

Thermo Fisher Scientific Lindberg/Blue M LGO 1200°C Box Furnace

Models: BF51731 and BF51732 (C/BC)

Installation and Operational Manual

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Safety Notes

Explanation of Symbols



This symbol when used alone indicates important operating instructions which reduce the risk of injury or poor performance of the unit.



DANGER : Indicates a hazardous situation which, if not avoided, will result in death or serious injuries.



WARNING : Indicates a hazardous situation which, if not avoided, could result in death or serious injuries.



CAUTION : Indicates a situation which, if not avoided, could result in damage to equipment or property.



Before installing, using or maintaining this product, please be sure to read the manual and product warning labels carefully. Failure to follow these instructions may cause the product to malfunction, which could result in injury or damage



This symbol indicates possible pinch points which may cause personal injury.



This symbol indicates surfaces which may become hot during use and may cause a burn if touched with unprotected body parts.



WARNING : This symbol indicates situations where dangerous voltages exist and potential for electrical shock is present.



This symbol indicates a need to use gloves during the indicated procedures. If performing decontamination procedures, use chemically resistant gloves.

Use gloves during the daily usage.



WARNING : This symbol indicates a situation which fire hazards exists in the Product.



WARNING : Unauthorized repair of your Furnace will invalidate your warranty. Contact Technical Service at 1-800-438-4851 for additional information.



This symbol indicates power is ON.



This symbol indicates power is OFF.



This symbol indicates Alternating current.



This symbol indicates Earth ground power.



This symbol indicates Protective conductor terminal.

Safety Considerations

**DANGER :**

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 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.



WARNING : Use appropriate Personal Protective Equipment (PPE) per local protocols.



CAUTION : This product contains refractory 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 (1599.8°F)) 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 : This product can expose you to chemicals including arsenic, which is known to the state of California to cause cancer. For more information go to www.P65Warnings.ca.gov.



WARNING : Before maintaining this equipment, read the applicable Safety Data Sheets (SDS). SDS is provided with unit.



WARNING : When installing, maintaining, or removing the 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 ceramic fiber parts and dust in plastic bags and dispose of properly.

Standards and Directives

The box furnaces complies with the following standards and guidelines:

European Union



The European voltage models of this product meet all the applicable requirements of the European Directives and therefore display the CE Marking. The most current EU Declaration of Conformity may be obtained from the manufacturer.

Product Safety



This product family has been tested to applicable product standards by UL a Nationally Recognized Test Laboratory (NRTL).

Electromagnetic Compatibility

FCC Statement (USA)



Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian ISSED IC Notice

This ISM digital apparatus complies with Canadian ICES-001.

Cet appareil ISM est conforme à la norme NMB-001 du Canada.

South Korean EMC Statement



사용자안내문이기기는업무용환경에서사용할목적으로적합성평가를받은기기로 서가정용환경에서사용하는경우전파간섭의우려가있습니다 .

EMC Registration is done on this equipment for business use only. It may cause interference when the product would be used in home.

Evaluation of Chemicals - Regulations and Directives

Proposition 65 - California



WARNING : Cancer and Reproductive Harm - www.P65Warnings.ca.gov

REACH - Europe

Thermo Fisher Scientific are committed to meeting all compliance obligations to evaluate, communicate, and register any Substances of Very High Concern (SVHC), and finding alternates where appropriate.

RoHS - Europe

Thermo Fisher Scientific are determined to reduce the impact on the environment, and so can declare that this product fully complies with the European Parliament's RoHS2 (Restriction of Hazardous Substances) Directive 2011/65/EU, with respect to all the following substances:

- Lead (0.1%)
- Mercury (0.1%)
- Cadmium (0.01%)
- Hexavalent chromium (0.1%)
- Polybrominated biphenyls (PBB) (0.1%)
- Polybrominated diphenyl ethers (PBDE) (0.1%)

Our compliance is witnessed by written declaration from our suppliers and/or component testing. This confirms that any potential trace contamination levels of the substances listed above are below the maximum level set by the latest regulations or are exempt due to their application.

RoHS – China

This product complies with the requirements of the legislative act Administration on the Control of Pollution Caused by Electronic Information Products (ACPEIP). The following label of conformance, may be found on the product:



Introduction

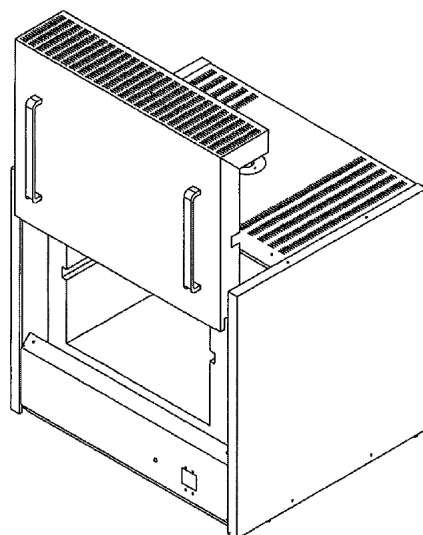


Figure 1 1200°C Box Furnace

The Thermo Fisher Scientific BF51731, BF51732 is a reliable, energy efficient 1200°C laboratory box furnace. The heating elements and low thermal mass Moldatherm[®] insulation provide fast duty cycles, energy conservation, and efficient programming. Refer to Table 1 “BF51731, BF51732 Laboratory Box Furnaces” for specifications.

Features and Benefits

- Controlled heat-up rate eliminates thermal shock to materials.
- Quick heat-up and cool-down rates.
- Vertical lift door:
 - Functions as shield to keep the hot face away from the user.
 - Optimizes the use of bench space.
 - Provides smooth, spring - loaded operation.
- Safety interlock switch automatically interrupts power to heating elements when door is opened. This feature protects heating elements and eliminates operator's exposure to electrical shock.
- Energy efficient Moldatherm insulation suitable for high interior-exterior temperature differential. The unit is rated for a maximum operating temperature of 1200°C.
- Patented LGO (light gauge overbend) heating elements transfer radiant heat energy to the work chamber and load efficiently and economically.
- Replaceable hearth plates and shelves.
- Digital control with adjustable parameters.

- Main power ON/OFF switch and power indicator on control panel.
- Double wall construction.
- Front control panel is recessed at the top. This feature provides easy viewing of the control LED and protection for the control instrumentation.

Intended Use

This furnace is intended as a general purpose laboratory, ashing, and heat treating furnace at 1200°C for continuous (over 3 hours) or intermittent (under 3 hours) use. For industrial, laboratory, and commercial applications only. The furnace is designed for thermal technology applications in laboratories, such as those found in manufacturing trades and industry, schools, universities and biology. It is used for ageing, analysis, tempering, decomposing, baking, annealing, hardening, soldering, oxidizing, reducing, incineration and preheating.

Non-Intended Use

This furnace is not intended for the following:

- To heat up food.
- For drying or heat treatment of substances which release gases or vapors into the atmosphere that are flammable or dangerously explosive when mixed with air.
- This furnace is equally unsuitable for the heat treatment of combustible dusts and fibrous materials.

Specifications

Table 1 BF51731, BF51732 Laboratory Box Furnaces

Model	BF51731C-1 BF51731COMC-1*	BF51731BC-1	BF51732C-1 BF51732COMC-1*	BF51732BC-1 BF51732BCOMC-1*
Capacity	16.4 L (0.6 cu. ft.)	16.4 L (0.6 cu. ft.)	16.4 L (0.6 cu. ft.)	16.4 L (0.6 cu. ft.)
Temp. Range	1200°C	1200°C	1200°C	1200°C
Interior (D x W x H)	11 x 12 x 11 in (27.9 x 33.0 x 17.8 cm)	11 x 12 x 11 in (27.9 x 33.0 x 17.8 cm)	11 x 12 x 11 in (27.9 x 33.0 x 17.8 cm)	11 x 12 x 11 in (27.9 x 33.0 x 17.8 cm)
Exterior (L x W x H)	23 x 24 x 27 in (58.4 x 61 x 68.6 cm)	23 x 24 x 27 in (58.4 x 61 x 68.6 cm)	23 x 24 x 27 in (58.4 x 61 x 68.6 cm)	23 x 24 x 27 in (58.4 x 61 x 68.6 cm)
Control	3216c	3216c, 3216i	3216p	3216p, 3216i
Electrical	208/240 VAC, 50/60 Hz, 4500 W 16-19 A	208/240 VAC, 50/60 Hz, 4500 W 16-19 A	208/240 VAC, 50/60 Hz, 4500 W 16-19 A	208/240 VAC, 50/60 Hz, 4500 W 16-19 A
Shipping Weight	165 lbs 75 kg	165 lbs 75 kg	165 lbs 75 kg	165 lbs 75 kg

*COM = Unit includes male and female RS 485 Digital Communications DB-9 ports.

3216c = 1/16 DIN, 1 program 8 segment digital dual display controller.

3216p = 1/16 DIN, 5 program 16 segment digital dual display controller.

3216i = 1/16 DIN, Excess Temperature Controller.

Pre-Installation

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 Thermo Fisher Scientific without written authorization. When submitting a claim for shipping damage, request that the carrier inspect the shipping container and equipment.

Inside the furnace cabinet is a bag containing:

- Hearth Plate
- Gas Inlet Tube Assembly
- Exhaust Port Cover
- Shelves (Qty 2)
- User Manual, SDS, User Information Instructions*

*NOTE May be contained on optional USB thumb drive.

Operating Conditions

High concentrations of sulfates, chlorides, fluorides, alkalis, and V_2O_5 can have corrosive effects on the ceramic fiber. Contact Thermo Fisher Scientific 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. Recommend turning off the furnace completely when not in use. The heating unit is not damaged by rapid heating and cooling cycles.

Environmental Conditions

Indoor Use Only.

Class of Equipment	Class I
Mains Supply Fluctuations	Mains supply voltage fluctuations not to exceed $\pm 10\%$ of the nominal voltage.
Operating	The recommended ambient temperature is 17°C to 27°C (62.6°F to 80.6°F); 20% to 80% relative humidity, non-condensing. Installation Category II (over-voltage) in accordance with IEC 664. Pollution degree 2 in accordance with IEC 664. Do not exceed ambient temperature of 40°C (104°F).
Altitude Limit	2,000 meters (6561.68 feet).
Storage	-25°C (-13°F) to 65°C (149°F); 20% to 80% relative humidity.

Atmosphere Systems

The 1200°C box furnace series are not designed for use with combustible or inert atmospheres requiring an air tight chamber. If an exhaust port is used, the furnace should not be located in an enclosed area without proper ventilation.



WARNING : Do not use combustible gases directly in this furnace. Process gases 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.

Installation



CAUTION : Be sure ambient temperature does not exceed 40°C (104°F). Ambient above this level may result in damage to the controller. The recommended ambient temperature is 17°C to 27°C (62.6°F to 80.6°F).



CAUTION : Allow at least 3" (7.62 cm) of space between the furnace, at least 12" (30.48 cm) above the furnace and any combustible surface. This permits the heat from the furnace case to escape so as not to create a possible fire hazard.



WARNING : To avoid electrical shock, this furnace must be installed by a competent electrician who ensures compatibility among furnace specification, power source and ground code requirements.

Lifting and Carrying



CAUTION : Heavy loads. Lift with care!

1. To avoid injury through physical strain, such as strain trauma and slipped discs, do not attempt to lift the furnace alone.
2. To avoid injury through dropped loads, wear Personal Protective Equipment (PPE) per local protocols, such as safety shoes, when lifting the furnace.
3. To avoid crushing your fingers or hands (particularly in a closing door) or damaging the furnace, do not use any other lift points than the bottom sides of the furnace.

