thermoscientific

Thermo Scientific Lindberg/Blue M Control Console

Models: CC58434, CC584343

Installation and Operational Manual

304118H04 Rev. A February, 2022

ThermoFisher SCIENTIFIC

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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 : Unauthorized repair of your Control console 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.

Standards and Directives

The Control Console 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 safety standards by a Nationally Recognized Test Laboratory (NRTL) and may bear the NRTL's mark of safety compliance to those applicable standards.

The maximum limit of 10 mA shall not be exceeded when tested according to Clause 5.5 (Measurement of protective conductor current) of EN 50678 VDE 0701.

Electromagnetic Compatibility

FCC Statement (USA)

This device complies with Part 15 Subpart B of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by the manufacturer 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 ISED IC Notice

This ISM digital apparatus complies with Canadian ICES-001, Class A.

Cet appareil ISM est conforme á la norme NMB-001 du Canada, Classe A.

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 is 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 is determined to reduce the impact we have on the environment, and so can declare that this product complies with the European Parliament's RoHS2 (Restriction of Hazardous Substances) Directive 2011/65/EU, and 2015/863 Annex II (RoHS2 Amendment) with respect to the limitation of the following substances:

- Lead (0.1 %)
- Mercury (0.1 %)
- Cadmium (0.01 %)
- Hexavalent chromium (0.1 %)
- Polybrominated biphenyls (PPB) (0.1 %)
- Polybrominated diphenyl ethers (PBDE) (0.1 %)
- Bis(2-ethylhexyl) phthalate (DEHP) (0.1 %)
- Butyl benzyl phthalate (BBP) (0.1 %)
- Dibutyl phthalate (DBP) (0.1 %)
- Diisobutyl phthalate (DIBP) (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 follow established exemptions of the regulation 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:

A declaration may be obtained from the manufacturer with greater detail of this conformance.

Introduction

Lindberg/Blue M CC58434 series control consoles are complete three zone temperature control systems containing microprocessor-based digital temperature controllers or programmers and featuring an Over Temperature Protection (OTP) system.

Model CC58434 features three independent Single Setpoint/1 Program temperature controllers. CC584343P has three independent multi-program temperature controllers.Model CC53434P is a primary/mimic system with a primary controller temperature programmer for the main furnace zone and mimic temperature controllers for the two other zones. The mimic controllers aim to duplicate or track the main zone temperature.

Each console is equipped with three solid state power modules, a power contactor (for OTP), panel mounted circuit breaker and polarized thermocouple jacks. "B" models also include Over Temperature Control (OTC) by an independent digital controller.

These control consoles are designed to operate the Lindberg/Blue M 1200°C split-hinge laboratory tube furnaces with three heating zones.

Features and Benefits

- Controlled heat-up rate eliminates thermal shock to materials.
- Quick heat-up and cool-down rates.
- Digital instrumentation for precise temperature setpoint and display. Microprocessor capable of automatically optimizes control parameters during furnace operation.
- Main power ON/OFF switch on control panel.
- Platinel II Thermocouple Lead Wire connection.
- Communication option.

Intended Use

Control Console is intended to be used as a general purpose laboratory controller in combination with Thermo Fisher Scientific recommended independent furnace operating between 100-1200° C.

Non-Intended Use

This Control Console is not intended for the following:

- To be used in combination with any non-Thermo Fisher Scientific recommended device.
- To operate any device where the interconnecting power and control cable(s) exceed 3 meters in length.

Specifications

Table 1 Control Console Furnace Series

Model	CC58434PBC-1[1] CC58434PBCOMC-1[1,2]	CC58434BC-1[1] CC58434BCOMC-1[1,2]	CC584343PBC-1[1] CC584343PBCOMC-1[1,2]
Maximum Temperature Range	1200°C	1200°C	1200°C
3 Zone Control	Primary-Mimic	Independent	Independent
Controller Configuration	3216p (Zone 2), 3216c*(Zones 1 & 3) & 3216i	3216c (Zones 1-3) & 3216i	3216p (Zones 1-3) & 3216i
Electrical Voltage	208/240 VAC	208/240 VAC	208/240 VAC
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Maximum Current	60 A	60 A	60 A
Dimensions (D x W x H)	17 x 19 x 14 in (43.1 x 48.2 x 35.5 cm)	17 x 19 x 14 in (43.1 x 48.2 x 35.5 cm)	17 x 19 x 14 in (43.1 x 48.2 x 35.5 cm)
Shipping Weight	60 lbs (28 Kg)	60 lbs (28 Kg)	60 lbs (28 Kg)

3216c = 1/16 DIN, 1 program 8 segment digital dual display controller.
3216p = 1/16 DIN, 5 program 16 segment digital dual display controller.

