LINDBERG/BLUE M

Mini-Mite™ Tube Furnace

Models: TF55030A
TF55030C
TF55035A
TF55035C

Installation and Operation Manual

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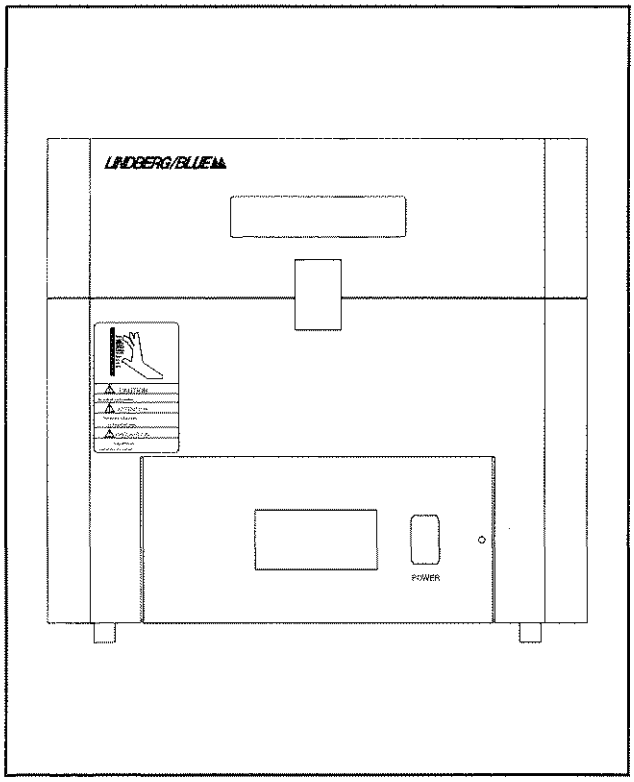
1 Introduction



The Lindberg/Blue M Mini-Mite™ Tube Furnaces are a family of ultra lightweight, economical laboratory tube furnaces. The low thermal mass Moldatherm® insulation/heating element provides fast duty cycles, energy conservation, and efficient programming. Refer to Table 1 for specifications.

1.1 Features and Benefits

- Controlled heat-up rate eliminates thermal shock to materials.
- Quick heat-up and cool-down rates.
- Energy efficient Moldatherm insulation suitable for high interior-exterior temperature differential. The unit is rated for a maximum operating temperature of 1100°C.
- When fitted with a process tube can be used with atmospheres other than air.
- Digital instrumentation for precise temperature setpoint and display. Microprocessor automatically optimizes control parameters during furnace operation.
- Main power ON/OFF switch on control panel.
- Type K Thermocouple.

1.2 Specifications

Table 1. Lindberg/Blue M Mini-Mite TF55030 Series Moldatherm Tube Furnaces

Model	Chamber Dimensions in. (cm)	Watts	Control Type	Voltage	Net Product Weight lbs (kg)
TF55030A	1 Dia. x 12 L (2.5 x 30.5)	800	Single Setpoint Digital	120 VAC 50/60 Hz, 1 phase	28 (12.7)
TF55030C	1 Dia. x 12 L (2.5 x 30.5)	800	Single Setpoint Digital	208/240 VAC 50/60 Hz, 1 phase	28 (12.7)
TF55035A	1 Dia. x 12 L (2.5 x 30.5)	800	Programmable Digital	120 VAC 50/60 Hz, 1 phase	28 (12.7)
TF55035C	1 Dia. x 12 L (2.5 x 30.5)	800	Programmable Digital	208/240 VAC 50/60 Hz, 1 phase	28 (12.7)

2 Safety Considerations

WARNING! Do not modify or use equipment in a manner other than expressly intended. Modification of equipment other than that for which it is explicitly designed could cause severe injury or death. Any customer after-market retrofit violates the warranty of the equipment.

Do not reconfigure the controller. Any reconfiguration of the control instrument could cause inaccurate readings, faulty instrument values, and may cause the unit to become overheated and start on fire, causing personal injury or death, product and property damage.

Do not modify or disconnect any safety features provided. Disconnection of the unit safety features could allow the unit to become overheated and start on fire, causing personal injury or death, product and property damage.

Do not use components or materials not specifically designed for this equipment. Failure to comply with this precaution could result in damage to equipment used or the furnace and may create an overheat situation. Also, do not use anything other than OEM exact replacement equipment and parts. Not using OEM replacement parts could cause faulty instrumentation readings, inoperable equipment, or temperature overshoot. Both situations may cause personal injury or death, product, and property damage.

Before using, user shall determine the suitability and integrity of the product for the intended use and that the unit has not been altered in any way. Misapplication may compromise the safety of the end user or the life of the product.

CAUTION! This product contains ceramic fiber or other refractories which can result in the following:

- May be irritating to skin, eyes, and respiratory tract.
- May be harmful if inhaled.
- May contain or form cristobalite (crystalline silica) with use at high temperature (above 871°C) which can cause severe respiratory disease.
- Possible cancer hazard based on tests with laboratory animals. Animal studies to date are inconclusive. No human exposure studies with this product have been reported.

WARNING! Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.

WARNING! When installing, maintaining, or removing the fiberglass insulation, the following precautions will minimize airborne dust and fiber:

- Keep personnel not involved in the installation out of the area.
- Use a good vacuum to clean area and equipment. Use a dust suppressant if sweeping is necessary. Do **not** use compressed air.
- Use a disposable mask suitable for nuisance dust.
- Wear long sleeve clothing, gloves, hat, and eye protection to minimize skin and eye contact. Do not wear contact lenses.
- Thoroughly wash self after work is complete.
- Launder work clothing separate from other clothes and thoroughly clean laundering equipment after use. If clothing contains a large amount of dust and/or fiber, dispose of rather than clean.
- Promptly place used fiberglass parts and dust in plastic bags and dispose of properly.

3 Pre-Installation

3.1 Unpacking

Carefully unpack and inspect the unit and all accessories for damage. If you find any damage, keep the packing materials and immediately report the damage to the carrier. We will assist you with your claim, if requested. **Do not return goods to Lindberg/Blue M without written authorization.** When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment.

3.2 Operating Conditions

High concentrations of sulfates, chlorides, fluorides, alkalis, and V_2O_5 can have corrosive effects on the ceramic fiber. Contact Lindberg/Blue M for additional information about the effects of specific atmospheres on furnace performance.

With prolonged use, hairline cracks can develop in the insulation materials. These minor cracks will not affect the furnace's performance. We recommend turning off the furnace completely when not in use. The heating unit is not damaged by rapid heating and cooling cycles.

3.3 Atmosphere Systems

The Lindberg/Blue M Mini-Mite furnaces are designed for use with combustible or inert atmospheres when contained in a process tube.

WARNING! Do not use combustible gases directly in this furnace. Process gasses must always be contained in a separate tube.

CAUTION! Avoid combustible products which generate toxic or hazardous vapor or fumes. Work should only be done in a properly vented environment.

4 Installation

Do not exceed the electrical and temperature ratings printed on the dataplate of the furnace.

CAUTION! Improper operation of the furnace could result in dangerous conditions. To preclude hazard and minimize risk, follow all instructions and operate within design limits noted on the dataplate.

4.1 Location

Install the furnace in a level area free from vibration with a minimum of three inches of space, for air flow, around the unit.

4.2 Wiring

For detailed wiring information, refer to Figure 7 on page 18.

4.2.1 120 VAC Operation

The TF55030A model operates on 120 VAC, 50/60 Hz, single phase. Each furnace includes a 120 VAC grounded plug and cord set. The units are completely prewired and ready for operation.

Before initial start up, inspect the furnace's wiring connections:

1. Remove the corner screws on the back panel of the furnace and detach the back panel.
2. Check that the thermocouple is securely mounted and undamaged.
3. Check the thermocouple wiring connections. Refer to Figure 1. Red is always negative.

CAUTION! Failure to check thermocouple wiring connections before initial start up could result in damage to the furnace.

4. Check that all electrical connections are secure.

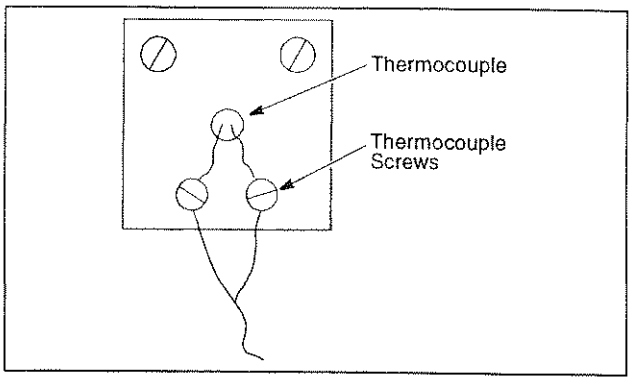


Figure 1. Thermocouple

5. Replace the back panel on the furnace and secure with the corner screws.
6. Plug the line cord into a 120 VAC, 15 amp, grounded line. The furnace draws approximately 6.7 amps at 120 VAC.

4.2.2 208 VAC Operation

The TF55030C model operates on 240 VAC, 50/60 Hz, single phase. The Lindberg/Blue M Moldatherm tube furnace heating elements are specifically designed for operation on 120, 208, or 240 VAC. A furnace wired for 240 VAC operation can also operate on 208 VAC. However, heatup and recovery times will be longer.

4.2.3 120 to 208/240 VAC Conversion

Models factory wired to operate at 120 VAC can be converted to 208/240 VAC.

The conversion procedure requires replacing the power relay and changing the jumper configuration of the elements. If you plan to convert from 120 VAC to 208/240 VAC operation, please contact the service department.