Transport

1. For transport, do not lift the device using the doors or components attached to the device (e.g. control box on rear panel) as lift points.
2. Lift at the bottom sides of the furnace with NIOSH rated straps and/or using appropriate number of personnel per local safety policies and regulations.

Location

Install the furnace in a level area free from vibration. To permit proper air flow, leave at least 3" (7.62 cm) of space on all sides of the unit and 12" (30.48 cm) above the unit.

Wiring

Thermo Fisher Scientific model furnaces are designed for operation on 208-240 VAC. The furnaces will operate on 208 volts, but will have reduced heat up rates.

1. Suitable lengths of properly sized wires must be acquired prior to the installation of your furnace will draw approximately 19 amps on 240 VAC. Minimum recommended wire gauge size is 12WG. A high temperature (150°C) wire casing is also recommended. A ground wire should be provided per local code.
2. Remove the right panel (side with High Voltage label) of the furnace by removing the appropriate four screws. Removing the side panel allows for access to the terminal block and grounding screws, located at the base of the unit.

Furnace installation requires L1, L2, and ground wire (not provided).

NOTE For Europe, L2 connection at furnace is wired to Neutral.

NOTE Electrical installation must be performed by a qualified electrician. Consult local electrical codes for proper sizing of power and control wiring.

3. Thread two properly sized power wires and one properly sized ground wire through the conduit hole. The wires should be marked L1, L2, and ground. Insert power leads L1 and L2 into terminal block and tighten down securely. Ground on the provide ground screw.

Wire	Label
Line 1	L1
Line 2	L2
Ground	GND

NOTE Unit supplied with 7/8" Hole covered with a bushing that is sized for 1/2" Conduit / connections per electrical standards. Utilize strain reliefs as needed.

4. Check that all electrical connections are secure.
5. Place the Side Panel on the furnace and secure with the screws.

Mains Electrical/Thermocouple Check



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

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

1. Remove the two screws on the small panel at the back of furnace and detach.
2. Check that the thermocouple is securely mounted and undamaged.
3. Check the thermocouple wiring connections. Refer to Figure 2 "Thermocouple". Red is always negative.
4. Check that all electrical connections are secure. Visually check that the door properly activates the power interrupt switch near the front of the furnace.

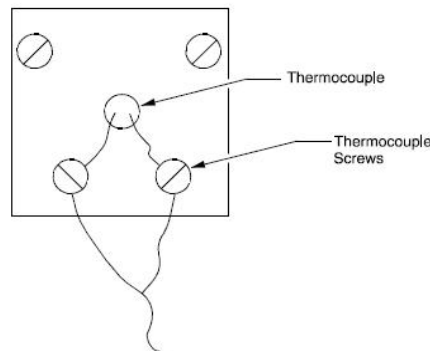


Figure 2 Thermocouple

5. Replace the small back panel on the furnace and secure with the screws.
6. Connect Mains electrical to facility ground outlet meeting the unit specifications found on the data tag.

Exhaust Vent

Flow from the exhaust vent on the top of the unit can be adjusted by inserting or removing the plug provided.

For most applications, the exhaust vent should be fully plugged during operation of the furnace; a closed vent results in more efficient operation and greater temperature stability. However, there are some applications which benefit from a partially or fully open exhaust vent.

The exhaust vent should be partially or fully open for the following applications:

- To provide slow cool down of work load. Some work loads may be damaged by heat shock when the furnace door is opened. The vent can be opened to allow work load to cool gradually.
- To remove unwanted vapors and gases from the furnace chamber. If you need to ventilate vapors and gases outside of the room, be sure to read section “Exhaust Port Connections”.
- Figure 3 “Exhaust Vents” shows how you can use the plug to adjust flow from the exhaust vent.

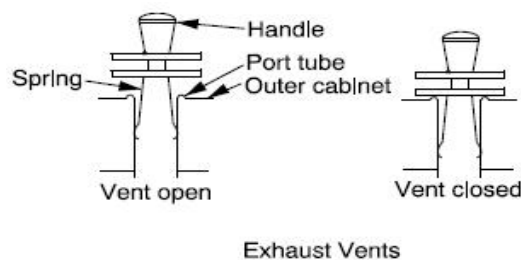


Figure 3 Exhaust Vents

Exhaust Port Connections

The 1" (2.54 cm) diameter exhaust port through the top wall of the furnace allows for the removal of unwanted vapors and gases produced during high-temperature operation.

When you need to ventilate vapors and gases outside of the room, be sure to make a proper connection to the exhaust port that allows some room air to flow into the exhaust. This is necessary to prevent “chimney effect” which sucks heat out of the chamber and results in slow run-up time or poor temperature uniformity.

Two methods of making the exhaust port connection are shown in Figure 4 “Preventing Chimney Effect”. With a hood suspended above the furnace, be sure that there is at least 3" (7.62 cm) between the hood and the exhaust port. If you use a metal tube or pipe, leave at least 1" (2.54 cm) clearance.

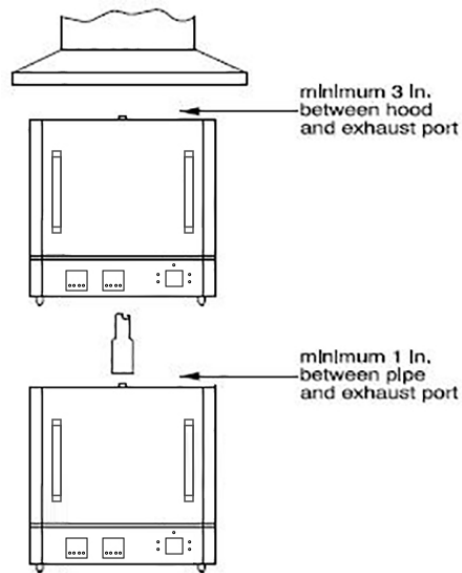


Figure 4 Preventing Chimney Effect

Atmosphere Inlet

Furnaces have a factory-installed air/atmosphere inlet.

Most inert atmospheres (i.e. nitrogen, argon, and helium) can be safely run in this box furnace. However, maximum temperatures may be derated depending on atmosphere. An initial burn-in period in air is recommended.

Please contact Thermo Fisher Scientific prior to using the furnace with an inert atmosphere.

The furnace should run for 7 to 10 hours at 1200°C before using an inert atmosphere and after every 60 hours of use with an inert atmosphere. This burn in process will help remove contaminants and provides a protective oxide layer on the heating elements.

This furnace is not designed to be a gas-tight atmosphere furnace.

Atmosphere Inlet Port

The atmosphere inlet tube assembly has been packaged separately to avoid breakage during shipping and handling.

Even if you do not intend to use the gas inlet, you must install the assembly before operating the furnace. The only tool you need is a Phillips head screwdriver.

To install the atmosphere inlet tube assembly:

1. Carefully remove the assembly from the package and inspect for any damage.
2. Remove the two mounting screws from the rear housing panel of the furnace.
3. Insert the ceramic tube end through the access hole in the rear of the furnace and guide the tube into the back of the chamber.
4. Align the mounting holes in the rear housing panel with the holes in the atmosphere inlet port and secure the assembly with the mounting screws.

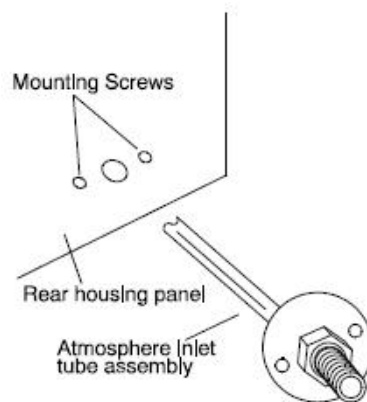


Figure 5 Gas Inlet Tube Assembly

Hearth Plate and Shelves Information



CAUTION : Most hearth plate and Shelves materials are made of ceramic fiber and refractory material can be broken if dropped.

Why to Use

- To provide a load bearing surface and distribute the weight of product being heated.
- To protect the furnace chamber from spillage.
- To lengthen the life of furnace, by allowing heat from the chamber floor to circulate into the chamber center.

When to use

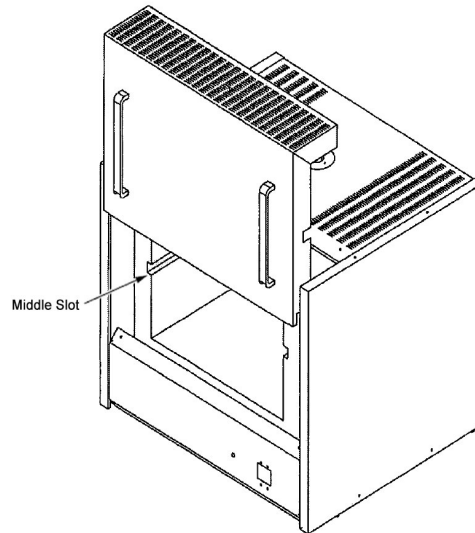
- Hearth plates are recommended during each furnace operation.

How to Install Hearth Plates

- Hearth plates are designed with grooved surface.
- The grooved surface must be positioned facing the chamber floor.

How to Install Shelves

- Slide into middle slot opening on heater assembly.



Start-Up



WARNING : After transport and decommissioning, or storage under humid conditions a drying-out process must be performed due to hygroscopic nature of the ceramic fiber insulation. During the drying-out process the equipment cannot be assumed to meet all the safety requirements of the IEC 61010-2-010 standard.












WARNING : Observe the following precautions when operating the furnace:

- Never stand in front of an open furnace.
- Wear protective eyewear.
- 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.

Initial Furnace Start-Up/Drying-Out Process

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 the furnace ON.
2. Press the SCROLL  button until set point SP1 is displayed. Press UP  or DOWN  button until 200 is indicated on the display.
3. Run the furnace for 2 hours after reaching 200°C.
4. Check for heat loss through the door. In the event of heat loss, recheck the door seal. (Refer to section “Door Seal Check”).
5. If no heat loss is detected, then press the SCROLL  button until set point SP1 is displayed. Press UP  or DOWN  button until 600 is indicated on the display.
6. Run the furnace for 2 hours after reaching 600°C.
7. Check for heat loss through the door. In the event of heat loss, recheck the door seal. (Refer to section “Door Seal Check”).
8. If no heat loss is detected, then press the SCROLL  button until set point SP1 is displayed. Press UP  or DOWN  button until 1200 is indicated on the display.
9. Run the furnace for 2 hours after reaching 1200°C.
10. Check for heat loss through the door. In the event of heat loss, recheck the door seal. (Refer to section “Door Seal Check”).
11. Adjust the set point SP1 to room temperature.

12. Highly recommended to Auto Tune unit for application prior to use refer to section "Auto Tuning" .

Refer to section "Eurotherm 3216 Controller" for detailed start up steps.

Door Seal Check

It is very important to check the door seal before using this furnace. Door seal integrity is essential to maintain temperature uniformity and to prevent fumes being released into the area surrounding the furnace.

To check the door seal:

1. With the furnace power off and the chamber cold, open the door.
2. Insert a strip of paper (a couple of inches wide) between the door insulation and the chamber opening. Do not position the paper in the corner of the chamber. Close the door.
3. Slowly pull the paper strip from the outside. You should feel some resistance. If the paper does not pull out, this area of the door seal may be too tight, causing a gap in another area of the door seal.
4. Repeat this test at 2" (5.08 cm) intervals around the door. If the door does not seal properly, a door adjustment must be done. Refer to section "Door Seal Adjustment (if necessary)" .

