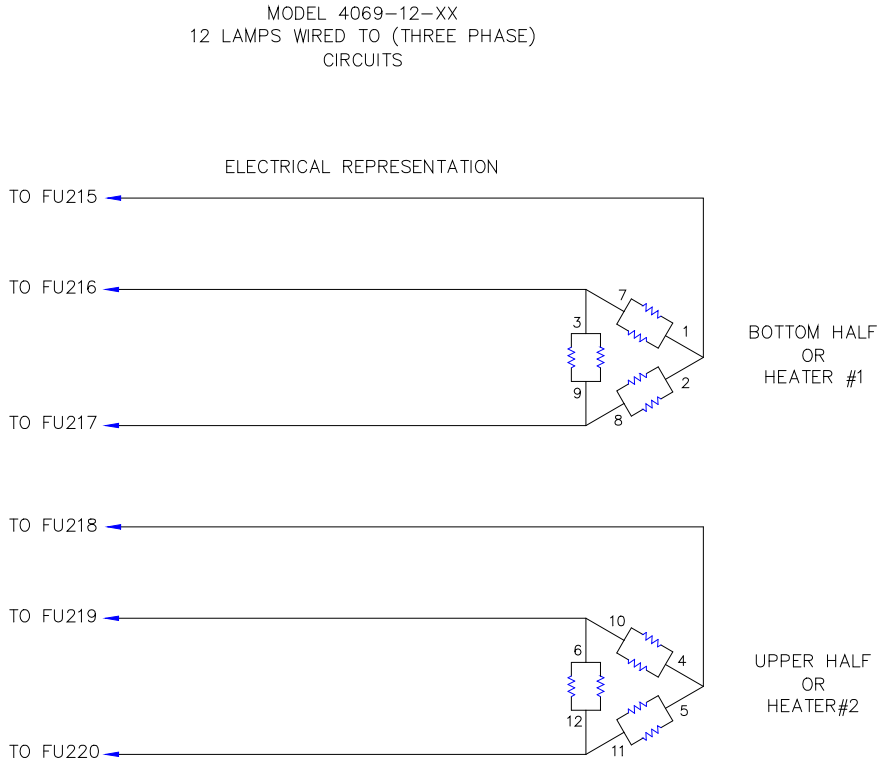


Figure 2.

CONTROL CONNECTIONS

Remote Interlock Switch

This feature provides for remote process interlock shutdown of the heater power. This is accomplished by opening the heater power controller contactor. With the interlock open, the heater cannot be turned on from the control system front panel. The switch contacts must be open during the heater off condition. If this feature is desired, connect using the following procedure:

1. Remove the factory installed jumper at TB-1 pins 17 and 18.

2. Connect the normally open contacts of the switch to TB-1 pins 17 and 18.

If more than 1 interlock switch is used in a system, wire the contacts in series and then connect to the system.

Remote Fast Stop

This feature provides for remote process fast stop shutdown of the heater power, water and fan cooling. This is accomplished by opening the heater power controller contactor. With the fast stop open switch, the heater cannot be turned on from the control system front panel. The switch contacts must be open during the heater off condition. If this feature is desired, connect using the following procedure:

3. Remove the factory installed jumper at TB-1 pins 19 and 20.

4. Connect the normally open contacts of the switch to TB-1 pins 19 and 20.

If more than remote fast stop switch is used in a system, wire the contacts in series and then connect to the system.

Water Connections

Use male 3/8” NPT fittings to connect the water input and output ports. See Specifications for required flow rates.

Air Connections

Use a male 3/8” NPT fitting for the air input connection when the optional Air Curing Nozzles and/or Pyrometer have been ordered.

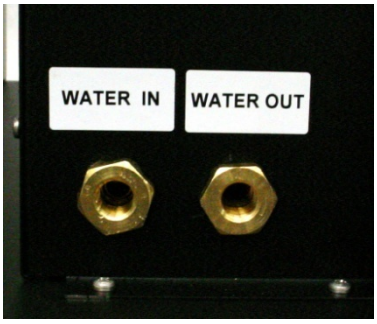


Figure 3

Operating Instructions

Figures 4 & 5 shows the location of the controls and indicators.