5 Start Up

CAUTION! Observe the following precautions when operating the furnace:

- Never stand in front of an open furnace.
- Wear protective eyeware.
- Wear protective gloves.
- Use tongs to insert and remove furnace load.
- Do not allow the load to touch the furnace walls.
- Always use a hearth plate on the furnace bottom.

WARNING! Before operating this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.

WARNING! When installing, maintaining, or removing the refractory insulation, the following precautions will minimize airborne dust and ceramic fiber:

- Keep personnel not involved in the installation out of the area.
- Use a good vacuum to clean area and equipment. Do **not** use compressed air.
- Use NIOSH high efficiency respirator (3M #8710 or equivalent).
- Wear long sleeve clothing, gloves, hat, and eye protection to minimize skin and eye contact. Do not wear contact lenses.
- Thoroughly wash self after work is complete.
- Launder work clothing separate from other clothes and thoroughly clean laundering equipment after use. If clothing contains a large amount of dust and/or ceramic fiber, dispose of rather than clean.
- Promptly place used ceramic fiber parts and dust in plastic bags and dispose of properly.

5.1 Furnace Start Up

The furnace has a power interrupt switch. Opening the furnace door shuts off power to the heating unit. The door must be completely closed before the furnace will operate.

To start up the furnace, complete the following steps:

1. Turn furnace ON.
2. Use the arrow keys to adjust the setpoint to 550°C. Press the SET/ENT key to register the change.
3. Run the furnace for two hours at 550°C.
4. Use the arrow keys to adjust the setpoint to 1,000°C. Press the SET/ENT key to register the change.
5. Run the furnace for two hours at 1,000°C.
6. Adjust setpoint to room temperature. Press the SET/ENT key to register the change.

6 Operation – UT150 Controller

Figure 2. UT150 Control Panel

The furnace temperature controller is configured and tuned at the factory to function well for most applications. Occasionally, it may be advisable to configure the temperature controller differently to suit a particular working environment or process.

CAUTION! Before reconfiguring the controller, read this chapter and the UT150 operation manual. Reconfiguring the controller can change the unit characteristics and design parameters, which can hamper performance and make the equipment dangerous to use.

This chapter provides brief instructions on how to perform the following configuration changes:

- Setting the temperature
- Setting the Overtemperature Protection Temperature
- Changing between celsius and fahrenheit
- Setting the ramp to setpoint time
- Autotuning the controller

Detailed instructions on configuring the temperature controller are found in the UT150 operation manual.

For instructions on the Controller-PC Communication Option, refer to Section 8 on page 9.

6.1 Normal Controller Operation

The Temperature Controller senses the chamber air temperature of the furnace (the PV, or process value) and supplies the heat necessary to achieve the desired setpoint. The controller includes an LED display and a pushbutton keypad. Refer to Table 1 and Table 2 for lists of displayed parameters and keypad functions.

Table 1. UT150 Parameter Functions

Parameter Code	Factory Set Value	Description
Operating parameters (access by holding the SET/ENT key)		
A1	1125.0	Alarm setpoint (°C; 2057°F)
CtL	Pid	Control mode
At	oFF	Auto tuning
P	20.0	Proportional band (°C; °F=36.0)
I	120	Integral time
d	30	Derivative time
Ct	1	Heat cycle time
FL	2	Sensor filter
bS	0.0	PV bias (offset)
LoC	0	Key lock
Setup parameters (access by setting LoC=-1)		
In	1	Input type (J thermocouple in °C; °F=31)
SPH	1100.0	High setpoint limit °C; °F=2012
SPL	0.0	Low setpoint limit °C; °F=32
Upr	oFF	Up ramp rate (degrees C or F / minute)
dnr	oFF	Down ramp rate (degrees C or F / minute)
AL 1	9	Alarm 1 type
AL 2	oFF	Alarm 2 type
HY 1	0.5	Alarm 1 hysteresis (°F=1)
HY 2	0.0	Alarm 2 hysteresis
SC	on	Super Control
dr	0	Direct/reverse action

Table 2. Pushbutton Keypad

Button	Function
SET/ENT	Pressing and holding the SET/ENT for three seconds advances the display to the Operation Parameters Menu. While in the Operation Parameters Menu, use SET/ENT to move from one parameter to the next, and to register changes you have made in setpoint and parameter values. Holding SET/ENT for three seconds exits either the Operation or Setup Parameters menu.
△	Use the Up Arrow button to increase the temperature setpoint display and to change parameter values in the Operation and Setup Parameter menus. Whenever you change the value of a setpoint or parameter, the decimal point flashes to remind you to register the changed value with SET/ENT.
▽	Use the Down Arrow button to decrease the temperature setpoint display and to change parameter values in the Operation and Setup Parameter menus. Whenever you change the value of a setpoint or parameter, the decimal point flashes to remind you to register the changed value with SET/ENT.

6.2 Setting the Temperature

To set the temperature to the desired setpoint, complete the following steps:

1. Press △ or ▽ until the desired setpoint is indicated on the bottom line of the display.
2. Press **SET/ENT** to register the new setpoint.

6.3 Setting the Overtemperature Protection (OTP) Temperature

The high limit alarm system with the temperature controller disables the heater output. To set the alarm on the temperature controller (typically 5°C above the desired main temperature setpoint), complete the following steps:

1. Press and hold **SET/ENT** for 3 seconds, until **A1** is displayed on the upper line.
2. Press △ or ▽ until the desired overtemperature limit setpoint shows on the bottom line of the display.
3. Press **SET/ENT** to register the new overtemperature alarm setpoint.
4. Press and hold **SET/ENT** for 3 seconds to return to the normal display.

6.4 Changing Between Celsius and Fahrenheit

The controller is factory-set to operate with degrees Celsius. To change the display modes and parameter settings to the Fahrenheit scale, you will need to change the Input Type parameter **In** and also the values of various scale-dependent parameters. If during this procedure the buttons are inactive for more than two minutes, the controller will return to the standard display.

To change from Celsius to Fahrenheit:

1. With the controller operating, access the Operating Parameters menu by pressing and holding **SET/ENT** for 3 seconds.
2. Press and release **SET/ENT** repeatedly until the upper display reads LoC.
3. Press ▽ until the displayed value of LoC is -1; then press **SET/ENT** to access the Setup Parameters menu (refer to Table 1 on page 5).
4. The first setup parameter displayed is Input Type (In). Press to change its value from 1 to 31. After making this adjustment (and all following parameter adjustments) be sure to press and release **SET/ENT** again to register the change.
5. Press and release **SET/ENT** to advance to the SPH parameter and change its value to 2012.
6. Press and release **SET/ENT** to advance to the SPL parameter and change its value to 32.
7. Press and release **SET/ENT** to advance to the HY1 parameter and change its value to 1.
8. Press and hold **SET/ENT** for 3 seconds to exit the Setup Parameters Menu.
9. Press and hold **SET/ENT** for 3 seconds to enter the Operating Parameters Menu and display the A1 parameter.

10. Use the △ button to set the A1 parameter to the desired overtemperature limit in °F.
11. Press and release **SET/ENT** to advance to the P parameter and change its value to 36.0.
12. Press and hold **SET/ENT** for 3 seconds to exit the Operating Parameters Menu.
13. The new temperature units are now effective. Follow the instructions in Section 6.2 to reset the temperature setpoint in °F.
14. Apply the °F label over the °C label on the control panel.

6.5 Setting the Ramp to Setpoint Rate

The Ramp Rate feature allows the chamber to be heated or cooled at any rate slower than the maximum capability of the unit. To fine tune ramp rates, you may need to test using loads with similar mass and thermal properties to loads you intend to use in furnace applications.

To set the ramp to setpoint time, complete the following steps. If during this procedure the buttons are inactive for more than two minutes, the controller will return to the standard display.

1. With the controller operating, press and hold **SET/ENT** for 3 seconds to enter the Operating Parameters menu.
2. Press and release **SET/ENT** until the LoC parameter is on the upper display.
3. Press the down arrow button to show '-1', and press **SET/ENT** once to enter the Setup Parameters menu.
4. Press and release **SET/ENT** until the Upr parameter is on the upper display.
5. Press the arrow buttons to select the new Up Ramp Rate value, in °C per minute or °F per minute, or 'oFF'. Press and release **SET/ENT** to register the value change.
6. Press and release **SET/ENT** until the dnr parameter is on the upper display.
7. Press the arrow buttons to select the new Down Ramp Rate value, in °C per minute or °F per minute, or 'oFF'. Press and release **SET/ENT** to register the value change.
8. Press and hold **SET/ENT** for three seconds to exit the Setup Parameters menu.
9. The new Ramp Rates are now effective.
10. Follow the instructions in Section 6.2 to reset the temperature setpoint.

Note: *The ramp rate begins when the SET/ENT button is pressed after the target setpoint is selected. The setpoint display on the controller will show the changing setpoint at the selected ramp rate.*

To view the target setpoint during the ramp rate, press and release an arrow button. The lower display will show the setpoint next to the selected target setpoint. Return to the ramping setpoint display by pressing and releasing the other arrow button.

6.6 Auto Tuning the Controller

Factory settings are provided for general purposes, but your process can be enhanced through the auto tune feature. For a given process temperature and product load, auto tuning maximizes the performance of the chamber by operating with the quickest response and minimal temperature overshoot.

To auto tune the controller.

1. Load the chamber with materials that have the same mass and thermal characteristics as a typical product load.
2. Operate the chamber to the process temperature.
3. Press and hold **SET/ENT** for 3 seconds to display the A1 parameter of the Operating Parameter menu.
4. Press and release **SET/ENT** to show the At parameter.
5. Press and release the arrow buttons to show on in the lower display.
6. Press **SET/ENT** once to enter the auto tune mode and exit the Operating Parameters menu.