3216c* = 1/16 DIN, (mimic) digital dual display controller. See “Operation 3216c Mimic temperature controller” for reference.

[1]B: Unit includes 3216i 1/16 DIN, digital dual display over temperature controller.

[2]COM: Unit includes male and female RS 485 Digital Communications DB-9 ports.

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.

Items enclosed in packaging:

- User Manual, SDS, User Information Instruction.
- Essential Safety Instructions.
- External Communications Cable (COM units only).

*NOTE May be contained on optional USB thumb drive.

Environmental Conditions

Indoor Use Only.	
Class of Equipment	Class I
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.

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 Control console, at least 3" (7.62 cm) above the Control console and any combustible surface. This permits the heat from the Control console case to escape so as not to create a possible fire hazard.

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

Lifting and Carrying

CAUTION : Lift with care!

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

Transport

1. Lift at the bottom sides of the Control console with NIOSH rated straps and/or using appropriate number of personnel per local safety policies and regulations.

Location

Install the Control console in a level area free from vibration. To permit proper air flow, leave atleast 3" (7.62 cm) of space on all sides of the unit and 3" (7.62 cm) above the unit. Control Console must be located in the same room of the unit it is operating.

WARNING : Do not stack furnaces or control consoles to avoid damage or personal injury due to units are not designed to be secured together.

Wiring

Thermo Fisher Scientific model control consoles are designed for operation on 208-240 VAC (C units) . The “C” control consoles 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 60 amps on 240 VAC. Minimum recommended wire gauge size is 8AWG, 90°C insulated copper wire. A ground wire should be provided per local code.

2. Remove both console side panels by undoing the appropriate screws. In the back panel, push out the two lower plastic hole plugs from inside the plastic bushing. Insert the power and ground wires through one of the bushings. The second bushing is used for the wiring to the furnace. These control consoles can be used in conjunction with a large number of different furnaces. The internal connections must be made according to the wiring diagram relating to your particular furnace.

Control Console 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. For Furnace connection: Insert min 14 AWG (depending on the wire requirements for furnace) 90°C insulated copper wire no more than 3 meters long to A1 and B1 (Zone 1), A2 and B2 (Zone 2, and A3 and B3 (Zone 3) into terminal block and tighten down securely. The other end of the lead wires will connect to the Thermo Scientific approved furnace.
5. For Door Switch connection: Insert min 14 AWG 90°C insulated copper wire no more than 3 meters long to LS1 and LS2 into terminal block and tighten down securely. The other end of the lead wires will connect to the Thermo Scientific approved furnace.

NOTE If attached furnace does not have a door switch connection, contact technical service for alternate wiring method.

6. Check that all electrical connections are secure.
7. Place the side panels on the furnace and secure with the screws.
8. Connect Thermocouple type Platinel II extension wires (not included with control console) to the thermocouple jacks at the rear of the control console to the respective jacks on the furnace.

NOTE Select three-zone control consoles may be supplied with 6 thermocouple jacks which are primarily only used for units with the primary/mimic style control system. Otherwise only 4 thermocouple jacks wires are supplied for individually controlled zones.

CAUTION For personal safety and trouble-free operation, this unit must be properly grounded before it is used. Always conform to the National Electrical Code and local codes. Utilize proper grounding techniques to reduce RFI and EMI for electronic gear. Do not connect unit to already overloaded power lines; lower voltage to unit will decrease power to the heating elements.

CAUTION Connect the console to the proper power source. Failure to use the specified voltage can result in damage to the unit.

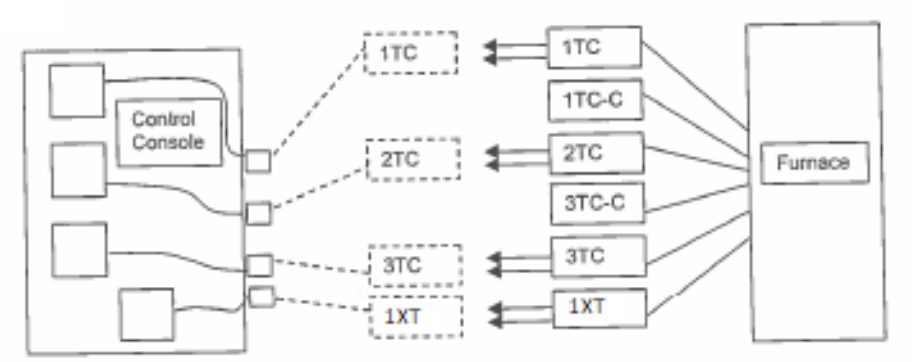


Figure 1 Three single-Setpoint or Three Programmable Controllers, With Over-Temperature