Door Seal Adjustment (if necessary)

To adjust the door seal:

1. Door assemblies have hex nuts attaching the insulation frame to the outer door frame. Loosen the appropriate nuts and move the door insulation frame to improve the door seal.
2. Recheck the door seal, following the instructions in the section "Door Seal Check" .
3. If a gap is detected only in the center top edge of the door seal, then the top corners of the sealing surface of the door may be sanded to lessen the center gap.
4. After each adjustment recheck the door seal.

The door seal has been adjusted properly if there is no heat loss when operating the furnace up to 500°C.

1x8 segment and 5x16 Segment Programmable Models w/OTP

Eurotherm 3216 Controller

The Eurotherm 3216c and 3216p temperature controllers sense the furnace's chamber air temperature (the PV or process value) and provides the heat needed to reach the required set point.

There are two choices of controls used in the various furnaces models: The 3216c controller is a basic single setpoint and Timer (1-program 8-segment or Dwell timer or Delay timer). The 3216p controller offers single setpoint and 5-program 16-segment, this controller can store upto 5-different programs and each program can contains 16 segments.

This chapter provides brief instructions on various controller operations which include:

- Setting target temperature
- Setting the ramp rate
- Changing display units
- Auto tuning the controller
- Setting over – temperature protection (OTP)
- Temperature offset procedure
- Timer operation (3216c controller only)
- 5x16 programmer operation (3216p controller only)



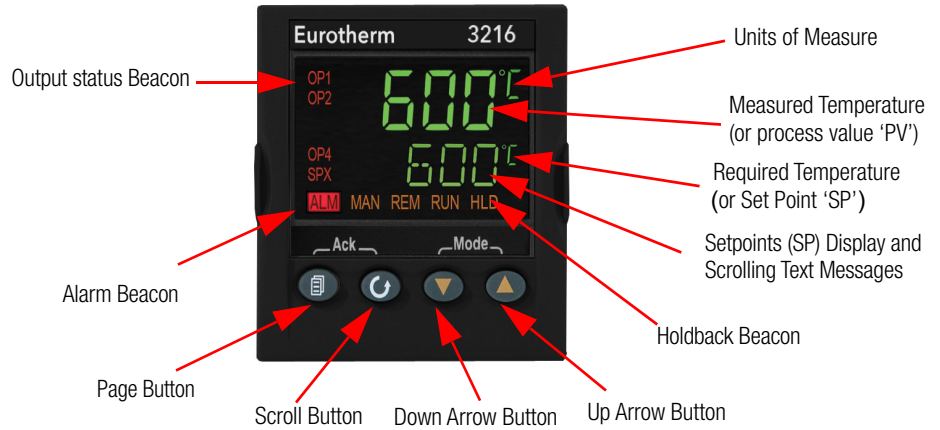
CAUTION : Before operating the controller, read this chapter carefully. Wrong procedures can change the unit characteristics and design parameters, which can hamper performance and make the equipment dangerous to use.

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.

Operator Interface & HOME Display

When the controller is turned ON, it will perform a brief self-test and then display the HOME Display page. The measured value (process value) is found in the upper display and the set point is found in the lower display.

The description of interface beacons and buttons are shown in “Beacon Display and Description” & “Operator Buttons” respectively.



Beacon Display and Description

OP1 (Output 1)	Illuminates when the output to heater
OP4 (Output 4)	Illuminates when the output is ON (Over-temperature alarm)
SPX	Alternative set point in use (SP2)
ALM	Alarm active (Red)
REM	Remote set point or communication active
RUN	Timer running for 3216c or Program running for 3216p
RUN (flashing)	Timer hold for 3216c or Program hold for 3216p
HLD	Program Segment Holdback (See Section “Holdback Function”)

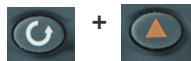
Operator Buttons



Press to select a new list of parameters and from any display - press PAGE to return to the HOME Page.



Press to select new parameter from the page header. If held down it will continuously scroll through parameters.



Hold down SCROLL and press UP ARROW to scroll back parameters.



Press to decrease or change the state of a value.



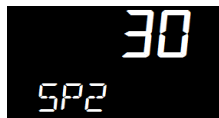
Press to increase or change the state of a value.




Single Set Point Operation

3216 controller has capability to select set point-1 and set point-2. User can setup two different set points to select the desired set point, SP.SEL function can be used.




To set the desired temperature set point, complete the following steps:

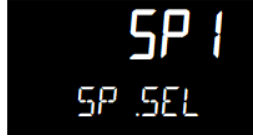
1. Press the  SCROLL button until SP1 or SP2 is displayed.



2. Press UP  or DOWN  button until the desired setpoint is displayed and then release the button. A few seconds after the button is released, the controller will accept the new value and is indicated by a brief flash of the display.
3. Press PAGE  button to return to the HOME display.

Alternate Set Point Selection (SP2)

1. Press the SCROLL  button from HOME display until SP.SEL is displayed.
2. Press UP  or DOWN  button to select SP1 or SP2.



If SP2 is selected, then SPX beacon will appear on the HOME display indicating the action of alternate set point in use.






Set Point Ramp Rate


The ramp rate SP.RAT is designed to reduce the heating rate that the furnace normally exhibits. When SP.RAT is 'OFF', the furnace will operate at its maximum heating capability. But if ramp rate feature is used, then the chamber is heated at any rate slower than the maximum capability of the unit. To fine tune ramp rates, you may need to test the furnace using loads that you intend to use in furnace application or with loads having similar mass and thermal properties.

NOTE If ramp rate exceed the capability of the furnace unit, it will run the max 100% output of heater capacity. If ramp rate value set less than 100%, furnace unit heater output reduced and furnace unit chamber gets heated slowly.

Complete the following steps to set the ramp rate units:

1. The ramp rate units can be set in seconds, minutes or hours.
2. Press the SCROLL  button until RAMPU is displayed.
3. Press UP  or DOWN  button until the desired ramp rate unit is indicated on the display.





4. The new ramp rate unit is applied when the button is released and is indicated by a brief flash of the display.
5. Press PAGE  button to return to HOME display.


Complete the following steps to change the ramp rate of SSP.

6. Press the SCROLL  button until SP.RAT is displayed.




7. Press UP  or DOWN  button until the desired ramp rate is indicated on the display. The unit of ramp rate depends on the type of ramp unit RAMPU selected.

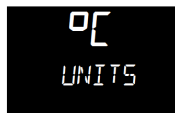


8. The new ramp rate is applied when the button is released and is indicated by a brief flash of the display.
9. Press PAGE  button to return to home display.

View or Change the Display Units

To change the temperature scale in 3216 controller to operate on °F instead of the factory setting of °C, or to change from °F to °C, follow these steps.

1. Press the SCROLL  button until "UNITS" is shown in the lower display. The current unit is shown in the upper display.



2. Press UP  or DOWN  button to change the display unit.
- a. (°C): Degrees Celsius



- b. (°F): Degrees Fahrenheit



- c. (°K): Kelvin



- d. (NONE): No units displayed



- e. (PERC): Percent



NOTE Do not use nonE & PERc, they are used to measure other applications types other than temperature.

Auto Tuning

In Auto Tuning the characteristics (PID parameters) of the controller are matched to the characteristics of the product load in order to obtain good control.


Good control means:

- Stable control of the set point
- No overshoot or undershoot
- Quick response to deviations from the set point
- Removal of fluctuations



The 3216 controller uses a one-shot tuner which automatically sets the initial values of the parameters listed in Table 2 and Table 3.


Thermo Fisher recommend that you tune the furnace to your specific application to obtain the best results.

Steps 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. Set the temperature as per requirement; refer to section “Single Set Point Operation” on setting SP1 or SP2.
3. Press SCROLL  button to scroll through the list of parameters until A.TUNE is displayed.



4. To enable the auto-tune, set the A. TUNE parameter to ON by using DOWN  or UP  button.

- Press the PAGE  button to return to the HOME display. The display will flash TUNE to indicate that tuning is in progress.



The auto tune is completed when the regular display of the measured temperature is shown and the process is allowed to control at the target set point using the new control terms.


NOTE

- If the process temperature or load changes significantly another auto tune session may be necessary to optimize the chamber performance.
- If the controller is auto tuning and sensor break occurs, the auto tune will abort. Auto tune must be re-started when the sensor break condition is no longer present.
- If an Auto tune cannot be performed an error message, Etun, will be flashed in the display.
- Auto tune will not work when controller is running program or Timer.

Parameter List


Parameters are available under different levels of security and are defined as Operator Level 1 (LEv1) & Operator Level 2 (LEv2). This section describes various parameters used in each operator levels.



Operator Level 1



Operator level 1 is designed for day to day operation of the controller and parameters are not protected by a security code. From HOME display, press SCROLL  button to scroll through the list of parameters in Level 1.

The parameter mnemonic and its scrolling description are shown in the lower display. The value of the parameter is shown in the upper display. After 5 seconds, a description of the parameter will scroll once along the display and then revert back to the mnemonic. The scrolling text can be interrupted at any time by a single press of any of the buttons, but will not scroll again until the parameter is returned to.


Operator Level 2

Operator Level 2 provides access to additional parameters and this access is protected by a security code. The Level 2 access should typically be granted to a specially trained person, since changing parameters can have major impact on the temperature performance of the furnace. After entering Level 2, press SCROLL  button to scroll through the list of parameters. Like Level 1, the mnemonic of the parameter is shown in the lower display, followed once by a scrolling help message showing a longer description of the parameter. The value of the parameter is shown in the upper display.


Press DOWN  or UP  button to adjust this value. If no button is pressed for about 30 seconds the display returns to 'HOME Display'.

Back scroll is achieved when you are in the list by pressing UP  button while holding DOWN  and SCROLL  button.



To Enter Level 2

1. From any display press and hold PAGE  button.
2. After a few seconds the display will show 'LEv 1 GOTO'.



3. Release SCROLL  button. (If no button is pressed for about 45 seconds the display returns to the HOME Display).
4. Press the UP  or DOWN  button to choose LEv2 (Level 2).





5. Press UP  or DOWN  button to enter the password. The default code is '25'.



If an incorrect code is entered the display reverts to Level 1.

To Return to Level 1

1. Press and hold PAGE  button to show the current operator level.
2. Press UP  or DOWN  button to select LEv 1.

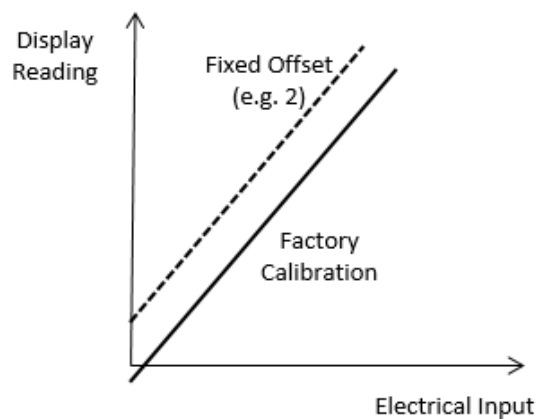


When Level 1 is selected the display reverts to the HOME display. A passcode is not required when moving from a higher level to a lower level.