The controller will cycle three times through a heating and cooling pattern, measuring the characteristics of the load and chamber temperature controls. During the auto tuning, At will alternately flash with the measured temperature (PV) to indicate that the auto tuning is in progress. The length of time for the auto tune varies with the load, chamber size and temperature selected.

The auto tune is completed when the regular display of the measured temperature is shown. The chamber should now operate to the process temperature with the given product load, with the quickest response and minimal temperature overshoot.

If the process temperature or load changes significantly, another auto tune session may be necessary to optimize the chamber performance.

7 Operation – UP150 Controller (P Models)

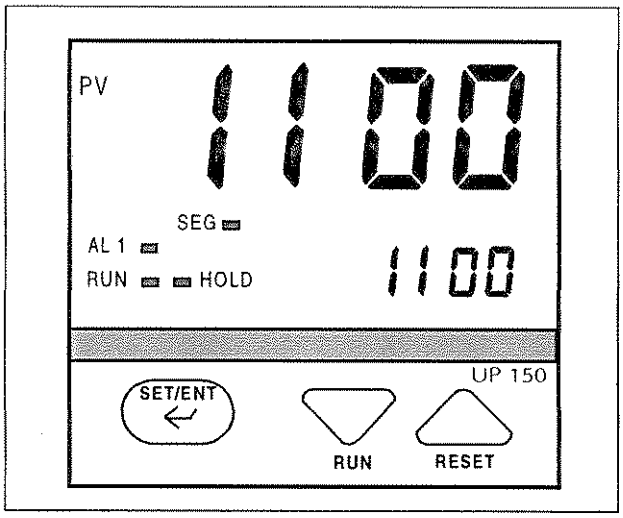


Figure 3. UP150 Control Panel

The furnace temperature controller is configured and tuned at the factory to function well for most applications. Occasionally, it may be advisable to configure the temperature controller differently to suit a particular working environment or process.

CAUTION! Before reconfiguring the controller, read this chapter carefully. Reconfiguring the controller can change the unit characteristics and design parameters, which can hamper performance and make the equipment dangerous to use.

For more detailed instructions, refer to the Yokogawa UP150 manual (2nd edition).

7.1 Normal Controller Operation

The Temperature Controller senses the chamber air temperature of the furnace (the PV, or process value) and supplies the heat necessary to achieve the desired setpoint. The controller includes an LED display and a pushbutton keypad. Refer to Table 1 and Table 2 for lists of displayed parameters and keypad functions.

The UP150 controller will accept a single program of up to 16 segments. This controller includes an automatic tuning feature and "Super" control to improve the performance. Refer to the UP150 manual for detailed information on the "Super" feature and on autotuning.

Table 3. UP150 Parameter Functions

Parameter Code	Factory Set Value	Description
Operating parameters (access by holding the SET/ENT key)		
HoLd	OFF	Program Hold
AdV	OFF	Segment Advance
CtL	Pid	Control mode
At	oFF	Auto tuning
P	34	Proportional band (°C; °F=93)
I	44	Integral time
d	11	Derivative time
Ct	1	Heat cycle time
FL	OFF	Sensor filter
bS	0.0	PV bias (offset)
LoC	1	Key lock
Setup parameters (access by setting LoC=-1)		
In	1	Input type (J thermocouple)
SC	ON	Super function

Table 4. Pushbutton Keypad

Button	Function
SET/ENT	Pressing and holding the SET/ENT for three seconds advances the display to the Operation Parameters Menu. While in the Operation Parameters Menu, use SET/ENT to move from one parameter to the next, and to register changes you have made in setpoint and parameter values. Holding SET/ENT for three seconds exits either the Operation or Setup Parameters menu.
△	Use the Up Arrow button to increase the temperature setpoint display and to change parameter values in the Operation and Setup Parameter menus. Whenever you change the value of a setpoint or parameter, the decimal point flashes to remind you to register the changed value with SET/ENT. While in operating mode, pressing this key stops (resets) program operation.
▽	Use the Down Arrow button to decrease the temperature setpoint display and to change parameter values in the Operation and Setup Parameter menus. Whenever you change the value of a setpoint or parameter, the decimal point flashes to remind you to register the changed value with SET/ENT. While in operating mode, pressing this key starts (runs) a program

7.2 Basic Operation

To operate the UP150 controller, you must first enter a program. Once the program is entered into the controller, press the "arrow down" key to run it. Once the program is running, it can be placed in "hold mode" to maintain the current setpoint. Also, a "program advance" can be executed to step the program rapidly through program segments.

7.3 Entering Program Parameters

To access programming mode:

1. Press the SET/ENT key for 3 seconds. Make sure the RUN light is not lit at this time.
2. "PrG" will be displayed in the upper display with "0" in the lower display. Press the "arrow down" key once until "-1" is displayed with a flashing decimal.
3. Press the SET/ENT key once. Now the programming mode is accessed.

Prior to entering the actual program steps, you will be prompted for event type settings (EV1). This refers to how a relay will function, either as a "time event" or a "process variable (alarm) event".

To enter a program in program mode:

1. With "EV1" in the upper display and "0" in the lower display, press the SET/ENT key.
2. Next, "AL1" appears in the upper display. A value of "9" in the lower display configures the alarm as a high temperature alarm which is the factory setting. (For more information see "PV Event (alarm) Function List" in the UP150 Instruction Manual).
3. Press the SET/ENT key to advance to the Alarm 1 value (A1). This is the temperature at which the alarm will trip. This is typically set for 10° higher than the highest setpoint in the program.
4. Use the arrow up/down keys to enter the Alarm 1 value. Notice that the decimal point will flash indicating a change has been made. You must press the SET/ENT key to register a change.
5. Press the SET/ENT key to advance past the EV2 and AL2 settings to the SSP (starting setpoint) value and enter the appropriate setting.
6. From this point, you will be prompted for SP1 (setpoint 1), tM1 (time 1), SP2 – tM2, SP3 – tM3... etc. until all the program parameters have been entered. Note that Time is entered in hours and minutes, for example, 1.45 equals 1 hour and 45 minutes.
7. The controller will accept up to 16 setpoints and times. If fewer than 16 are required, enter "oFF" as a time value. This tells the controller you are finished. ***Do not enter a setpoint into your program beyond the maximum operating temperature of your unit.***
8. Next, you will be prompted for a Junction Code (JC). This determines how the controller will function at the end of the program. Three Junction Code values are available: "0" will cause the controller to shut-off its outputs at the end of the program. This is called the "reset" mode. "1" will place the controller in "Hold" mode. "2" will cause the program to repeat continuously.
9. Next you will be prompted for a Wait Zone (WTZ). This is similar to "guaranteed soak". The factory setting is "oFF" which means "not used". A wait zone causes the controller to stop the program clock if, at the transition from a ramp segment to a soak segment, the actual chamber temperature (PV) is not close enough to the setpoint. Assume the controller is programmed to ramp from 25°C to 100°C in 1 minute. Since the unit does not have the capability to heat up this quickly, the controller will change the setpoint from 25° to 100° in 1 minute and wait at beginning of the 100° segment for the unit to catch up with the setpoint before continuing the program. The program will continue when the unit temperature (PV) falls within the specified Wait Zone. The minimum value of the Wait Zone is 1% of the controller's span for a given input type. In this example, the span is from –200° to 1000° (1200° x 1% = 12°). This means, in the above example, the controller will continue the program when the unit temperature reaches 88° (100° - 12° = 88°).
10. The program is now complete and ready to run. Exit the program parameter setting mode by pressing and holding the SET/ENT key for 3 seconds.

7.4 Running the Program

To run the program, press the Run or "arrow down" key until the RUN light illuminates.

7.5 Using the Hold Function

To hold a running program:

1. Press and hold the SET/ENT key for 3 seconds."HoLd" will appear in the upper display.
2. Press the "arrow up" key so that "on" with flashing decimal appears in the lower display.
3. Press the SET/ENT key to accept.
4. Press and hold the SET/ENT key again to return to the normal display.

To exit the hold mode:

Press and hold the SET/ENT key for 3 seconds. "HoLd" will appear in the upper display. Press the "arrow down" key so that "oFF" with flashing decimal appears in the lower display. Press the SET/ENT key to accept. Press and hold the SET/ENT key again to return to the normal display.

7.6 Using the Advance Function

While the program is running, press and hold the SET/ENT key for 3 seconds. "HoLd" will appear in the upper display. Press the SET/ENT key again and "AdV" will appear in the upper display. "oFF" will appear in the lower display. Press the "arrow up" key so that "on" with flashing decimal appears in the lower display. Press the SET/ENT key to accept. The controller will automatically return to the normal display and the increment the program segment by one.

8 Communication Option

The Communication Option enables digital communication between the UT150 controller and a PC. It is a factory-installed temperature controller and cable assembly using an RS-485 connection through a DB9 cable.

This option is supplied with the necessary cable and diagnostic software to set up and check the connections between the unit and the PC. Follow the steps below to make the cable connections and to check the data transfer. If you have purchased the 'SpecView Plus Communication Software' with the copy protection key, refer to the SpecView instructions in parallel with this setup outline.

8.1 Cable Installation

1. To install the 25-foot external cable, disconnect the electrical power from both the unit and PC.
2. Connect the cable end with a black housing to the 9-pin port on the rear of the Lindberg/Blue M unit.
3. Connect the other cable end with the RS-232/485 Converter to the COM 1 Port (or other COM port of your choice) on the rear of the PC.
4. If you have purchased the SpecView Plus Communication Software with the copy protection key, install this key on your parallel port. It may be necessary to locate the key between a cable and the parallel port.
5. Apply electrical power to the unit and the PC.