CONTROLS AND INDICATORS

Main Disconnect Switch

The main disconnect switch turn on and off the power control system. Note the following:

Before turning on the disconnect switch, check the following:

1. The load is wired and ready for power to be applied to it.
2. All safety precautions are observed.

System ON/OFF Switch

The System ON/OFF switch allows the operator to enable or disable the power going to the load. This is accomplished by removing power from the AC contactor. This in turn removes power from the SCR controller. Additionally this will enable or disable the water and air solenoids, chamber fan and control console indicator light.

Indicator Light

- Indicator light off indicates all systems controlled by ON/OFF switch are disabled.
- Indicator light on steady indicates power is applied to the heater power controller, and chamber fan, air and water solenoids are enabled.
- Indicator light flashing slowly (three seconds on, one second off) indicates either the Remote Interlock is open or the Motion Detection Sensor has stopped.
- Indicator light flashing fast (one second on, one second off) indicates that the chamber cooling flow switched and/or thermostat has tripped.

Watlow F4 Process Controller

The Watlow F4 Process Controller is used to increase voltage to the lamps, display settings and display alarm messages.

- The Watlow F4 Process Controller is shipped in manual mode.
- The upper display reads output percentage directly.
- The lower display provides alarm message identification.
- Change voltage output to lamps as follows:
    1. Use the scroll up/down buttons to move the cursor to Manual Pwr.
    2. Push scroll right to select Manual Pwr.
    3. Use the up/down scroll buttons to increase or decrease output value percentage.
    4. Push scroll right button to enter new output value which is applied immediately.

Actuator Control

The black/white buttons on the control console control movement of the actuators that provide elevation adjustments to the chamber.

- The left black/white controls the left actuator.
- The right black/white controls the right actuator.

E-stop (Fast Stop)

Activation of the E-stop will disable the chamber contactor which cuts power to the lamps, cooling fan and water and air solenoids.

To reset the E-stop switch, turn the switch head to the right.

Figure 4.


Actuator Control
(Left)
Watlow
Controller
Actuator Control
(Right)
On/Off
Switch
Indicator
Light
E-stop
UP
DOWN
WATLOW
OFF ON
ExtrudeIR
INFRARED HEATERS

Figure 5.

Maintenance and Trouble Shooting

ROUTINE MAINTENANCE

The following bi-monthly routine maintenance is suggested:

1. Remove power connection to the system. Lock out power if possible. Carefully vacuum any dust or dirt collecting within the enclosure. Use caution to not disturb the wiring. Service more often in dust locations.

2. Clean the outside of the enclosure with glass cleaner and a soft cotton cloth as necessary.

The T3-style lamps are installed into the Model 4069 when shipped from the factory. The following procedure details the process to replace the lamps in the Model 4069 (reference Figure 6, 7, & 8):

LAMP REMOVAL, REPLACEMENT, INSTALLATION:

Note:
Remove all power from the heater BEFORE attempting to install/replace the lamps. Allow a minimum of ½-inch (12 mm) of slack in the lamp leads so that the leads are not taut when inserted into the lamp terminal blocks.
Always take care to handle all lamps by the ceramic end seals and use clean cotton or latex gloves to prevent contamination of the quartz lamp envelopes.

1. Remove quartz liner (see next section). Take this opportunity to clean the liner.
2. Remove end-cover screws (4 per end cover).
3. Remove end covers on both ends of the heater.
4. Remove end-reflector screws (2 per reflector)
5. Remove end reflectors on both ends.
6. Carefully disengage lamp from clips (both ends).
7. Slide the end of the lamp through the rectangular cutout in the end casting on one end of the heater through the rectangular cutout in the end casting of the other end of the heater.
8. Position the lamp over the lamp clips so that the lighted portion of the lamp is equally space in the reflector.

   Note: Be sure that the Gas Fill Tip is facing away from the reflector

9. While holding the lamp on both ends by the ceramic end seals, with light pressure push the lamp into the lamp clips. A slight twisting motion of the lamp, while pushing the lamp into the clip, helps the lamp to seat properly.