Offset Procedure


All ranges of the controller have been calibrated against traceable reference standards. This means that if the input type is changed it is not necessary to calibrate the controller. There may be occasions, however, when you wish to apply an offset to the standard calibration to take account of known errors within the process, for example, a known sensor error or a known error due to the positioning of the sensor. In these instances it is not advisable to change the reference (factory) calibration, but to apply a user defined offset.

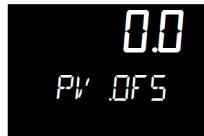
PV Offset applies a single offset to the temperature or process value over the full display range of the controller and can be adjusted in Level 2. It has the effect of moving the curve up or down about a central point as shown in the example below:-



To Apply an Offset

Connect the input of the controller to the source device which you wish to calibrate to. Set the source to the desired calibration value. The controller will display the current measurement of the value. If the display is correct, the controller is correctly calibrated and no further action is necessary. If you wish to offset the reading

1. Enter Level 2; refer to section “To Enter Level 2” for steps to enter Level 2.
2. Press SCROLL  button to scroll through the parameter list until 'PV.OFS' displayed.



3. Press UP  or DOWN  button to set the required offset value.

Alarms & Diagnostics

Alarms are used to alert an operator when a pre-set level has been exceeded. They are indicated by a scrolling message on the display and the red ALM beacon.

Alarm Indication & Acknowledgment

Alarm Indication & Acknowledgement should go before Sensor Break.

- If an alarm occurs the red ALM beacon will flash, a scrolling message will give the source of the alarm and the alarm (relay) output will operate. A typical default message will show the source of the alarm followed by the type of alarm. For example, 'ALARM 1 FULL SCALE HIGH'. If more than one alarm is present further messages are flashed in turn in the main display. The alarm indication will continue while the alarm condition is present and is not acknowledged.
- ALM beacon on continuously = alarm has been acknowledged.



- Press PAGE  and SCROLL  button together to acknowledge an Alarm. If the alarm is still present the ALM beacon lights continuously.

If the alarm is still present ALM beacon lights continuously. The action which takes place depends on the type of alarm configured.

Sensor Break & Loop Break Protection

Sensor Break Protection - The controller provides sensor break protection in the event the thermocouple opens. If an open thermocouple condition occurs, the digital display will blink "S.br", a red alarm beacon will be illuminated and the power to the heating element will be shut off.

Loop Break alarm is displayed as CONTROL LOOP BROKEN. This occurs if the controller does not detect a change in process value following a change in output demand after a suitable delay time. Since the time of response will vary from process to process the Loop Break Time parameter 'LBT' allows a time to be set before a loop break alarm is initiated. In these circumstances the output power will drive to high or low limit. For a PID controller, if the PV has not moved by $0.5 \times P_b$ in the loop break time the loop is in break.

The loop break time is set by the AutoTune, a typical value is $12 \times T_d$. The loop break alarm may be disabled by setting its time to Off.

Over – Temperature Protection (OTP)


The over-temperature protection will be in effect during any alarm condition when the temperature of the furnace has deviated beyond the limit. The Deviation High alarm is triggered when the measured temperature becomes higher than the set point by the amount of the threshold/deviation. Thermo Fisher recommend a value of 50°C above your working temperature to provide protection for your workload.

In certain units, full scale high alarm 'Hi' is also present. Full scale high alarm will be detected if the PV value exceeds the full alarm trip level.

To Configure Deviation High Alarm

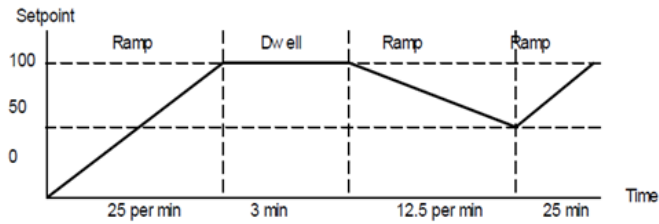
1. Press SCROLL  button until "A1.DHi" appears on the display.



2. Press UP  or DOWN  button to select the OTP value you desire. We recommend a value of 50.

Program/Timer Segment Types

Programmer where each segment consists of a controlled rate ramp to a target set point followed by a dwell at that set point. These values can be set by the user.



a. Target set point

Target set point will ramp from the current value of the measured temperature to the target set point value based on ramp rate.

b. Ramp Rate

A Ramp segment provides a controlled change of set point from an original to a target set point. The duration of the ramp is determined by the rate of change specified. The segment is specified by the target set point and the desired ramp rate. The ramp rate parameter is presented in engineering units (°C, °F, Eng.) per real time units (Seconds, Minutes or Hours). If the units are changed, all ramp rates are re-calculated to the new units.



c. Step

The set point changes instantaneously from its current value of the measured temperature to a new value at the beginning of a segment. Step can be achieved by turning off Ramp rate. A Step segment has a minimum duration of 1 second.



d. Dwell

The set point remains constant for a specified period at the specified target. The operating set point of a dwell is inherited from the previous segment.



Remaining Time

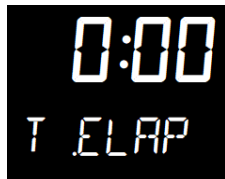
Time remaining before the dwell segment completes.

NOTE For all modes except the setpoint programmer, the time remaining may be edited while the program is running, in this case the program duration is modified immediately. This is useful for extending or shortening the duration of a batch.



Elapsed Time

The time elapsed since the Program/Timer was activated.



1-Program 8-Segment Controller Operation

An internal timer in 3216c controller can be configured to operate in four different modes:

- Dwell at temperature. This may be used in combination with the set point ramp limit to provide a simple ramp/dwell temperature sequence.
- Delayed switch on timer. This may be used to implement a switch on delay, and often eradicates the need for a separate timer device.
- Soft Start timer. Starts automatically on power up. It applies a power limit until the temperature reaches a threshold value or the timer times-out after the dwell period. It is typically used to dry-out heaters in Hot Runner control systems.
- 8-Segment programmable controller (4 ramps & 4 soaks).

The 8-segment programmable 3216c controller consists of microprocessor based three-mode PID (Proportional, Integral, and Derivative) and appropriate output switching devices to control the furnace. The programmable controller can be used as a single set point controller or as a programmable controller. The 8-segment digital model enables eight segments of programming. The controller is capable of varying temperature or process value with time through programming. A program is stored as a series of segments and can be run once.

Some of the commonly used parameters in operator Level 1 and Level 2 of 3216c controller are:

Table 2 Parameter Description and Accessibility in 3216c

No.	Parameter	Description	Level	Access	Factory Default Value	Page No.
1	T.STAT	Timer Status	Level 1 + 2	Read/Write	rES	6-39
2	T.REMN	Timer Remaining	Level 1 + 2	Read Only	-	6-37
3	T.ELAP	Elapsed Time	Level 1 + 2	Read Only	-	6-37
4	A1.DHI	Deviation High Alarm Set Point	Level 1	Read/Write	50	6-35
5	A2.HI	High Temperature Alarm Set Point	Level 2	Read Only	1225	6-35
6	SP.SEL	Set point Select	Level 1 + 2	Read/Write	SP1	6-27
7	SP1	Set point 1	Level 1 + 2	Read/Write	0-1200	6-27
8	SP2	Set point 2	Level 1 + 2	Read/Write	0-1200	6-27
9	RAMPU	Set point Ramp Units	Level 1 + 2	Read/Write	Mins	6-28
10	SP.RAT	Set point Rate Limit	Level 1 + 2	Read/Write	Off	6-29
11	A.TUNE	Auto Tune Enable	Level 1 + 2	Read/Write	Off	6-30
12	UNITS	Display Units	Level 1 + 2	Read/Write	Deg C	6-29
13	TM.CFG	Timer Configuration	Level 1 + 2	Read/Write	Prog	6-42
14	SS.SP	Soft Start Setpoint	Level 1 + 2*	Read Only*	-	6-40
15	SS.PWR	Soft Start Power Limit	Level 1 + 2*	Read Only*	-	6-40
16	T.T	Requested Time Duration	Level 1 + 2*	Read Only*	-	6-40
17	THRES	Timer Start Threshold	Level 1 + 2	Read/Write	1	6-41
18	END.T	Timer End Type	Level 1 + 2	Read/Write	Dwell	6-42
19	Timer.TimeRes	Timer resolution	Level 1 + 2*	Read Only*	Mins	6-41
20	TSP.1 to TSP.4	Target Set point 1 to Target Set point 4	Level 2	Read/Write	550	6-43
21	RMP.1 to RMP.4	Ramp Rate 1 to Ramp Rate 4	Level 2	Read/Write	OFF	6-43
22	DWEL.1 to DWEL.4	Dwell Time 1 to Dwell Time 4	Level 2	Read/Write	1 hour	6-43
23	PB	Proportional Band	Level 2	Read/Write	15	-
24	TI	Integral Time	Level 2	Read/Write	95	-
25	TD	Derivative Time	Level 2	Read/Write	16	-
26	LBT	Loop Break Time	Level 2	Read/Write	30 mins	6-35
27	PV.OFS	PV Offset	Level 2	Read/Write	0	6-34
28	ADDR**	Comms Address	Level 2	Read/Write	1	8-82
29	BAUD**	BAUD RATE	Level 2	Read/Write	9600	8-82
30	IN.TYP	Input Type	Level 2	Read Only	Platinel II (T028) Thermocouple	-
31	ID	Customer ID	Level 2	Read Only	305 (without COMMS) 306 (with COMMS)	-



*Level 1+2 Read Only states that, Level 1 gives Read only access to user where as Level 2 gives Write access along with Read access.

**Only units enabled with Communications.

Soft Start Timer

The timer is used to start a process at reduced power and/or reduced setpoint. It may be used where it is required to dry out a heater before applying full power, such as hot runner applications.

It is initiated by any one of the following:

- Switching on power;
- Pressing  and  together;
- Setting the parameter T.STAT to run;
- A command through serial communications;
- A logic input suitable configured.

When the timer status = run, the control output is limited to a reduced start up power until parameter SS.SP is exceeded. If the PV is already greater than SS.SP the reduced power limit is not applied and the timer times out.

When the timer status = reset, the control output is controlling at a level limited by the output high and low limits.

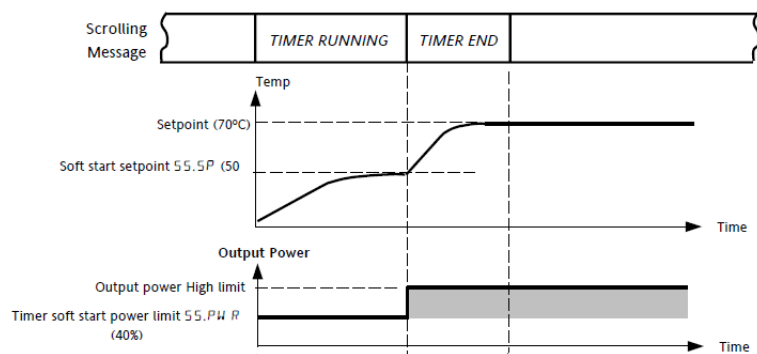
Soft Start Setpoint

A soft start timer is provided to control start-up of sensitive heaters. If these heaters are stressed by applying 100% power from cold they could be damaged. The soft start facility introduces a power limit until either the safe operating temperature (SS.SP) is reached or a time duration has elapsed (TIME).

The SS.SP is the threshold for the soft-start timer. If the PV is below this value at power up then the soft start timer is started.

Soft Start Power Limit



The soft start function limits the power delivered to the heater until it has warmed up. The SS.PWR is the power limit applied until the PV reaches the SS.SP or the timer has elapsed.