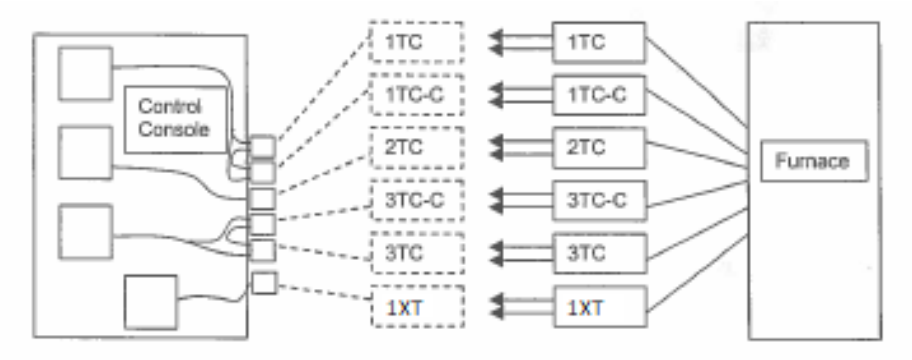


Figure 2 Primary-Mimic (Programmable-Single-Setpoint) Controllers, with Over-Temperature

Start-Up

Initial Control console Start-Up

1. Turn on the main power at the customer-provided disconnect switch or mainline circuit breaker. Make sure that the circuit breaker on the front of the control panel is also in the "ON" position.
2. It is necessary to become familiar with the digital temperature controller(s) before attempting to operate the furnace for the first time. Examine the appropriate installation/operation instructions for the controller(s) that are included with the control console.
   Refer to the separate furnace instruction manual for initial heatup time and temperature recommendations.
   Refer to section “Eurotherm 3216 Controller” for detailed start up steps.
3. During operation, observe output amperage reading with customer connected ammeter device. Ensure amperage for connected furnaces is achieving dataplate values. Contact technical service for further assistance.
4. Open and close door or lid of connected furnace and observe red indicator light turns off (door/lid open) and turns on (door/lid closed).

WARNING : If the controls and indications as described above are not working Properly:

1. Shut off the circuit breaker.
2. Shut off the customer's power to the system before attempting any maintenance or repair.
3. See the Section “Troubleshooting” and “Maintenance & Cleaning” of this manual.

Main Controller: 1x8 & 5x16 Segment Programmable

Eurotherm 3216 Controller

The Eurotherm 3216c and 3216p temperature controllers sense the furnace air temperature (the PV or process value) and provide 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 up to 5 different programs and each program can contain up to 16 segments.

NOTE 3216c controller has a variation in programming that is included only with CC58434P models which functions as a mimic (slave) control comparatively to the center zone (Zone 2) control.

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)

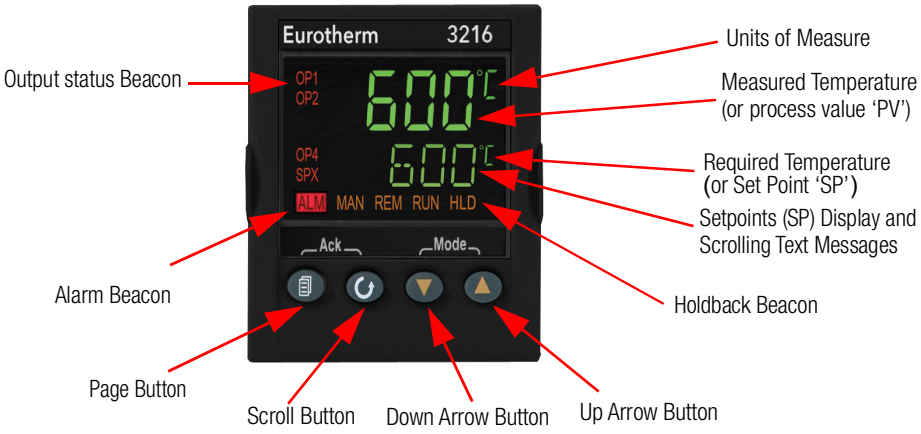
CAUTION : Before operating the controller, read this chapter carefully. Wrong procedures can change the unit characteristics and design parameters, which can hamper performance and make the equipment dangerous to use.

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.

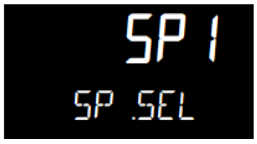
To set the desired temperature set point, complete the following steps:

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 is 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 “Parameter Description and Accessibility in 3216” and Table 3 “Parameter Description and Accessibility in 3216p”.