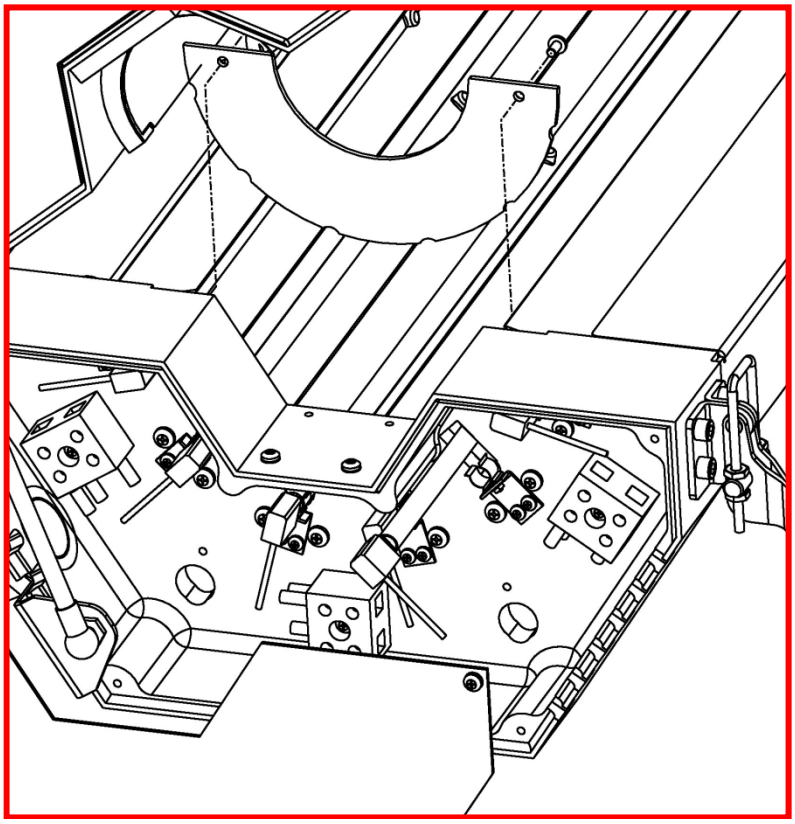


Figure 6.

10. Cut wire to a length allowing for a service loop.
11. Strip back the insulation on the end of the lamp leads approximately 1-1/2 inches (38 mm).
12. Insert the bare wire of each insulated lamp lead into the ceramic terminal block position that previously held the old lamp. Push each lead wire into the terminal block far enough so, that when tightened, the setscrew will hold the lead securely.
13. Tighten the setscrews in each terminal block so the lead wires are held securely (1.0 Ft.-Lbs. [1.4 N-m]).
14. Form a loop within each lead along its length. This loop will act as a strain relief within the lead during normal operation of the heater.
15. Reinstall the end reflectors, end covers, and quartz liner.

SPLIT QUARTZ LINER CLEANING AND REPLACEMENT

The split quartz liner can be replaced or removed from the Model 4069 for periodic cleaning. Use the following procedure to remove/reinstall/clean the quartz liner:

Note:
Remove all power from the heater BEFORE attempting to install/replace the lamps. Always use clean cotton or latex gloves when handling the split quartz liner so as not to deposit any oils or grease from your hands onto the surface of the split quartz liner.

1. Open the Model 4069 Heater to allow access to each heater half for split quartz liner installation.
2. Loosen the screws of one liner bracket and slide the bracket away from the quartz-liner of one liner half at one end of the heater, while supporting the liner with other hand.