Delayed Switch On Timer

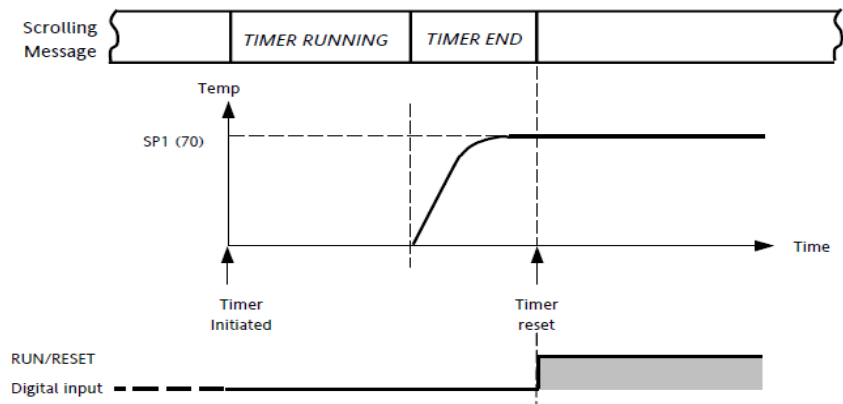
The timer is used to switch on the controller output power after a fixed length of time. It could be used to turn on a process at a particular time.

It is initiated by any of the following:

- Switching on power;
- Momentarily pressing  and  together;
- Setting the parameter T.STAT to run;
- A command through serial communications;
- A logic input suitably configured.




When the timer status = run, the control output is off.

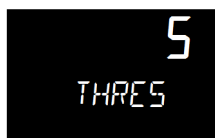
When the timer status = reset, the control output is controlling.



Timer Start Threshold

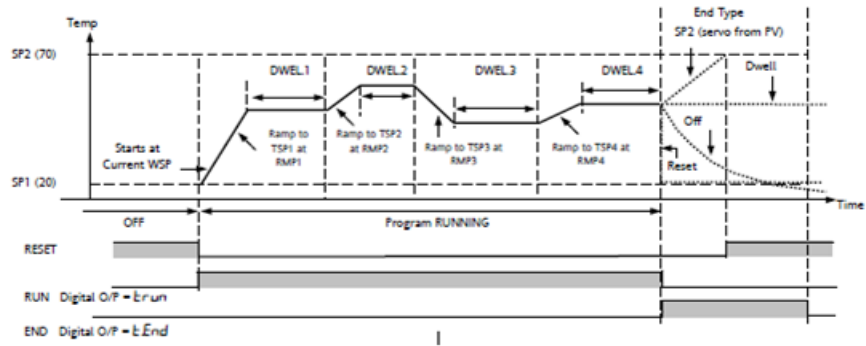
A single threshold value is available to provide a holdback on the entry to the dwell part of the ramp/dwell pair. It holds back the dwell until the PV has reached the band defined by +/- threshold around the PV. The timer starts timing when the temperature is within this threshold of the setpoint. This provides a guaranteed soak temperature. The threshold can be set to Off (0) in which the threshold is ignored and the timing starts immediately. Note that if a ramp rate is set, the ramp completes before timing starts.

To set the threshold value, press SCROLL  button until 'THRES' is displayed. ("THRES" can be accessed from Level 1 and Level 2). Press UP  or DOWN  button to adjust the value (In the example given below, the dwell periods will not start until the PV is within 5 units of the set point).



Timer as 8-Segment Programmer

A sample program profile of 3216c is shown in the diagram below. It is an eight-segment programmer consisting of four ramp/dwell pairs. Each ramp consists of a controlled rate of change of set point to a target level. Each ramp is followed by a dwell at that level. The ramp rate, target level and dwell time are set by the user.



End Type parameter




The action which occurs at the end of program or in reset depends on the configuration of the 'END.T' parameter. The 'END.T' can be:

OFF : The heating is turned OFF.

dwEll : Controls at last program setpoint.




SP2 : Controls at setpoint 2 (When the timer completes the target setpoint will switch to setpoint 2. The setpoint 2 may be a lower or a higher temperature.)

rES : Reset on completion and reverts to SP1 or SP2, based on the Setpoint selection.




SCROLL  button through parameters in level 2 and set the required 'END.T' by pressing UP  or DOWN  button.



To Configure the Programmer




1. Enter level 2 to configure the timer as a programmer. Press SCROLL  button to scroll through the list of parameters until 'TM.CFG' is displayed. Now, press DOWN  or UP  button to select 'ProG'.

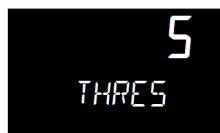


2. To set the resolution, press SCROLL  button to select '**TM.RES**'. Press DOWN  or UP  button to set 'Hour or 'min' (In this example the ramp rate and dwell period are set in hours).







Hour
TM.RES

3. Now set the threshold by pressing SCROLL  button to select '**THRES**'. Press UP  or DOWN  button to adjust the value (In this example, the dwell periods will not start until the PV is within 5 units of the set point).






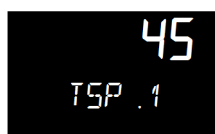
5
THRES

4. Now, set the action when the programmer times out. Press SCROLL  button to select '**END.T**' is displayed. Press UP  or DOWN  button to select 'Off or 'SP2' or 'Dwell' (This example uses 'dwell' where the controller will continue to control indefinitely at the last set point. OFF will turn the output power off and SP2 will control at set point 2).






dwell
END.T

5. To set the first target set point, Press SCROLL  button to select '**TSP.1**'. Press UP  or DOWN  button to adjust the value (In this example the set point will ramp from the current value of the PV to the first target 45°C).






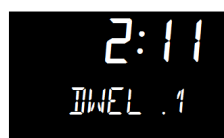
45
TSP.1

6. To set the first ramp rate, Press SCROLL  button to select '**RMP.1**'. Press UP  or DOWN  button to adjust the value to 8. (In this example the set point will ramp to 45 at 8.0 units per hour).



8.0
RMP.1







7. To set the first Dwell, Press SCROLL  button to select '**DWEL.1**'. Press UP  or DOWN  button to adjust the value to 2:11. (In this example the set point will dwell at 45 for 2 hours 11 minutes).



2:11
DWEL.1

8. Now repeat the above three steps (5, 6 & 7) to set remaining all segments.

To Operate the Programmer

Operation	Action	Indication
To Run a program	Press and quickly release  + 	Beacon RUN = On Scrolling display - TIMER RUNNING
To Hold a program	Press and quickly release  + 	Beacon RUN = Flashing Scrolling display - TIMER HOLD
To Reset a program	Press and hold  +  for more than 1 second	Beacon RUN = Off If End Type = Off then OFF will be displayed at the end of the program
	Program ended	Beacon RUN = Off SPX On if End Type = SP2 Scrolling display – TIMER END

Programs can also be operated from the **'T.STAT'** parameter found in the level 1 parameter list.





NOTE

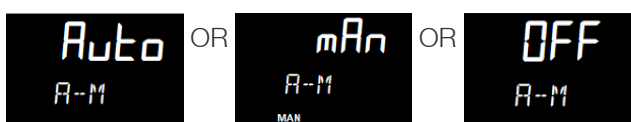
- The program ramp rate is designed to reduce the heating rate or cooling rate that the furnace normally exhibits. When not using this feature, the furnace will operate at its maximum heating and cooling capability.
- When the program ramp has ended or has been reset, the furnace will continue to maintain set point temperature. It will not cool to ambient temperature unless the set point is set to ambient temperature by the program or by the operator.
- When a step change is required, the ramp rate should be set to 'OFF'.
- Where ramp/dwell pairs are not required, the ramp rate should be set to 'OFF' and the target set point, TSP, the same as the preceding segment.
- TIMER END- when the end type is SP2, Timer END does not occur until the ramp is complete or SP2 is achieved. It is more usual to use a DWELL (default) or RESET end type.
- The program will start from the measured temperature. On recovery from power failure, the program will automatically run at the last ramp rate from the current measured temperature.

AUTO/MAN/OFF: (Auto/Manual/OFF Mode)



CAUTION : Thermo Fisher Scientific does not recommend to use controller in MANUAL mode or OFF mode, as Manual mode can damage the unit or cause over-heating without care or proper operation. If controller set as MANUAL mode operation, the end user must use a separate 'over-temperature' controller for safe operation of the unit.

Operation	Action	Indication
To change Auto to Manual model	Press and hold  +  for more than 3 seconds	Controller display Shows Auto mode as A-M.



1. **AUTO:** When the controller is in the automatic mode the output automatically adjusts to keep the temperature or process value at the setpoint. Auto mode is also referred to as “closed loop” as the controller will use thermocouple temperature as feedback to control the furnace temperature.
2. **MAN:** Manual mode means that the controller output power can be adjusted directly by the user. The input sensor is still connected and reading the PV but the control loop is ‘open’. In manual mode the MAN beacon will be lit, Band and deviation alarm are masked, the auto-tuning timer and programmer functions are disabled. The power output can be continuously increased or decreased using the up or down buttons.
3. **OFF:** Off mode means that the heating and cooling outputs are turned off. The process alarm and analogue retransmission outputs will however, still be active while Band and deviation alarm will be OFF.

5-Program 16-Segment Controller Operation

The 3216p temperature process controller is a single loop PID based controller that can store up to 5 programs with 16 segments each. This controller consists of microprocessor based three-mode PID (Proportional, Integral, and Derivative), programmable temperature controller and appropriate output switching devices to control the furnace. The programmable controller can be used as a single set point controller or as a programmable controller. The controller is capable of varying temperature or process value with time through programming. A program is stored as a series of segments and can be run once. This 16 segment digital model can enable 16 segments in each program.

Some of the commonly used parameters in operator Level 1 and Level 2 of 3216p controller are:

Table 3 Parameter Description and Accessibility in 3216p

No.	Parameter	Description	Level	Access	Factory Default Value	Page no.
1	P.STAT	Program Status	Level 1 + 2	Read/Write	Reset	6-50
2	T.REMN	Timer Remaining	Level 1 + 2*	Read Only	-	6-37
3	T.ELAP	Elapsed Time	Level 1 + 2*	Read Only	-	6-37
4	A1.DHI	Deviation High Alarm Set Point	Level 1	Read/Write	50	6-35
5	A2.HI	High Temperature Alarm Set Point	Level 2	Read Only	1225	6-35
6	SP.SEL	Set point Select	Level 1 + 2	Read/Write	SP1	6-27
7	SP1	Set point 1	Level 1 + 2	Read/Write	0-1200	6-27
8	SP2	Set point 2	Level 1 + 2	Read/Write	0-1200	6-27
9	RAMPU	Set point Ramp Units	Level 1 + 2	Read/Write	Mins	6-28
10	SP.RAT	Set point Rate Limit	Level 1 + 2	Read/Write	Off	6-29
11	A.TUNE	Auto Tune Enable	Level 1 + 2	Read/Write	Off	6-30
12	UNITS	Display Units	Level 1 + 2	Read/Write	Deg C	6-29
13	PROG	Current Program Number	Level 1 + 2	Read/Write	1 to 5	6-47
14	END.T	Program End Type	Level 1 + 2	Read/Write	Dwell	6-48
15	H.BACK	Program Holdback	Level 1 + 2	Read/Write	1	6-47
16	DWEL.U	Dwell Units	Level 1 + 2*	Read Only	Mins	6-49
17	TSP.1 to TSP.8	Target Set point 1 to Target Set point 8	Level 2	Read/Write	550	6-49
18	RMP.1 to RMP.8	Ramp Rate 1 to Ramp Rate 8	Level 2	Read/Write	OFF	6-49
19	DWEL.1 to DWEL.8	Dwell Time 1 to Dwell Time 8	Level 2	Read/Write	1 hour	6-49
20	PB	Proportional Band	Level 2	Read/Write	15	-
21	TI	Integral Time	Level 2	Read/Write	95	-
22	TD	Derivative Time	Level 2	Read/Write	16	-
23	LBT	Loop Break Time	Level 2	Read/Write	Off	6-35
24	PV.OFS	PV Offset	Level 2	Read/Write	2	6-34
25	ADDR**	Comms Address	Level 2	Read/Write	1	8-82
26	BAUD**	BAUD RATE	Level 2	Read/Write	9600	8-82
27	IN.TYP	Input Type	Level 2	Read Only	Platinel II (T028) Thermocouple	-
28	ID	Customer ID	Level 2	Read Only	307 (without COMMS) 308 (with COMMS)	-