8.2 UT150 Communications Setup Parameters

Table 4 shows the default values for UT150 Communications Setup Parameters. To access these parameters:

1. Hold the **SET/ENT** button for three seconds to display the Operating Parameters. Press and release the **SET/ENT** button to display the 'LoC' parameter. Press the down arrow to show '-1' in the lower display and press **SET/ENT** to acknowledge and enter the Setup Parameters menu.
2. Press and release the **SET/ENT** button to access the six parameters specific to the communications option.

Table 5. UT150 Communications Parameters

Parameter Code	Factory Set Value	Description
Communications Setup Parameters		
PSL	0	Protocol selection
Adr	1	Controller address
bPs	9600	Baud rate
Pr 1	EVN	Parity (even)
StP	1	Stop bit
dLn	8	Data length

8.3 Software Installation

1. Load the SpecView software onto the PC hard drive, using the disks provided.
2. Run the software. (If you have purchased the SpecView Plus Communication Software with the copy protection key, skip step 3.)
3. If you do not have a copy protection key, a 'SpecView' window opens with the message, "Problem with Dongle: 'Dongle' (Copy Protection Key) not detected on parallel port." Click the OK button to acknowledge the message. Without the copy protection key, this diagnostic/sampler software has a 20-minute time limit on each run. If the message 'demo version of SpecView has stopped communicating - values are frozen' appears before the communication diagnostics are finished, close the software and reopen it for another 20-minute segment.
4. When the 'Configurations Found..' window opens, click on the "Test Comms for New Config." Button.
5. The 'Input Required..' window then opens. Enter a new Config. Name (up to 8 characters with no spaces) or accept the 'DEFAULT' name. Click OK.
6. The 'Ports and Protocol' window opens next. On the 'COM1:' line (if the COM1 port is the serial port used to connect to the controller) select the pulldown menu from Protocol column. Highlight "*Yokogawa 100" or "100 Series" for controller model UT150.
7. Select the pulldown menu from the Baud Rate column. Highlight "9600". Click on the 'Start Scan' button.
8. The SpecView program scans all 99 possible controller addresses and places a representative 'instrument view' of the temperature controller on the PC screen for each controller found connected to the PC. The factory-set addresses are 1, 2, 3, etc., depending on the number of controllers with communications in a single furnace. Additional units with communications will require the controller's address to be changed. See Section 8.8 on page 10 for detailed instructions on configuring multiple controllers.
9. After the instrument scan is completed, a SpecView window appears with the message, "All channels scanned. Press OK to continue, or cancel to rescan". Press OK if all of the connected controllers are properly displayed. If no controls are displayed, check the "troubleshooting" section at the end of this setup.
10. To begin communication between the PC and the controller, click on the 'Enter Runtime' button (an icon of a running figurine). This action will ask for a file name to save this display: use the given default or select another.
11. The "SpecView" window will be displayed, showing the current PV (process variable) and SP (set point). If the SpecView display of the controller shows X's, the communications connection or power to the control may have been interrupted.
12. On some controllers, the decimal point position has been changed from the Yokogawa factory default. This will make the SpecView display differ from the controller. If this is the case, follow the instructions in Section 8.7 on page 10.

8.4 Communications Test

When you have established a working communications link between the controller and PC, you should check the link by varying the target set point function:

1. Click on the arrows of the controller(s) shown in the SpecView window. This will open a keypad window where the set point can be changed.
2. Select a temperature set point a few degrees from the current temperature and press the 'send' button. Verify that the controller display shows the setpoint change.
3. Select the original temperature set point through the keypad on the controller and observe the change on the PC display.
4. The controller parameters may be viewed through SpecView by clicking on the 'PAR' button. A window opens that lists the controller parameters. Each parameter can be changed by selecting it and clicking on the 'Alter' button. Select the 'Close' button. Make no changes at this time.

This concludes the initial software diagnostics.

8.5 Ordering SpecView

If this software program is what you need as a tool to organize and operate the digital communication on Lindberg/Blue M equipment, contact Lindberg/Blue M sales, SpecView directly at sales@specview.com, or on their Internet site at www.specview.com, and request "SpecView Plus".

8.6 Troubleshooting

If your connection is not working properly, check the following conditions:

A. Verify complete and tight cable connections between the Lindberg/Blue M unit and the PC.

B. Verify that power has been supplied to the unit and temperature controller before starting the software program.

C. Verify the configuration values in the controller, listed in the Table 5 on page 9.

D. Verify the values in the 'Ports & Protocols' window (see step 6 in Section 8.3).

8.7 Decimal Point Adjustment

If the decimal point on the PC display of the controller does not match the controller display, you can make an adjustment to correct this:

1. From the Configuration Mode (available through the 'file' drop down while in the Runtime Mode), select the 'Variables List' icon, represented by a page with lines on it.
2. Select the controller model number and select 'Properties' button. The 'Add/Rename Instrument' box appears.
3. In the Address window, highlight the middle digit (usually a 1), and change to '0' (zero).
4. Click the 'Rename Only' button. Close the 'Variables' box (click on 'X' in corner of smaller box).
5. Select the 'Enter Runtime' icon to see the results of the change.

8.8 Addresses for Multiple Controllers

When more than one controller has the same communication address, alternative addresses need to be set up in the individual controllers. Addresses 1 through 99 can be selected on the same communication link to each PC COM port.

1. Determine a unique address for each temperature controller equipped with the communications option.
2. On the UT150 controller, access the Operating Parameters menu by pressing and holding **SET/ENT** for 3 seconds.
3. Press and release **SET/ENT** repeatedly until the upper display reads LoC.
4. Press ▽ until the displayed value of LoC is -1; then press **SET/ENT** to access the Setup Parameters menu .
5. Press and release the **SET/ENT** button to access the six parameters specific to the communications option. Compare the displayed values to those in Table 5 on page 9. Make adjustments as needed.
6. Press and hold **SET/ENT** for 3 seconds to exit the Setup Parameters Menu.

9 Maintenance

CAUTION! Maintenance should only be performed by trained personnel.

WARNING! Disconnect furnace from main power before attempting any maintenance to furnace or its controls.

WARNING! Before maintaining this equipment, read the applicable MSDS (Material Safety Data Sheets) at the back of this manual.

WARNING! When installing, maintaining, or removing the refractory insulation, the following precautions will minimize airborne dust and ceramic fiber:

- Keep personnel not involved in maintenance out of the area.
- Use a good vacuum to clean area and equipment. Do **not** use compressed air.
- Use NIOSH high efficiently respirator (3M #8710 or equivalent).
- Wear long sleeve clothing, gloves, hat, and eye protection to minimize skin and eye contact. Do not wear contact lenses.
- Thoroughly wash self after work is complete.
- Launder work clothing separate from other clothes and thoroughly clean laundering equipment after use. If clothing contains a large amount of dust and/or ceramic fiber, dispose of rather than clean.
- Promptly place used ceramic fiber parts and dust in plastic bags and dispose of properly.

For replacement parts specifications, refer to Table 8 on page 16. For wiring schematics, refer to Figure 7 on page 17.

9.1 Thermocouple Replacement

WARNING! Disconnect furnace from main power before attempting any maintenance to furnace or its controls.

Note: *For optimal performance, the thermocouple should be replaced once a year. In some situations a more frequent replacement schedule is recommended.* **SnSr Fail** *on the controller display indicates a broken thermocouple.*

Refer to Figure 4 as you perform the following procedure:

1. Disconnect the main power.
2. Open the latch.
3. Remove the eight corner screws from the back furnace panel. Locate the thermocouple (item #1 in Figure 4).

Note: *There are wires connecting the back panel to the furnace. Be careful to place the back panel next to the furnace without disturbing these wires.*

4. Note polarity and thermocouple wire location. Remove the terminal screws and remove the thermocouple lead wires. Refer to Figure 1 on page 3.
5. Remove the thermocouple mounting screws.
6. Pull the thermocouple straight out of the heating unit.

Note: *The thermocouple could be damaged if it is not pulled out carefully.*

7. Slide the new thermocouple straight into the heating unit and replace the mounting screws.
8. Connect the thermocouple lead wire to the terminal screws on the thermocouple. Be careful not to bend the thermocouple wire. Red is always negative. (If the extension leads are black and white, white is negative). Refer to Figure 1 on page 3 for additional wiring information.
9. Replace the furnace rear panel.

Note: *Inspect all wire connections before reassembling the back panel.*

WARNING! Failure to check all wire connections may cause damage to the unit.

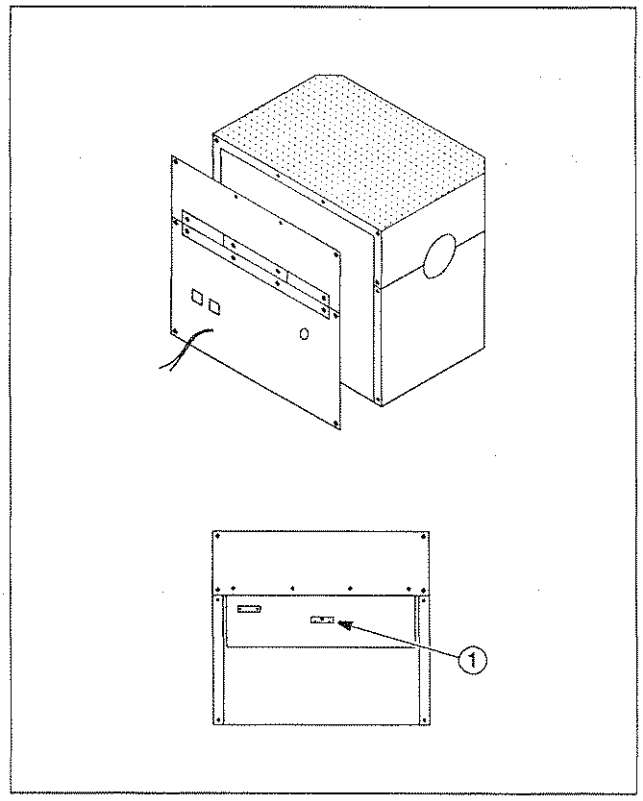


Figure 4. Thermocouple Replacement

9.2 Overtemperature Alarm Protection (OTP)

The Load Overtemperature Alarm System indicates if the temperature inside the chamber exceeds the load alarm setpoint. To insure proper operation, this alarm system must be checked at least once a month.