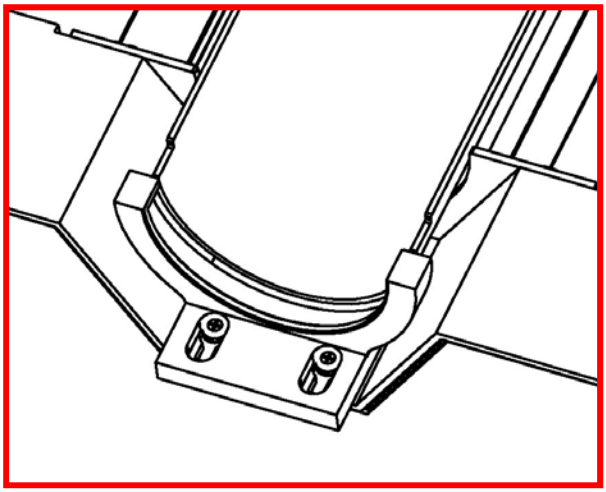


Figure 7

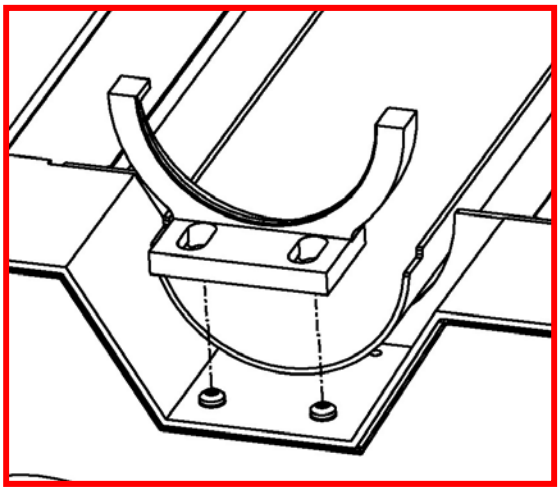


Figure 8

3. Remove the bracket from the end casting of the heater.
4. Gently slide the quartz liner out of the grooves of the liner bracket from the opposite end. Take care so that the quartz liner does chip or crack as it is removed.

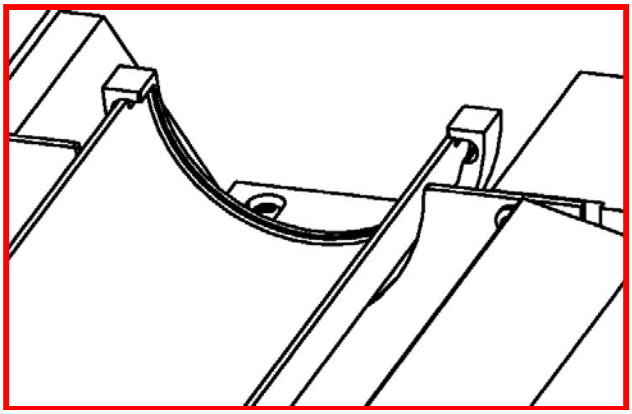


Figure 9

5. If cleaning the liner, use a non-abrasive glass cleaner (i.e. household ammonia and water or isopropyl alcohol) and a clean, dry, lint-free cloth. After cleaning, do not touch the outside surface of the liner unless wearing cotton gloves.
6. Reinsert the edges of the liner into the grooves of the quartz-liner bracket.
7. Reinstall the other bracket and secure with the two bracket screws.
8. Repeat this process for the other half of the liner.

CLEANING THE REFLECTORS

Clean reflectors provide the greatest radiant efficiency. If the reflector surface becomes contaminated, it reflects less energy. The energy that is not reflected is lost, absorbed by the reflectors, and removed by the cooling water and air.

The following procedure should be used to clean the Model 4069 reflectors:

1. Remove the lamps and quartz liner as described in Lamp Removal/Replacement/Installation and Split Quartz Liner Cleaning and Replacement.
2. Clean the reflectors with a mixture of warm water and common household ammonia followed by a thorough wipe-down using a clean, water-dampened flannel cloth.
3. Depending on the type of contamination present on the reflector, a suitable solvent may be required to remove the contamination. The solvent must be selected based on its inability to adversely affect the aluminum reflector.
4. Thoroughly wipe the reflector using the warm water/household ammonia mixture followed by the dampened flannel cloth.
5. Replace the lamps and quartz liner, as outlined in Lamp Removal/Replacement/Installation and Section Split Quartz Liner Cleaning and Replacement.