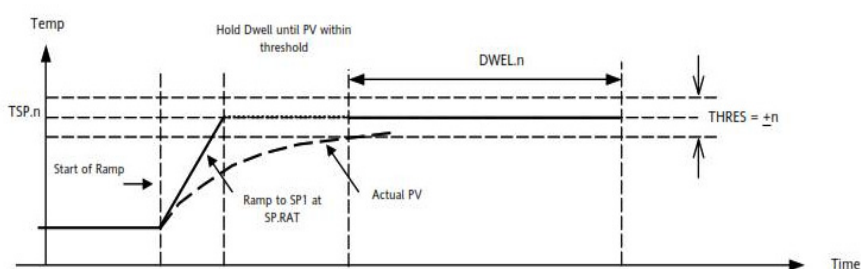
*Level 1+2 Read Only states that, Level 1 gives Read only access to user where as Level 2 gives Write access along with Read access.

**Only units enabled with Communications.


Holdback Function

The temperature ramp rate of the program is quicker than the furnace or oven can achieve, the program will wait until the temperature of the furnace or oven catches up. e.g. If a Holdback value of 10 is set and the program is set to ramp to a set point of 600°C, the program will reach 600°C, then go into a hold state; the hold indicator will light until the furnace or oven temperature reaches 590°C, the program will then continue to control again.


The hold back will only apply once per Segment, therefore when control has been reestablished, the hold back will not apply again to that segment, even if the furnace or oven temperature go outside the hold back band. Each program can have its own Holdback value assigned to it.



H.BACK can be accessed from Level 1 or Level 2. To set the hold back value:

1. Press SROLL  button until display reads, **"H.back"**




2. Press the UP  or DOWN  button to set holdback value or to turn off hold back function.

Creating a New Program or Editing an Existing Program



3216p is a 16 segment programmer consisting of eight ramp/ dwell pairs. Each ramp consists of a controlled rate of change of set point to a target level. Each ramp is followed by a dwell at that level. The ramp rate, target level and dwell time are set by the user.

The same steps are used when creating a new program and editing an existing program. A currently active program cannot be altered. Go into reset mode before starting to create or modify a program. Follow the steps below to create or edit a program.

1. **'PROG'** can be accessed from level 1 or Level 2.

2. Press the scroll  button until you reach the program parameter '**PROG**'.



3. Press the UP  or DOWN  button to select a number for a new program or to edit an existing program. The scrolling display shows "CURRENT PROGRAM NUMBER".






End Type parameter

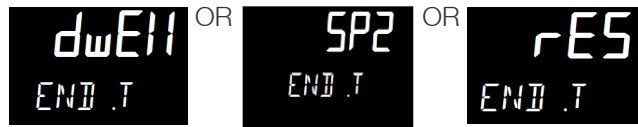
The action which occurs at the end of program or in reset depends on the configuration of the **END.T** parameter. The **END.T** can be:

dwEll : Controls at last program setpoint.


SP2 : Controls at setpoint 2 (When the programmer completes the target setpoint will switch to setpoint 2. The setpoint 2 may be a lower or a higher temperature).

rES : Reset on completion and reverts to SP1 or SP2, based on the Setpoint selection.

SCROLL  button through parameters in Level 2 and set the required '**END.T**' by pressing UP  or DOWN  button.



To Configure the Programmer

1. Enter level 2: refer to section "To Enter Level 2" for steps to enter Level 2.
2. To select the Programmer, press SCROLL  button as many times as necessary to view '**PROG**'.



3. To configure the first Program, press DOWN  or UP  button to select program number '**1**'.

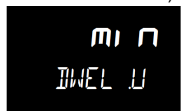


Similarly you can configure program (1, 2, 3, 4 or 5) for configuration.

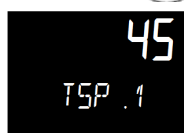
4. To set the ramp unit, press SCROLL (G) button to select '**RAMP.U**' and then press DOWN (▼) or UP (▲) button to select **hour, min or sec** (In this example the ramp unit is set in min).



5. To set the Dwell unit, press SCROLL (G) button to select 'DWEL.U' and then Press DOWN (▼) or UP (▲) button to select **hour or min** (In this example the dwell unit is set in min).



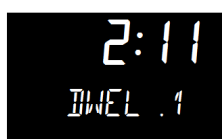
6. To set the first Target Set point, press SCROLL (G) button to select '**TSP.1**'. Then Press DOWN (▼) or UP (▲) button to set the value.



7. To set the first Ramp rate, press SCROLL (G) button to select '**RMP.1**'. Press DOWN (▼) or UP (▲) button to set the value.



8. To set the first Dwell, press SCROLL (G) button to select '**DWEL.1**'. Press DOWN (▼) or UP (▲) button to set the value.









9. Now repeat the above three steps (6, 7 & 8) to set remaining all segments.

NOTE

- If not all the segments are used for a program, the Ramp & Dwell of each of the subsequent Segments should be set to OFF.
- A program will end in one of two ways, either revert to the control Set Point or dwell at the temperature set in the last segment used. When a program finishes on a dwell and the dwell time expires the temperature will revert to the control set point.
- Before running a program ensure that the control set point is set to Zero to avoid unexpected heating at the end of the program.
- When a Holdback is set, each segment used must have a Ramp Rate assigned to it, in order for it to be recognized by the program.

To Operate the Programmer

Operation	Action	Indication
To Run a program	Press and quickly release  + 	Beacon RUN = On Scrolling display - CURRENT PROGRAM STATE
To Hold a program	Press and quickly release  + 	Beacon RUN = Flashing Scrolling display - PROGRAM HOLD
To Reset a program	Press and hold  +  for more than 1 second	If program has ended then 'PROGRAM END' will be displayed at the end of the program

Programs can also be operated from the 'P.STAT' parameter found in the level 2 parameter list.



NOTE

- The program ramp rate is designed to reduce the heating rate or cooling rate that the furnace normally exhibits. When not using this feature, the furnace will operate at its maximum heating and cooling capability.
- When the program ramp has ended or has been reset, the furnace will continue to maintain set point temperature. It will not cool to ambient temperature unless the set point is set to ambient temperature by the program or by the operator.
- When a step change is required, the ramp rate should be set to 'OFF'.
- Where ramp/dwell pairs are not required, the ramp rate should be set to 'OFF' and the target set point, TSP, the same as the preceding segment.
- END TYPE - when the end type is SP2, Timer END does not occur until the ramp is complete or SP2 is achieved. It is more usual to use a DWELL (default) or RESET end type.

Operation - 3216i Excess Temperature Controller

The 3216i controller serves as the Excess Temperature controller, when installed in the unit, provides an additional, independent temperature control system to help protect products from excess temperatures. The excess temperature controller is a single setpoint controller, which provides a single digital display to indicate the setpoint temperature (excess temperature Alarm threshold).

The Excess Temperature Alarm Threshold is typically set about 10°C (18°F) above the operating temperature of the chamber to account for variance for the process value temperature of the chamber. For example, Chamber temperature = 1200°C (2192°F) then Excess Temperature Alarm Threshold = 1210°C (2210°F). The maximum allowable Excess Temperature Alarm Threshold for this unit is 1250°C (2282°F) or +50°C (122°F) from maximum rating of the chamber temperature.

Excess temperature controller features are OTP (Over temperature protection), sensor break protection, and power failure indication.

NOTE *After turn on the unit & power failure, user must press PAGE button + SCROLL button for the normal operation of the unit.

Table 4 Default settings for the Excess temperature controller

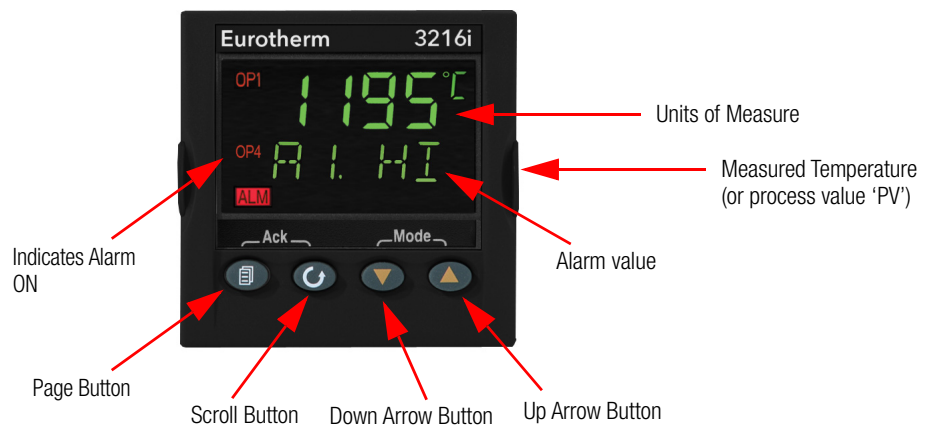
Parameter	Description	Factory Default Value	Access
ALARM.1.Threshold	Excess temp threshold	1250°C	Level 1+2 Read/Write
ALARM.1.Hysteresis	Alarm Hysteresis	1°C	Level 2 Read only
INPUT.Units	Display Units	°C	Level 1+2 Read/Write
INPUT.PVInValue	PV Input Value	Displays Process Value	Level 1+2* Read only
ACCESS.HomeDisplay	Home Display	Excess temp threshold (1250°C)	Level 1+2 Read/Write
INPUT.PeakHigh	Peak High	Peak High PV value	Read only
INPUT.PeakReset	Peak Reset	Peak Reset	Level 1+2 Read/Write
INPUT.TimeUnits	Time Units	Mins	Level 1+2 Read/Write
INPUT.Time	Time exceeded	Time in alarm	Level 1+2 Read/Write
INPUT.PVOffset	PV Offset	+/- adjusted with respect to main controller PV reading	Level 1+2 Read/Write
Customer ID	Customer ID	1202	Level 2 Read only

NOTE *Level 1+2 Read Only states that, Level 1 gives Read only access to user where as Level 2 gives Write access along with Read access.

NOTE To enter Level 2 and Level 1 refer to the section “To Enter Level 2” .

Excess Temperature controller Operation

When the controller is turned ON it will perform a short self-test and then display a default page as shown in the below image. The excess temperature Alarm threshold (setpoint) is found in the display. This excess temperature controller will be configured with respect to its functionality in the factory.



Buttons and Indicators

- PAGE button:** Allows you to select a new list of parameters.
- SCROLL button:** Allows you to select a parameter within a list of parameters.
- DOWN button:** Allows you to decrease a value.
- UP button:** Allows you to increase a value.