To test the load overtemperature alarm, complete the following steps:

1. Operate the furnace without a product load at your normal operating temperature.
2. Readjust main temperature control to a temperature above the load alarm setting (refer to Section 6.2).
3. Observe the unit closely until the load alarm trips, indicated on the controller beside the A1 label.
4. Reset the main temperature control to normal operating temperature. Once the unit cools below the alarm setpoint, the A1 indicator will go off.

9.3 Solid-State Relay Replacement

⚠ **WARNING!** Disconnect furnace from main power before attempting any maintenance to furnace or its controls.

Refer to the Troubleshooting section for relay testing. If the solid-state relay is inoperable, complete the following steps to replace the relay (refer to Figure 5):

1. Remove the screws located on the left and right sides of the control panel (#1 in Figure 5).
2. Slide the panel assembly away from the unit to expose components.
3. Locate the solid-state relay on the component tray (#2 in Figure 5).
4. Note the terminal connections of the relay wires and label them for reattachment. Remove the wires from the relay terminals.
5. Remove the mounting screws from the relay.
6. Replace the relay and reconnect the wires.
7. Reassemble the unit.

9.4 Power Relay Replacement

⚠ **WARNING!** Disconnect furnace from main power before attempting any maintenance to furnace or its controls.

Refer to the Troubleshooting section for power relay testing. If the power relay is inoperable, complete the following steps to replace the relay (refer to Figure 5):

1. Remove the screws located on the left and right sides of the control panel (item #1 in Figure 5).
2. Slide the panel assembly away from the unit to expose components.
3. Locate the power relay on the component tray (item #3 in Figure 5).
4. Note the terminal connections of the relay wires and label them for reattachment. Remove the wires from the terminals of the relay.
5. Remove the mounting screws from the relay.
6. Replace the relay and reconnect the wires.
7. Reassemble the unit.

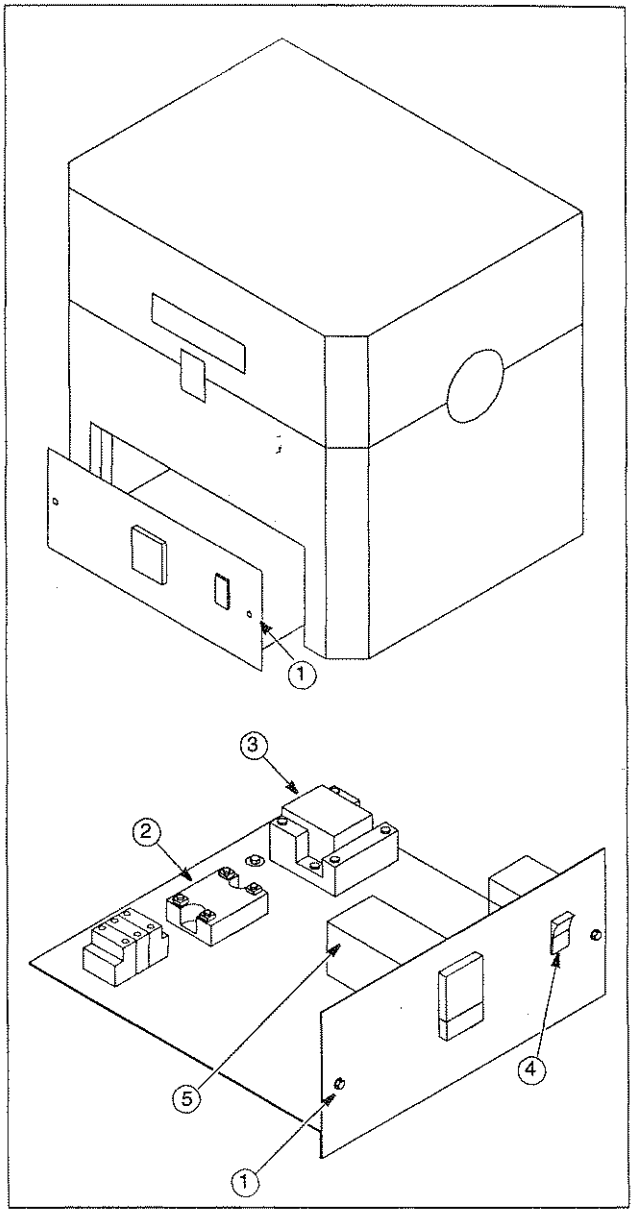


Figure 5. Solid State Relay Replacement

9.5 Temperature Controller Replacement

WARNING! Disconnect furnace from main power before attempting any maintenance to furnace or its controls.

To replace the temperature controller, complete the following steps (refer to Figure 5 on page 12):

1. Disconnect main power and switch the circuit breaker (#4 in Figure 5 on page 12) to the OFF position.
2. Remove the two sheet metal screws located on each side of the furnace near the lower front (#1 in Figure 5 on page 12). Pull the control panel forward to access the controller (#5 in Figure 5 on page 12).
3. Note the terminal connections of the wires and label them for reattachment. Remove power input and output wires from the back of the controller. Observe polarity for the thermocouple lead wire. Red is always negative. Refer to Figure 1 on page 3 for additional wiring information.
4. Carefully pry the top and bottom of the square collar away from the sleeve and slide the collar off the back of the sleeve.
5. Pull the controller out through the front of the control panel.
6. Install the replacement instrument by reversing the above procedure.

9.6 Circuit Breaker Replacement

The control circuitry is protected by two circuit breakers located at the rear of the furnace (lower left side). When a circuit breaker opens, a white indicator tab is visible. Check the circuit for faults and press the circuit breaker switch to reset. Replace any circuit breaker which does not reset.

9.7 Heating Unit Replacement

WARNING! Disconnect furnace from main power before attempting any maintenance to furnace or its controls.

CAUTION! This product contains ceramic fiber or other refractories which can result in the following:

- May be irritating to skin, eyes, and respiratory tract.
- May be harmful if inhaled.
- May contain or form cristobalite (crystalline silica) with use at high temperature (above 871°C) which can cause severe respiratory disease.
- Possible cancer hazard based on tests with laboratory animals. Animal studies to date are inconclusive. No human exposure studies with this product have been reported.

To replace the heating unit, complete the following steps (refer to Figure 6):

1. Disconnect the main power and open the latch.
2. Remove the eight corner screws connecting the back panel to the furnace (item #1 in Figure 6). Place the panel near the furnace.

Note: *There are wires connecting the back panel to the furnace. Be careful to place the back panel next to the furnace without disturbing these wires.*

3. Locate the top heating unit terminal block (item #2 in Figure 6). Label the twisted, solid silver wires which are attached to the terminal block.
4. Remove the nuts and washers holding the twisted wires to the terminal block and remove the wires. Remove the ring lugs from the twisted wires. Save the nuts, washers, and ring lugs for reassembly.
5. Lift the top heating unit assembly up and away from the furnace base. Place the assembly on a flat surface with the heating element facing up.

Note: *To replace the top heating unit, proceed to step 8.*

6. Mark and remove the wires from the bottom heating unit terminal block (item #3 in Figure 6).
7. Remove the thermocouple mounting screws and slide the thermocouple straight out (refer to Section 9.1 on page 11).
8. Remove the six screws holding the two element hold-down brackets (item #4 in Figure 6). Remove the hold-down brackets.
9. Lift the heating unit (item #5 in Figure 6) up and out.

CAUTION! Do not damage the wires extending from the heating unit.

10. Insert the new heating element. Guide the twisted, solid silver terminal wires through the slot in the side of the inner furnace. The bottom of the heating unit will lay flat against the leaf spring.
11. Reassemble the hold-down brackets. Replace the six screws.
12. Connect the heating element terminals to the terminal block
13. Reassemble the furnace.

Note: *Inspect all wire connections before reassembling the back panel.*

WARNING! Failure to check all wire connections may cause damage to the heating unit.