If necessary, the reflectors may require re-polishing. This is permissible because the reflector is solid aluminum and can be re-polished many times without damage from continued erosion. A fine particle polishing compound, such as a chrome, semi-chrome, or soft metal polishing compound may be used. These types of compounds can be found at a local automotive or metal-polishing supply house. Follow the polishing instructions listed on the polishing product.

The reflectors can be removed from the Model 4069 Heater to make cleaning and maintenance easier. The following procedure should be used to remove the Model 4069 reflectors:

Note:
Remove all power from the heater BEFORE attempting to install/replace the heater reflectors.

1. Drain all cooling fluid from the heater and blow out the heater cooling lines with compressed air.
2. Remove the heater-cover screws and heater cover.

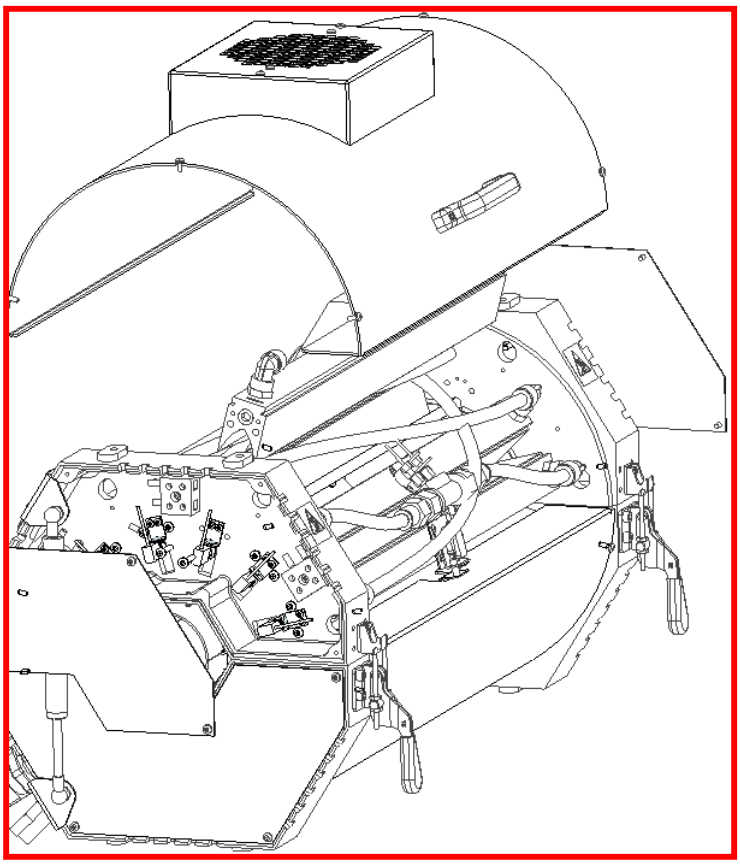


Figure 10

3. Disconnect the cooling line from the reflector to be maintained.
4. Loosen all screw from all reflectors on one side of the end casting of the reflector to be maintained.
5. Remove the reflector mounting screws from the end casting of the reflector to be maintained.
6. Remove the reflector.