Operational Instructions

NOTE If at any time you want to return to the HOME DISPLAY, press PAGE button.

1. To turn on the Load:


Press PAGE  and SCROLL  buttons to acknowledge the “ALM”.




Following image will be displayed after acknowledging the ALARM and load (heating element) will be turned on.



2. To change the Display Units:

Press SCROLL  button until "UNITS" is displayed, then change the desired unit's type with up/down arrow. A few seconds after the button is released, the controller will accept the new value and is indicated by a brief flash of the display.

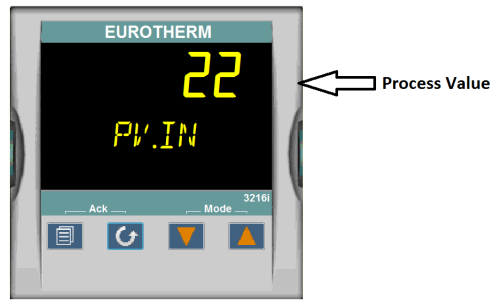
Press PAGE  button to return to HOME display.

Units Choice of Celsius (°C), Fahrenheit (°F), Kelvin (°K), Percentage (%), or None (none).







3. To get the PV value (Process Value):

Press SCROLL  button until "PV.IN" shows on the controller display.






- To change the Excess temperature Alarm threshold (High Limit / Setpoint)

Press the SCROLL  button until "A1.HI" is displayed, then press the UP  or DOWN  button for the desired alarm threshold value is displayed and then release the button. A few seconds after the button is released, the controller will accept the new value and is indicated by a brief flash of the display.

Press PAGE  button to return to HOME display.




- To change the ALARM HYSTERISIS

Press the SCROLL  button until "A1.HYS" is displayed, then press the UP  or DOWN  button for the desired HYSTERISIS value is displayed and then release the button. A few seconds after the button is released, the controller will accept the new value and is indicated by a brief flash of the display.

Press PAGE  button to return to HOME display.






- To get the Peak High Temperature reading

Press SCROLL  button until "HIGH" shows on the controller display. (example: below image shows maximum achieved temperature since the unit powered up)



- To REST the Peak High Temperature rating

Press scroll  button until "P.RST" shows on the screen. Press UP  or DOWN  button to rest peak values to the current process values.



Value Options

- 0 (OFF): Peak values not reset
- 1 (ON): Peak values reset

- Sensor Break

Check for Thermocouple connection if controller displays below message.




- TIME UNITS

Press SCROLL  button until TIME UNITS shows on the controller display.

(example: below image shows alarm time units are set as Minutes)



10. TIME

Press SCROLL  button until TIME shows on the controller display. The value shown on display is Time in Alarm.

(example: below image shows ALARM ON time, since the alarm raised on the controller)



11. OP4 (Output4)

Output is controlled through Relay and the logic is inverted in the configuration file with respect to the excess temperature functionality.

When "OP4" is illuminated load is not powered up and when "OP4" is not illuminated load is powered up.

OP4 Turns off when Power connected to Load

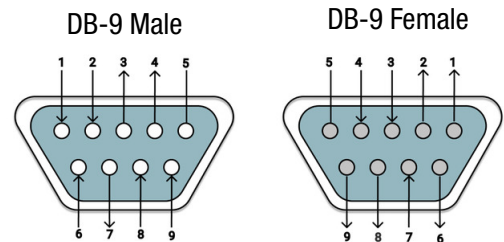


Communication Option

The factory installed optional RS 485 Digital Communications Port allows controller to be connected to a PC for remote monitoring and control of the furnace. The equipment with communication option (COM) is equipped with two DB9 serial ports (1 Male port & 1 Female port). These ports are intended for connection to the PC or a Laptop & making a communication chain of furnace with communication option (COM) Capability. The RS 485 communication allows multiple devices (up to 30) to communicate at half-duplex on a single pair of wires, plus a ground wire.

NOTE The RS 485 pin should match with your DB9 to USB or 232 adapters for the communication option to work.

Furnace DB9-Pinout	RS 485 Output
Pin 2	A / D-
Pin 3	B / D+
Pin 5	Ground



Adapters - RS 485 to RS 232/USB

The communication option requires an RS 485 to USB Adapter or RS 485 to RS 232 Adapter to for the furnace to communicate with the PC or Laptop. The RS 485 to USB or RS 485 to RS 232 adapter with terminal block is recommended for free wire connections. RS 485 adapter is suggested as pin connections vary with different adapter manufacturers and may not work properly if they don't match with the above DB9 pinout of the furnace.

NOTE Please ensure the adapter is compatible with the operating system of your PC/Laptop. Some adapter needs driver softwares & port access privileges on your PC/Laptop for proper functioning. Please contact your local IT for assistance.

RS 485 Pinout & Connections

The furnace is provided with a communication cable for connecting the furnace to the RS 485 adapter. The communication cable consists of DB9 connector at both ends. Use the accessory Cable # 7233 for serial communication.

NOTE 7233

Twenty five feet RS 485 cable and RS 232 converter for connection of furnace/control console RS 485 port to personal computer serial port.

Host Computer & Software

The host computer can communicate with furnaces with communication option (COM). A datalogging & control software is required for data logging & control of the furnace using the RS 485 communication. Software like Spec view is suitable for these applications. These softwares can communicate with either a single Furnace or a network of Furnaces with the communication option.

Controller Parameters for Communication

Table 4 Controller Parameters for Communication

Parameter	Value
Comms Module Identity	Comms (67)
Communications Protocol	Modbus
Communication Interface	RS 485
Baud Rate	9600_baud (0)
Parity	None
Comms Address	1

Troubleshooting Communications

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

- a. Verify complete and tight cable connections between the furnace and the PC.
- b. Verify that power has been supplied to the unit and temperature controller before starting the software program.
- c. Verify DB-9 pin connections as shown in wiring diagram, interchange 2 & 3 connections if communication is not working.
- d. Verify the configuration values in the controller, listed in the Table 4 “Controller Parameters for Communication”.

Maintenance & Cleaning

General Maintenance



CAUTION : Maintenance should only be performed by trained personnel.



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



WARNING : Before maintaining this equipment, read the applicable Safety Data Sheets (SDS). SDS is provided with unit.



WARNING : When installing, maintaining, or removing the ceramic fiber 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 ceramic fiber parts and dust in plastic bags and dispose of properly.

Cleaning and Decontamination

Furnace must be kept clean in order to ensure proper operation. Cleaning routine should be started with furnace at room temperature.

1. Vacuum the chamber to remove dust/debris, if needed.
2. Clean/Disinfect all exterior surfaces with a general-use laboratory disinfectant, such as quaternary ammonium. Rinse thoroughly with sterile distilled water, then 70% alcohol. Dry with a clean cloth as needed. Be sure not to spray any liquids directly on electronics, controls, and ceramic insulating materials or heating elements.
3. Ensure the upper exhaust port is free of any soot buildup. A pipe cleaner or stiff wire can be used to clean out the exhaust port.

4. Interior Surfaces Cleaning: Do not use any liquids on ceramic insulating materials or heating elements.

Heating Elements

The heating units are rated for a maximum of 1200°C. They will resist attack from most corrosive agents. High concentrations of atmospheres or chemicals which may have corrosive effects on the ceramic fiber are sulfates, chlorides, fluorides, alkalis, and vanadium. Please contact Thermo Fisher Scientific regarding questions on the effect of specific atmospheres on your furnace performance.

High concentrations of volatile materials being burnt off in the furnace may reduce heating element life. Proper venting of the volatiles is essential.

After prolonged use, hairline cracks may develop in the insulating materials. Minor cracks will not affect furnace performance.

Care should be taken when working with or handling the heating units, as the ceramic fibers and dust particles are a possible eye/skin/lung irritant. Read the applicable Safety Data Sheets (SDS). SDS is provided with unit

Heating Unit Replacement

Replacement of the heating units requires partial disassembly of the furnace. Two persons may be required for parts of the procedure. Allow adequate work space for the disassembly.

1. Be sure to disconnect all power to the furnace.
2. Remove the outer panels of the furnace by removing the appropriate hex-head screws.
3. Remove the radiation panels (thin-gauge sheet metal on the sides and top of the furnace chamber).
4. With the door in the open position, remove the guard brackets at the front sides of the chamber.
5. With the furnace door held or braced, remove the door springs on each side of the chamber.
6. Remove the two bolts that hold the door assembly to the furnace. This will free the entire door assembly so that it can be removed from the chamber frame.
7. Remove the thermocouple and the power wires/connecting straps from the heating elements at the rear of the furnace.
8. Open furnace slightly. Disassemble the chamber frame starting from the top rear and working toward the base. The front supports do not have to be removed. The heating elements can then be pulled back and out of the remaining front support brackets.
9. A gasket made of ceramic fiber blanket is located between the two heating units. This material should be retained and used with the replacement heating units.

10. Install the replacement heating units in the frame and reverse the above procedure to reassemble the furnace.

Thermocouple (T/C) Replacement

To replace the thermocouple:

1. Disconnect power to the furnace.
2. Remove the back panel of the furnace by removing the appropriate eight hexhead screws.

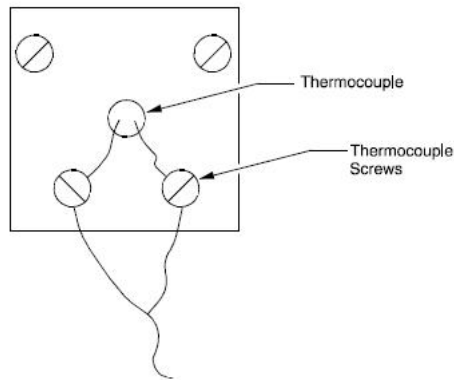


Figure 6 Thermocouple

3. The thermocouple is located in the upper left hand corner of the rear of the furnace. Note location and color of the thermocouple and lead wires. Remove the mounting and connection screws. Carefully pull the thermocouple assembly out of the furnace chamber.
4. Replace the cylindrical thermocouple section with the new section. Put the thermocouple assembly back into the furnace chamber. Fasten with the mounting screws and reconnect wires. Refer to Figure 8 “Wiring Diagram (BF51731, BF51732)” for proper wire connections.
5. Replace the back panel.

Solid State Relay (SSR) Replacement

To replace the solid state relay:

1. Disconnect power to the furnace.
2. Remove the left side panel (facing front) to provide access to the SSR assembly.
3. Note positions of the wires on the SSR. Disconnect the wires and remove outer screws. Remove the heat sink and SSR from the furnace.
4. Remove the SSR from the heat sink. Replace with the new SSR and reverse the above procedure for reassembly.