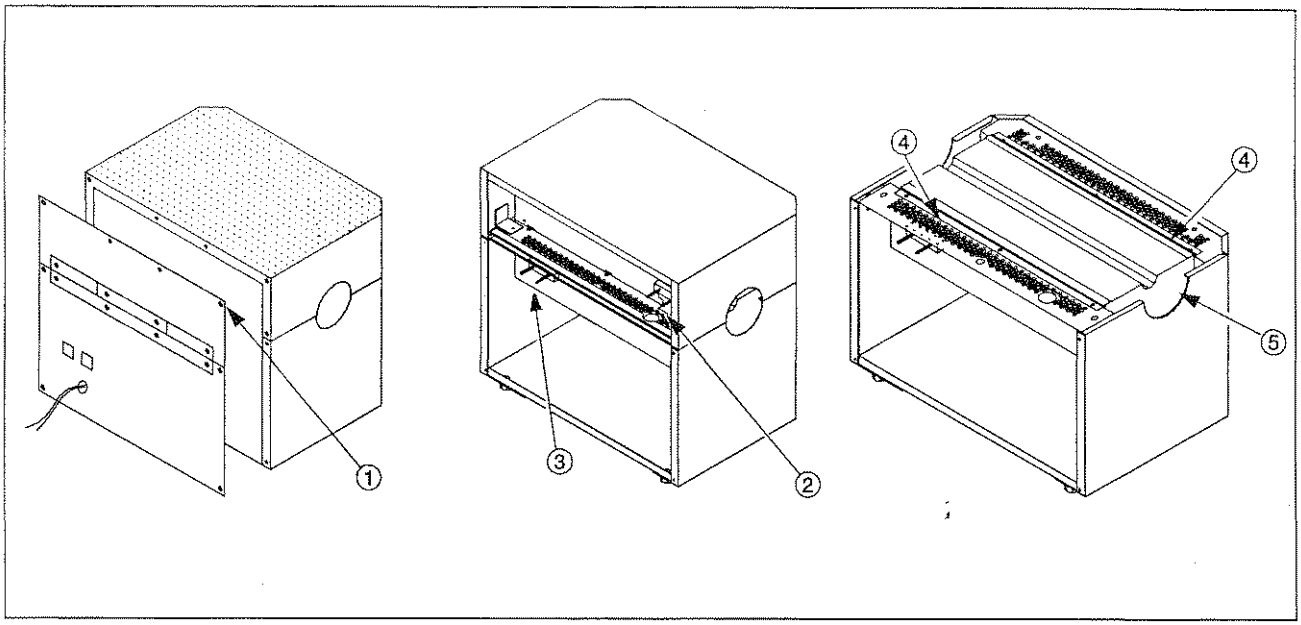


Figure 6. Heating Unit Replacement

10 Troubleshooting

WARNING! Troubleshooting procedures involve working with high voltages which can cause injury or death. Troubleshooting should only be performed by trained personnel.

This section is a guide to troubleshooting furnace problems.

Table 6. UT150 Controller Troubleshooting

Problem	Probable Causes	Solution
Controller reads P.Er.	Abnormal parameter value	Check controller parameter settings and reset to proper values.
Controller reads b. o	Input burnout	Check the sensor wiring, replace sensor if necessary.
Controller reads ooo.	PV exceeds effective range	Check the input type and range settings and correct them.
Controller reads UUU.	PV is below effective range	Check the input type and range settings and correct them.
Controller reads Err	Probable hardware failure	Call Service for controller repair.
The controller displays do not illuminate.	The furnace is not connected to the power supply.	Check furnace connection to power source.
	Main switch is defective.	Replace power switch or controller.
	Fuse(s) blown.	Replace fuse(s) and verify power connections.

Table 7. Furnace Troubleshooting

Problem	Solution
Furnace temperature runs away.	Check solid-state relay: 1. Remove the controller from the furnace. 2. Connect power to the furnace. If the heating unit heats, replace the solid-state relay.
Furnace does not heat	Front panel red indicator light is on: 1. If the controller output light is off, check that the setpoint temperature is higher than the furnace display temperature. 2. If the output light is on, disconnect power from the furnace and check the heating elements for continuity.
	Front panel red indicator light is off: 1. Check that the power switch is on. 2. Check that the indicator lights on the controller display are on. 3. Check that the furnace door is fully closed. 4. Check that the door interrupt switch at the middle front of the furnace is engaged when the furnace door is fully closed. 5. Check the electrical wires for visible damage. Replace the electrical wires if necessary. 6. Check that the Alarm Setpoint on the controller is set higher than the operating temperature (refer to Section 6.3 on page 5).

11 Replacement Parts and Wiring Diagram

All quantities are one each unless noted.

Table 8. Replacement Parts

Furnace Model		TF55030A	TF55030C
Heating Unit		(2) 301571H01	(2) 301571H01
Thermocouple Assembly		7299-1186-00B	7299-1186-00B
Thermocouple Head		7214-2051-00A	7214-2051-00A
Single Thermocouple		7299-1122-0BS	7299-1122-0BS
Temperature Controller		303115H03	303115H03
UP150 Control (P models)		303115H07	303115H07
Solid-State Relay		102460	102460
Cord Assembly		48951H09	48951H03
Rocker Switch		118007	118006
Circuit Breaker 8A		(2) 86703H01	(2) 86703H01
Light, Neon Red		33002-001	33002-001
Power Relay		16869	16934
Terminal Block			
	Heater	7214-2112-00A	7214-2112-00A
	Electrical	(3) 33410-003 (1) 33410-004	(3) 33410-003 (1) 33410-004

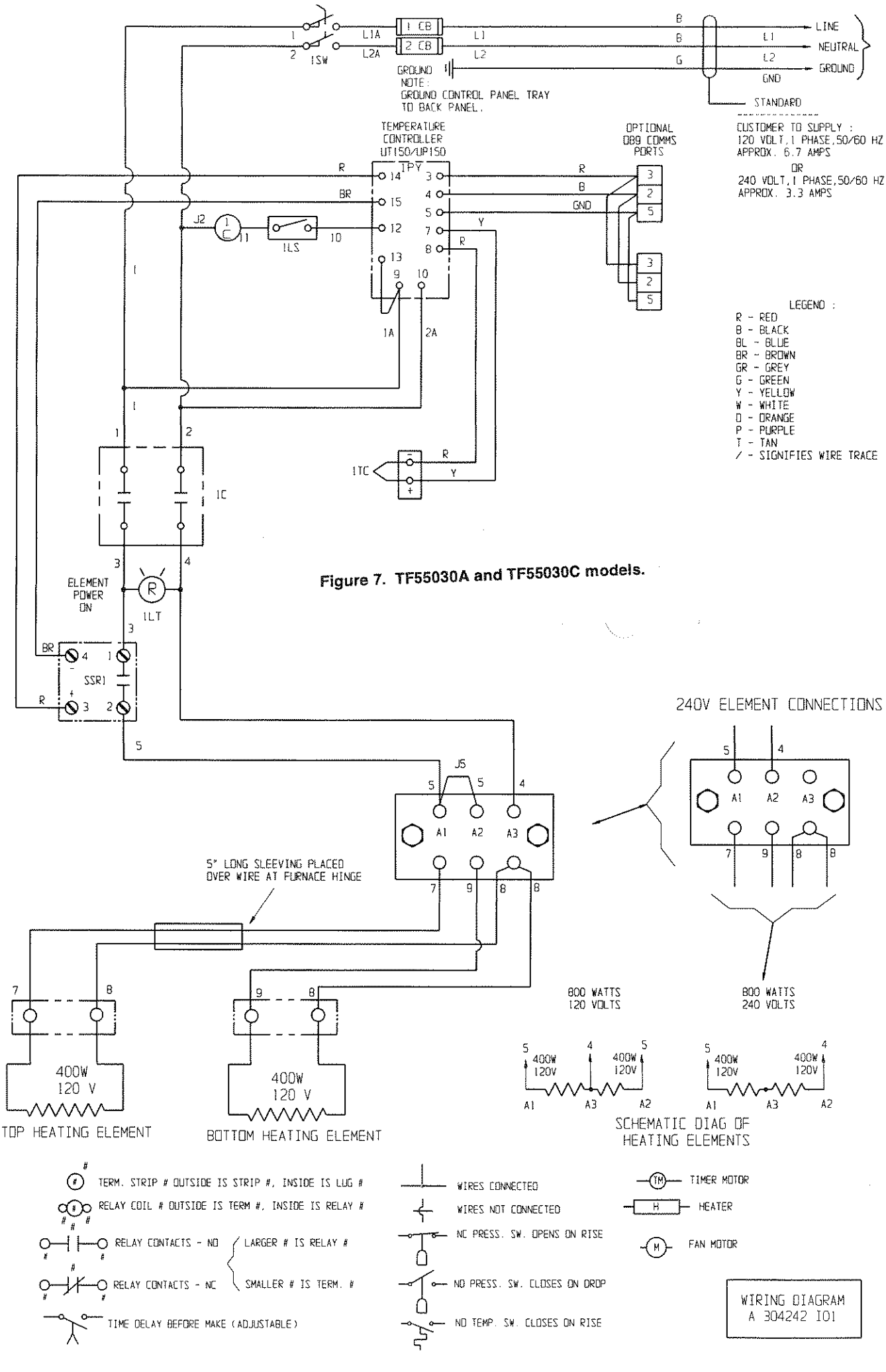


Figure 7. TF55030A and TF55030C models.