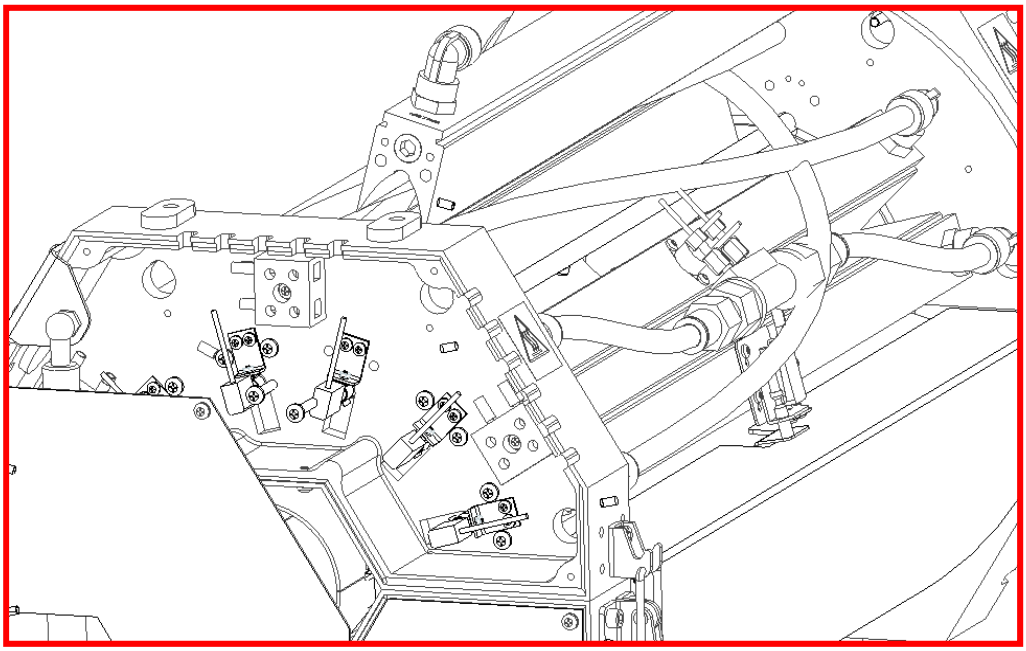


Figure 11

TROUBLE-SHOOTING

Symptom	Action
Heater Contactor will not energize.	1. Verify line voltage is applied to the main disconnect switch. 2. Verify remote heater open, remote process interlocks or water flow switches (if used) are closed. 3. If not using remote heater enable, heater open interlocks or water flow switches, verify the 2 pin jumpers are installed between TB 100 pins 2 to 3, 10 to 11 and 14 to 15. 4. Check fuses FU 1050, FU 1051, FU 107, FU 108 and TB 100 pin 1.
No output to load, heaters or lamps. Setpoint switch is in LOCAL mode.	1. Verify the 'Heater On' indicator is illuminated. 2. Verify a 0-5 VDC signal is present on pins 13 and 14 of the power controller connector. This voltage is proportional to the setting of the local Setpoint potentiometer or the idle potentiometer (product detect option) if product is not detected. 3. If the over current light on the controller is illuminated, check the load wiring, lamp or heater connections for short circuits. 4. If the shorted SCR light is lit on the controller, refer to the power controller manual regarding repairs. 5. If the COMMAND led on the power controller is not lit and a control signal is greater than 10 percent is applied, refer to the power controller manual regarding repairs.

Symptom	Action
No output to load, heaters or lamps. Setpoint switch is in REMOTE. Operation O.K. with Setpoint switch in LOCAL (if not see above).	1. Verify the polarity of the remote input. TB 100 pin 16 is positive, and 17 is negative. 2. Units with Temperature control option: Place temperature controller in manual mode with 50 percent output. Verify 2.5VDC at TB 100 pins 16 and 17. Refer to the temperature controller manual regarding repairs.
Full voltage cannot be obtained.	1. Verify the load, lamps, or heaters are not drawing current at full capacity of the system. Rotate the current limit pot on the power controller 1 turn counterclockwise. If the load current decreases, the current limit is controlling the output. 2. Verify the line voltage. Load voltage maximum is approximately 98 percent of the line voltage. 3. Test in LOCAL setpoint mode. Set the 'Local Setpoint' potentiometer to 900. The voltage should be 216 (240 volt line), or 432 (480 volt line). Adjust the RUN SPAN potentiometer of the power controller as necessary. 4. Faulty power controller SCR or control circuit. Refer to the power controller manual regarding repairs.
Load voltage will not go to zero.	1. Verify the load voltage will go to zero with the SCR switch set to DISABLED. If it does not, refer to the power controller manual regarding repairs. 2. If the shorted SCR indicator of the power controller is on, an SCR has failed. 3. Units with the Product Detect option: Normal operation of the idle circuit. The idle potentiometer maintains the voltage at idle. 4. Units with the Conveyor / Web speed option: Normal operation. The minimum idle potentiometer may be adjusted to lower the load voltage to zero if the web is stopped.