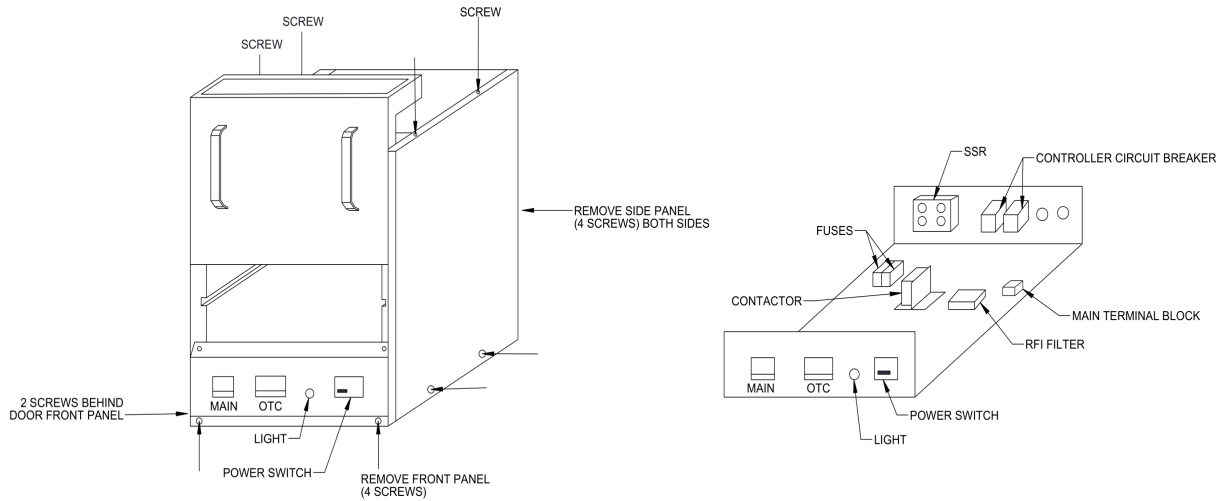


Figure 7. Controller Electrical Panel

Door Insulation Replacement

To replace the door insulation:

1. Disconnect power.
2. Open furnace door.
3. Loosen the screws holding the upper and lower door insulation brackets in place. The screws do not need to be removed.
4. Pull the door insulation out of the support brackets. Insert new insulation and reassemble the support brackets.

Troubleshooting



DANGER : 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 controller and furnace problem.

Table 6 Eurotherm 3216 Controller Troubleshooting

Problem	Probable Cause	Solution
Etun	Auto tune cannot be performed.	Check whether program or timer is running, If yes Turn off Programmer or Timer. Turn off Auto tune & Turn on again The error will be resolved, if still problem persist contact your supplier.
ECAL	Calibration error	Re-instate factory calibration.
E2.Er	EEPROM error	Return to factory for repair.
EE.Er	Non-vol memory error	Note the error and contact your supplier.
E.Lin	Invalid input type. This refers to custom linearization which may not have been applied correctly or may have been corrupted.	Return to factory for 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.
	One of two circuit breakers is tripped.	If you find the breaker tripped first try to reset it by pressing the button in. If the breaker is not tripped and will not reset it should be replaced. Ensure both breakers are reset.

Table 7 Furnace Troubleshooting

Problem	Solution
Furnace temperature runs away.	Check solid-state relay: Disconnect controller source to solid state relay. Connect power to furnace. If the heating unit heats, replace the solid-state relay.
Furnace does not heat.	Front panel red indicator light is on: If the controller run or local light is off, check that the setpoint temperature is higher than the furnace display temperature. If the controller run or local light is on, disconnect power from the furnace and check the heating element for continuity.
	Front panel red indicator light is off: Check that the power switch is on. Check that the indicator lights on the controller display are on. Check that the furnace door is fully closed. Check that the door interrupt switch is engaged when the furnace door is fully closed. Check the electrical wires for visible damage. Replace the electrical wires if necessary. Check that the deviation high alarm setpoint on the controller is set higher than the operating temperature.

Replacement Parts

Table 8 Model BF51731 and BF51732 Box Furnaces, 1200°C

Description	Item
Main circuit breaker	302795H04
Heater fuse	32657-004
Contactora	300088H01
Solid state relay	102460
Red pilot light	33002-01
Control Circuit Breaker	21642H01
Door Limit Switch	38258H01 & 38259H01
Excess Temperature Controller ("B" Models)	CN71X1202
Double Thermocouple ("B" Models)	7299-1200-00N S
Controller (3216c) w/o COMMS	CN71X305
Controller (3216c) w/COMMS	CN71X306
Controller (3216p) w/o COMMS	CN71X307
Controller (3216p) w/COMMS	CN71X308
Hearth Plate	7221-2061-00A
Shelf	7221-2060-001
Exhaust Port Cover	7221-2063-00A
Gas Inlet assembly	300253G04
Single Thermocouple	7299-1104-00H S
Thermocouple lead wire	33940-002 (4 feet)
Heater/Insulation Assembly	304969H01 (2 per unit)
Door Insulation	7221-2048-00A
RFI Filter	CAX94
Wire Harness	38850G301
COMMS male end cable	303402G01
COMMS female end cable	303402G02
Screwlock Kit	740-0039
Operational Manual	304257H02

Wiring Diagram

304256I02

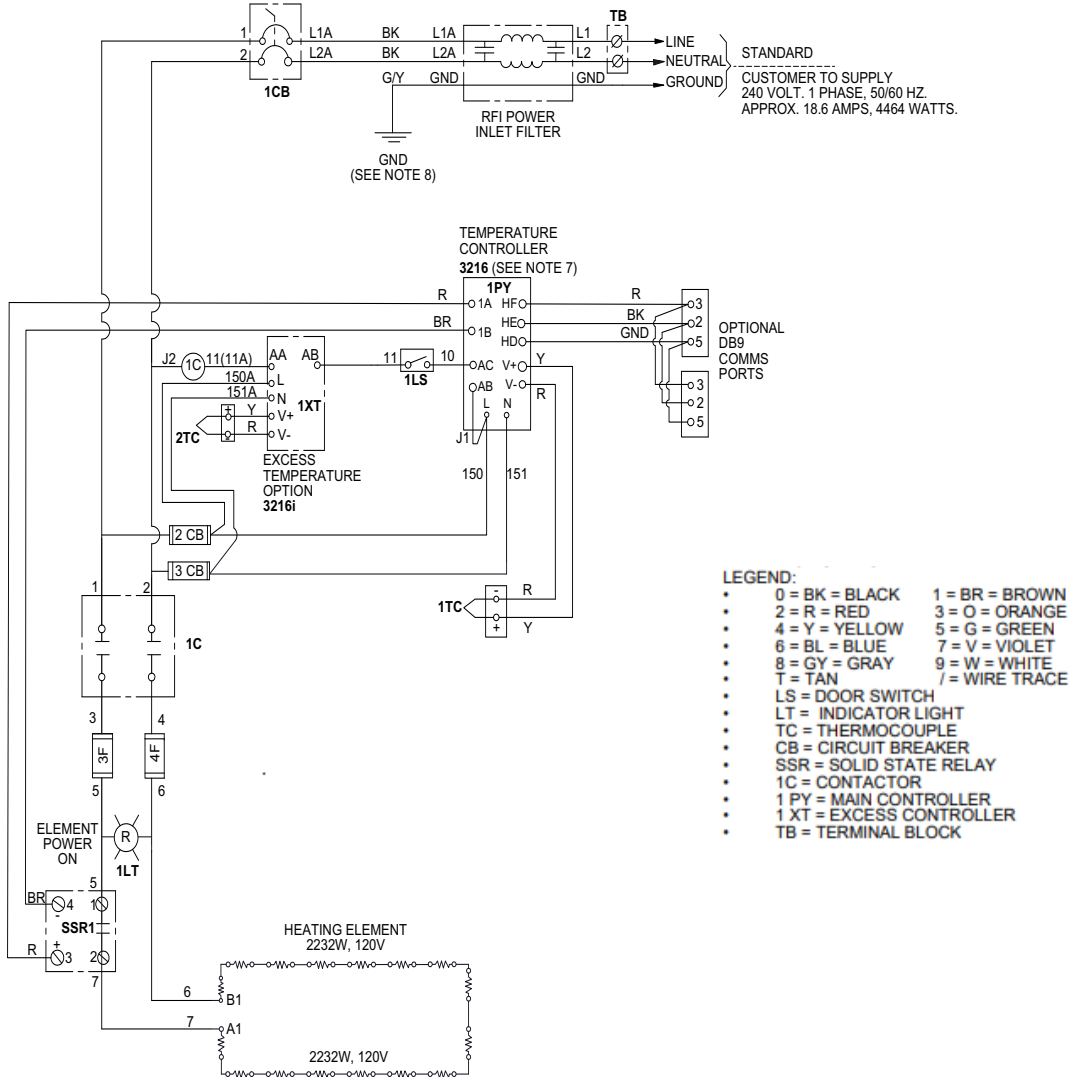


Figure 8 Wiring Diagram (BF51731, BF51732)

End of Life Care

Be sure to follow local regulations when disposing of any unit. Some additional suggestions are listed below:

- Be sure to clean up any biological safety hazards.
- Have a certified technician remove the insulation from the unit then dispose per SDS and local laws and regulations.

WEEE Compliance

WEEE Compliance. This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2012/19/EU. It is marked with the following symbol. Thermo Fisher Scientific has contracted with one or more recycling/disposal companies in each EU Member State, and this product should be disposed of or recycled through them. Further information on our compliance with these Directives, the recyclers in your country, and information on Thermo Scientific products which may assist the detection of substances subject to the RoHS Directive are available at www.thermofisher.com/

WEEE Konformität. Dieses Produkt muss die EU Waste Electrical & Electronic Equipment (WEEE) Richtlinie 2012/19/EU erfüllen. Das Produkt ist durch folgendes Symbol gekennzeichnet. Thermo Fisher Scientific hat Vereinbarungen getroffen mit Verwertungs-/Entsorgungsanlagen in allen EU-Mitgliederstaaten und dieses Produkt muss durch diese Firmen verwertet oder entsorgt werden. Mehr Informationen über die Einhaltung dieser Anweisungen durch Thermo Scientific, die Verwerter und Hinweise die Ihnen nützlich sein können, die Thermo Fisher Scientific Produkte zu identifizieren, die unter diese RoHS-Anweisung fallen, finden Sie unter www.thermofisher.com/

Conformità WEEE. Questo prodotto deve rispondere alla direttiva dell'Unione Europea 2012/19/EU in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). Marcato col seguente simbolo. Thermo Fisher Scientific ha stipulato contratti con una o diverse società di riciclaggio/smaltimento in ognuno degli Stati Membri Europei. Questo prodotto verrà smaltito o riciclato tramite queste medesime. Ulteriori informazioni sulla conformità di Thermo Fisher Scientific con queste Direttive, l'elenco delle ditte di riciclaggio nel Vostro paese e informazioni sui prodotti Thermo Scientific che possono essere utili alla rilevazione di sostanze soggette alla Direttiva RoHS sono disponibili sul sito <http://www.thermofisher.com/>

Conformité WEEE. Ce produit doit être conforme à la directive européenne (2012/19/EU) des Déchets d'Équipements Électriques et Électroniques (DEEE). Il est marqué par le symbole suivant. Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider la détection des substances sujettes à la directive RoHS sont disponibles sur <http://www.thermofisher.com/>

Cumplimiento de WEEE. Se requiere que este producto cumpla con la Directiva 2012/19/UE de Residuos de Equipos Eléctricos y Electrónicos (WEEE) de la Unión Europea. Está marcado con el siguiente símbolo. Thermo Fisher Scientific ha contratado a una o más empresas de reciclaje / eliminación en cada Estado miembro de la UE, y este producto debe desecharse o reciclarse a través de ellos. Para obtener más información sobre el cumplimiento de estas Directivas, los recicladores de su país e información sobre los productos Thermo Scientific que pueden ayudar a detectar sustancias sujetas a la Directiva RoHS, visite www.thermofisher.com/

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For countries not listed here, visit www.thermofisher.com and go to the Contact Us page under the Services menu to locate the contact information for your area.

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