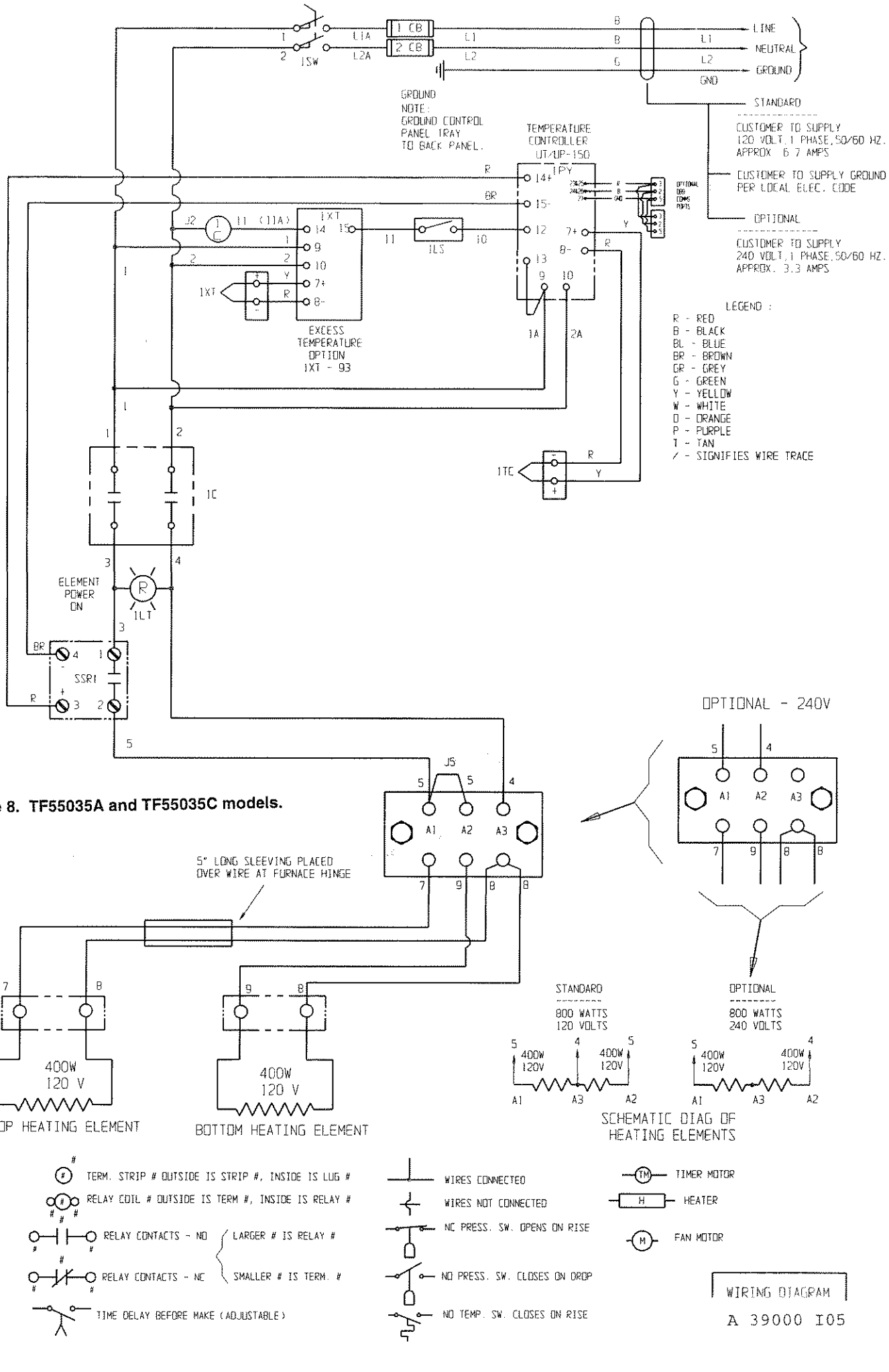


Figure 8. TF55035A and TF55035C models.

12 Warranty

12.1 Domestic Warranty (United States and Canada)

Lindberg/Blue M warrants this product to the owner for a period of twelve (12) months from date of shipment by Lindberg/Blue M. Under this warranty Lindberg/Blue M through its authorized Dealer or service organizations, will repair or at its option replace any part found to contain a manufacturing defect in material or workmanship, without charge to the owner, for a period of ninety (90) days, the labor, and a period of one (1) year, the parts, necessary to remedy any such defect. All components used in the manufacture of this product are covered by this warranty excluding heating elements and thermocouples.

This warranty is limited to products purchased and installed in the United States and Canada. It does not apply to damage caused from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided. This warranty shall not apply to equipment or parts which have been subjected to negligence, accident, or damage by circumstances beyond Lindberg/Blue M's control or improper operation, application, maintenance, or storage.

To obtain prompt warranty service, contact the nearest Lindberg/Blue M authorized service center or Dealer. A listing of these companies will be provided upon request. Lindberg/Blue M's own shipping records showing date of shipment shall be conclusive in establishing the warranty period.

This warranty is in lieu of any other warranties, expressed or implied, including merchantability or fitness for a particular purpose. The owner agrees that Lindberg/Blue M's sole liability with respect to defective parts shall be as set forth in this warranty, and any claims for incidental or consequential damages are expressly excluded.

12.2 International Warranty (excluding Canada) 12 Months Parts Warranty

Lindberg/Blue M warrants this product to the original owner for a period of twelve (12) months from the date of shipment from the Lindberg/Blue M factory. Thermocouples and heating elements are excluded from this warranty. If any part is found to contain a manufacturing defect in material or workmanship Lindberg/Blue M will, at its option, repair or replace the part. Lindberg/Blue M assumes no responsibility for any labor expenses for service, removal, or reinstallation required to repair or replace the part, or for incidental repairs, and such costs are the responsibility of the Owner and his Dealer.

The warranty does not apply to damage caused by accidents, misuse, fire, flood, Acts of God or any other events beyond Lindberg/Blue M's control or to damage caused from failure to properly install, operate, or maintain the product in accordance with the printed instructions provided by Lindberg/Blue M. To obtain prompt warranty service, simply contact the Dealer from whom you purchased the product or the nearest Dealer handling Lindberg/Blue M products. Lindberg/Blue M's own shipping records showing date of shipment shall be conclusive in establishing the warranty period.

This warranty is in lieu of any other warranties, expressed or implied, including merchantability or fitness for a particular purpose. The owner agrees that its sole remedy and Lindberg/Blue M's sole liability with respect to defective parts or any other claim shall be as set forth in this warranty, and any claims for incidental, consequential or other damages are expressly excluded.

Important

For your future reference and when contacting the factory, please have the following information readily available:

Model Number: _____

Serial Number: _____

The above information can be found on the dataplate attached to the equipment. If available, please provide the date purchased, the source of purchase (Lindberg/Blue M or specific agent/rep organization), and purchase order number.

IF YOU NEED ASSISTANCE:

LINDBERG/BLUE M SALES DIVISION

Phone:	828/658-2711 800/252-7100
FAX:	828/645-3368

LABORATORY PARTS and SERVICE

Phone:	828/658-2891 800/438-4851
FAX:	828/658-2576

TECHNICAL SUPPORT

Phone:	800/438-4851

LINDBERG/BLUE

275 Aiken Road
Asheville, NC 28804
U.S.A.

13 Moldatherm® Insulation Material Safety Data Sheet

Lindberg/Blue M, A Unit of General Signal Moldatherm® Insulation Material Safety Data Sheet

Manufacturer: Lindberg/Blue M, A Unit of General Signal

Address: 275 Aiken Road
Asheville NC 28804

Telephone: (828) 658-2711

Revision Date November 6, 1992 Replaces MSDS dated: August 14, 1987

Completed by: Lindberg/Blue M Unit Environmental, Safety, and Health Department

I. PRODUCT IDENTIFICATION			
Trade Name:	Moldatherm II® Insulation (Also known as Moldatherm® Insulation) Synonyms: Refractory Ceramic Fibers (RCFs); Ceramic Fiber; Man-Made Vitreous Fibers (MMVF); Mullite; High Alumina Ceramic Fiber		
Chemical Family:	Vitreous Aluminosilicate Fibers		
Molecular Formula:	$Al_2O_3 \cdot SiO_2$		
II. PRODUCT COMPOSITION			
Component	**CAS No.**	**Percent (%)**	**Exposure Limits (8 hr. TWA)**
Aluminosilicate	NA – Mixture	79 to 99	1.0 fibers/cc**
Silica, amorphous	7631-86-9	1 to 21	10 mg/m^3 ACGIH/TLV 6 mg/m^3 OSHA/PEL

Remaining components not determined hazardous and/or other components present at less than 1.0% (0.1% for carcinogens).

** NOTE: No OSHA or ACGIH exposure limits have been established for this material. The user is advised to follow the Lindberg/Blue M Recommended Exposure Limit (REL). (See Section VII. Personal Protective Equipment).

Moldatherm® insulation will partially convert to cristobalite (CAS No. 14464-46-1), a form of crystalline silica, at operating temperatures at or above 1800°F. The rate and percentage of conversion to cristobalite is time and temperature dependent. (See Section X. Special Precautions/Supplemental Information.) Cristobalite has an OSHA permissible exposure limit (PEL) and ACGIH threshold limit value (TLV) of 0.05 mg/m^3 (respirable dust).

NA = Not Applicable

III. PHYSICAL DATA					
Boiling Point:	NA	**Vapor Pressure:**	NA	**Vapor Density:**	NA
Evaporation Rate:	NA	**% Volatile:**	NA	**Water Solubility (%):**	Nil
Melting Point:	Greater than 3000°F	**Odor/Physical Description:**		White, odorless solid	

IV. FIRE AND EXPLOSION DATA			
Flash Point:	NA	**Flammable Limits (LEL & UEL):**	NA
Unusual Fire or Explosion Hazards:	None	**Extinguishing Media:**	NA
Fire Fighting Procedures:	Use extinguishing media suitable for surrounding fire.		