Accessories, Spare, and Replacement Parts – Controls

Model	Description
	Control Cabinet:
096191-006	Contactor- 3 phase, 100 amp, 24 VDC coil
107556-009	Fuse-Cubefuse, 100 amp
086445-016	Fuse-Time Delay, “CC”, 6 amp, 600 VAC
090744-020	Fuse-Current Lim “CC” 1.6 amp
099395-001	Switch-On /Off, 3 phase, 100 amp
099396-001	Switch Actuator-Red/Yellow
107549-001	Power Supply-480 VAC in, 24VDC out
099556-003	PLC-115/240, 8 DC in, 6 relay out
099556-010	Output Module-PLC Dl05/06 4 PT
080821-001	Relay-DPDT, 10 amp, 24VDC, 650 ohm
055899-015	Relay-SS, DC, 125 amp, 480 VAC
107321-001	Transformer-250 VA, 480/240 to 240/120
066798-004	Varistor-Assembled, 480 VAC
055300-289	Resistor-MF,1/4W, 1%, 10K ohm
	Control Console:
107525-001	Watlow F4P Series process controller
107392-004	Switch-Push Button, 2 head
107392-001	Switch-Push Button, E-stop
107391-003	Switch-Rotary, 3 position
107390-002	Contact Block-Normally open
107390-001	Contact Block-Normally closed
107393-003	Indicator Light-Amber, 24-120 VAC/DC
107439-001	Actuator-Telescopic, 8” lift, 24 V
	Cart
106783-011	Replacement Gas Spring for 4069-12R-10L
106783-012	Replacement Gas Spring for 4069-12R-16L
106783-013	Replacement Gas Spring for 4069-12R-25L
106783-014	Replacement Gas Spring for 4069-12R-38L
106784-011	Replacement Gas Spring for 4069-18R-10L
106784-012	Replacement Gas Spring for 4069-18R-16L
106784-013	Replacement Gas Spring for 4069-18R-25L
106784-014	Replacement Gas Spring for 4069-18R-38L
106783-013	Replacement Gas Spring for 4069-12-DUAL
106784-013	Replacement Gas Spring for 4069-18-DUAL
	Gas Spring with Latch Replacement
107358-011	Replacement Gas Spring & Latch for 4069-12R-10L
107358-012	Replacement Gas Spring & Latch for 4069-12R-16L
107358-014	Replacement Gas Spring & Latch for 4069-12R-25L
107358-014	Replacement Gas Spring & Latch for 4069-12R-38L
107396-011	Replacement Gas Spring & Latch for 4069-18R-10L
107396-012	Replacement Gas Spring & Latch for 4069-18R-16L
107396-013	Replacement Gas Spring & Latch for 4069-18R-25L
107396-014	Replacement Gas Spring & Latch for 4069-18R-38L

Accessories, Spare, and Replacement Parts – Heater

Model	Description
	Replacement Lamp For:
103390-003	12kW or 18kW maximum-power rated heater (10 inch length, 1000-watts)
103390-004	24kW or 36kW maximum-power rated heater (10 inch length, 2000-watts)
103390-005	19kW or 29kW maximum-power rated heater (16 inch length, 1600-watts)
103390-012	56KW maximum power rated heater (16 inch length, 3600-watts)
103390-007	30kW or 45kW maximum-power rated heater (25 inch length, 2500-watts)
103390-010	46kW or 68kW maximum-power rated heater (38 inch length, 3800-watts)
	Replacement Reflector For:
106721-001	10-inch length
106721-002	16-inch length
106721-003	25-inch length
106721-004	38-inch length
	Replacement End Reflectors (Four required per heater) for:
106778-001	12-reflector size heater
106778-002	18-reflector size heater
	Spare Split Quartz Liner Half (Two required per heater) for:
106895-001	12-reflector, 10-inch length
106895-002	12-reflector, 16-inch length
106895-003	12-reflector, 25-inch length
106895-004	12-reflector, 38-inch length
106895-005	18-reflector, 10-inch length
106895-006	18-reflector, 16-inch length
106895-007	18-reflector, 25-inch length
106895-008	18-reflector, 38-inch length
M4069C	**Additional Operation Manual**