V. HEALTH HAZARDS	
A. Health:	WARNING! MAY BE IRRITATING TO SKIN, EYES, AND RESPIRATORY TRACT. MAY BE HARMFUL IF INHALED. POSSIBLE CANCER HAZARD BY INHALATION. Contains refractory ceramic fibers which MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure. (See Section X. for information concerning additional hazards after high temperature operation.)
B. Ingestion:	Ingestion is unlikely. If ingested in sufficient quantity, may cause gastrointestinal disturbances. Symptoms may include irritation, nausea, vomiting, abdominal pain and diarrhea.
C. Skin:	Slightly to moderate irritating. May cause irritation, inflammation, and rash.
D. Eye:	Slightly to moderate irritating. Abrasive action may cause damage to the outer surface of the eye.
E. Inhalation:	May irritate respiratory tract. Pre-existing medical conditions, especially chronic bronchial or lung disease may be aggravated by exposure.
F. Toxicity:	Existing toxicology and epidemiology data are preliminary and the results presented below have not been validated by scientific review.
G. Epidemiology:	There are no known published reports of negative health affects of workers exposed to refractory ceramic fibers (RCFs). Studies of RCF production workers continues. Preliminary evidence, reportedly obtained from employees in RCF manufacturing facilities, indicates the following: 1. There is no evidence on x-rays of any fibrotic lung disease of RCF manufacturing employees. 2. There is no evidence of any lung disease among those employees exposed to RCF that never smoked. 3. A statistical trend of slightly decreased pulmonary function was observed in the exposed population of workers based on the duration of RCF exposure. The statistic showing decreased pulmonary function was within the normal range and/or was insignificant.

NA = Not Applicable

	Pleural plaques (thickening along the chest wall) have been observed in a small number of employees who had a long duration of employment. There are several occupational and non-occupational causes for pleural plaque. Plaques are not "pre-cancer" nor are they associated with any measurable effect on lung function.
H. Toxicology:	Several health effect studies of inhalation exposure of rats and hamsters are now reaching completion. In a lifetime nose-only inhalation study, rats exposed to a very high dose of 30 mg/m^3 (200 fibers/cc) developed progressive lung damage (interstitial fibrosis) and cancers of the lung and of the pleura (lining of the chest wall and lung). In contrast, hamsters similarly exposed developed interstitial fibrosis and pleural cancer, but no lung cancer. Cancer of the pleura is called mesothelioma. A multiple dose study (3, 9, 16 mg/m^3 or 25, 75, 150 fibers/cc, respectively) is currently ongoing in rats. After 24 months of exposure, only reversible cellular changes have been seen in the low dose group. At 9 mg/m^3 (75 fibers/cc), areas of lung fibrosis are barely discernible and at 16 mg/m^3 (150 fibers/cc) both lung and pleural fibrosis are present. At this time, no lung or pleural cancer has been seen in the multiple dose study. This information will be updated once the study is completed. In 1987, the International Agency for Research on Cancer (IARC) reviewed the carcinogenicity data on man-made vitreous fibers (including ceramic fiber, glasswool, rockwool, and slagwool). IARC classified ceramic fiber, fibrous glasswool and mineral wool (rockwool and slagwool) as possible human carcinogens (Group 2B).
VI. EMERGENCY AND FIRST AID PROCEDURES	
Ingestion:	Drink extra water. Allow for natural gastrointestinal elimination. Get medical attention if gastrointestinal symptoms develop (see Section V.).
Skin Contact:	Remove contaminated clothing. Wash affected skin thoroughly with soap and water. Do not rub or scratch exposed skin. A skin cream or lotion used after washing may be helpful. Seek medical attention if irritation persists.
Eye Contact:	Immediately rinse eyes with water. Remove any contact lenses, and continue flushing eyes with running water for at least 15 minutes. Do not rub eyes. Hold eyelids apart to ensure rinsing of the entire surface of eyes and lids with water. Get immediate medical attention.
Inhalation:	Remove exposed person to fresh air. Seek medical attention if shortness of breath, cough, wheezing, or chest pain develop. If breathing is labored, administer oxygen until medical assistance can be rendered.
VII. PERSONAL PROTECTIVE EQUIPMENT	
Eyes:	Wear safety glasses or chemical goggles. Contact lenses should not be worn unless chemical goggles are also used and care is taken to not touch the eyes with contaminated body parts or materials.
Skin:	Wear gloves, hats and full body covering to prevent skin irritation as necessary (see Section X.).

NA = Not Applicable

Respiratory Protection:	Use of properly designed and operating engineering controls is recommended and preferred over respiratory protection for controlling airborne dust and fiber concentrations. If exposures exceed our Recommended Exposure Limit (REL) of 1.0 fibers/cc of air (8 hour TWA) respiratory protection as outlined below must be used. Also, use respiratory protection if throat irritation is experienced. When airborne concentrations are unknown or exceed 0.5 f/cc, use of a half face respirator described below is recommended. Respiratory protection is necessary if the material has been exposed to temperatures at or above 1800°F. (See Section X.). Use only NIOSH/MSHA approved respirators.

Concentration (8 hour TWA)	**Minimum Acceptable Respirator Type**
0 to 0.5 f/cc	Optional disposable dust respirator
0.5 f/cc to 5 f/cc or up to 10 times the OSHA PEL for cristobalite	Half face, air-purifying respirator equipped with high-efficiency particulate air (HEPA) filter cartridges
5 to 25 f/cc or up to 50 times the OSHA PEL for cristobalite ($2.5\ mg/m^3$)	Full face, air-purifying respirator with high-efficiency particulate air (HEPA) filter cartridges or powered air-purifying respirator (PAPR) equipped with HEPA filter cartridges
Greater than 25 f/cc or 50 times the OSHA PEL for cristobalite ($2.5\ mg/m^3$)	Full face, positive pressure supplied air respirator
As minimum protection, use half-mask air-purifying respirators equipped with HEPA filter cartridges if airborne fiber levels or cristobalite concentrations are not known.	

PLEASE NOTE:

Employees must be given instruction, fit testing, medical evaluation, and training per 29 CFR 1910.134 and your company's written respirator program if respiratory protection is used. Appropriate respirator selection must be a part of the respirator program. The above respirator recommendations are general guidelines only and may not be appropriate for certain applications. Please consult with your safety or industrial hygiene staff or consultants.

VIII. REACTIVITY DATA

Stability/Incompatibility:	Stable under normal conditions of use. Soluble in hydrofluoric acid, phosphoric acid, and concentrated alkali.
Hazardous Reactions/Decomposition Products:	NONE

IX. ENVIRONMENTAL AND REGULATORY INFORMATION

Spill or Leak Procedure:	Use vacuums equipped with HEPA filters to clean up spilled material. Wet sweeping is also acceptable.

NA = Not Applicable

Waste Disposal:	This waste is not specifically listed as a hazardous waste under Federal regulations. However, it could be characteristically hazardous if it is considered toxic, corrosive, ignitable, or reactive according to Federal definitions (40 CFR 261). Additionally, it could be designated as hazardous or a special waste according to state regulations. This substance could also become a hazardous waste if it is mixed with or otherwise comes in contact with hazardous waste. Chemical additions, processing, or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate, or otherwise inappropriate. The transportation, storage, treatment, and disposal of this waste material must be conducted in compliance with all applicable Federal, state, and local environmental regulations.
SARA Title III Information:	This material is designated a "delayed hazard" per the Superfund Amendments and Reauthorization Act (SARA) Section 311/312 (40 CFR 370). This product does not contain any toxic chemicals subject to the reporting requirements of SARA Section 313 (40 CFR 372).
	This product contains ceramic fibers which are on the State of California "Proposition 65" list (Safe Drinking Water and Toxic Enforcement Act of 1986).
	The Canadian Workplace Hazardous Materials Information System (WHMIS) category of "Other Toxic Effects" applies to this product.
	This product is not a DOT listed hazardous material. Use product name for bill of lading description.
	Some states have "special waste" regulations or other regulations which may apply to this product. Consult with your state environmental regulatory authorities.
	X. SPECIAL PRECAUTIONS/SUPPLEMENTAL INFORMATION
Handling/Storage:	Moldatherm® insulation should be handled with caution. Follow the personal protective equipment recommendations detailed in Section VII. Special precaution should be taken to avoid unnecessary cutting and tearing of the material to minimize generation of airborne dust.
Clothing:	Full body clothing is recommended to reduce the possibility of skin irritation. If possible, do not take unwashed work clothes home. Work clothes should be washed separately from other clothing. Rinse the washing machine thoroughly after laundering the work clothes. Inform your launderer of this cleaning procedure.

NA = Not Applicable

Cristobalite:	Product which has been in service at elevated temperatures (at or above 1800°F) over time may undergo partial conversion to cristobalite, a form of crystalline silica. This reaction occurs at the furnace lining hot face. As cristobalite is formed, Moldatherm® insulation becomes more friable; special caution must be taken to minimize generation of airborne dust. The amount of cristobalite formed will vary based on the operating temperature and length of service. (The IARC classification for crystalline silica is a group 2A carcinogen (probable human carcinogen). Cristobalite (crystalline silica) is also listed by NTP as a carcinogen). WARNING! DUST CAN CAUSE SEVERE RESPIRATORY DISEASE. DUST MAY BE IRRITATING TO SKIN, EYES, AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD BY INHALATION. Cristobalite (crystalline silica) MAY CAUSE CANCER. The OSHA permissible exposure limit (PEL) and the ACGIH threshold limit value (TLV) for cristobalite is 0.05 mg/m^3 (respirable dust). Use NIOSH/MSHA approved respirators when airborne exposure limits may be exceeded. (See Section VII. table for respirator selection.)
Removal or Tearout of Moldatherm® Insulation:	Insulation surfaces should be lightly sprayed with water before removal to suppress airborne dust. Spray additional water as water evaporates during removal. A surfactant may aid the wetting process. After removal of the Moldatherm® insulation is complete, dust suppressing cleaning methods, such as wet sweeping or vacuuming should be used to clean the work area. If dry vacuuming is used, the vacuum must be equipped with a HEPA filter. Air blowing or dry sweeping should not be used. Dust suppressing components can be used to clean up light dust. Do not reuse product packaging because of possible product residue.

NOTICE: The information presented here is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However, no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. No responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

NA = Not Applicable