Thermo Fisher recommends 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.
5. 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

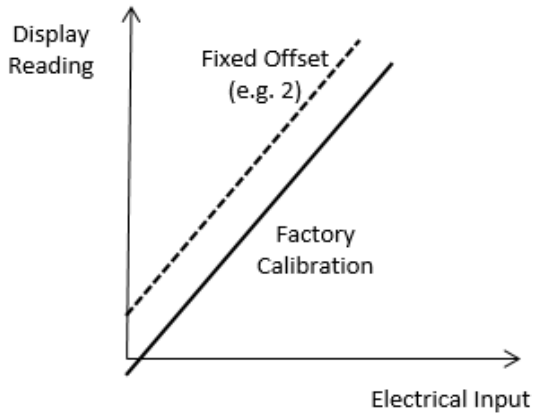
1. Press and hold PAGE button to show the current operator level.
2. Press UP or DOWN button to select LEv 1.

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 button 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** button **and SCROLL button together to acknowledge an alarm**. If the alarm is still present the 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 x Pb in the loop break time the loop is in break.

The loop break time is set by the AutoTune, a typical value is 12 x Td. 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 recommends 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.

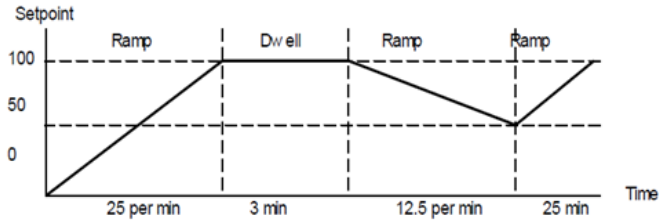
To Configure Deviation High Alarm

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

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

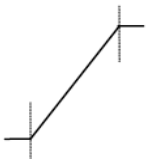


a. Target set point

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

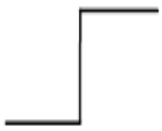
b. Ramp Rate

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.
- 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 3216

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

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 ** COMMS units only

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.

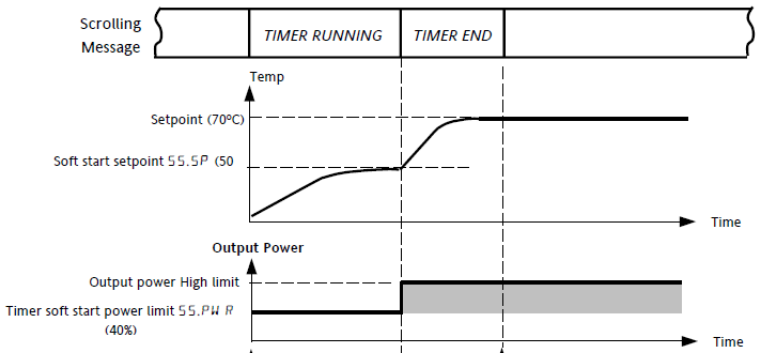
Soft Start Setpoint

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

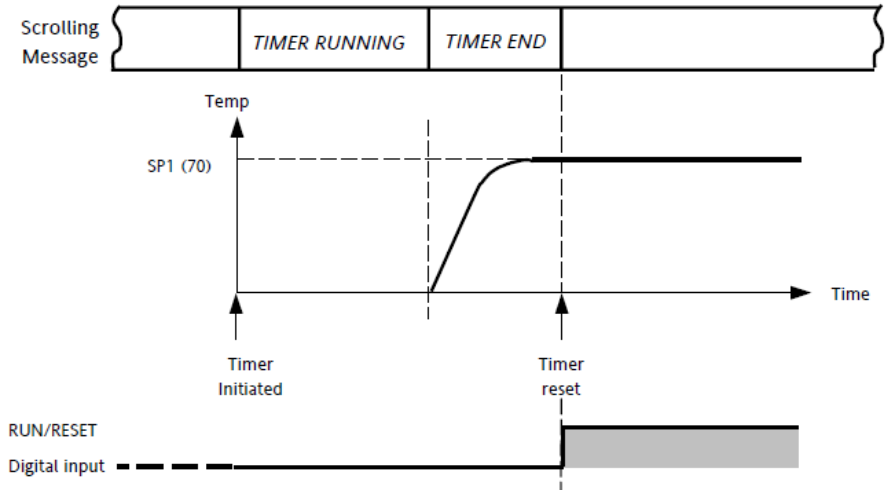
The timer is used to switch on the controller output power after a fixed length of time. It could be used to turn on a process at a particular time.

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.



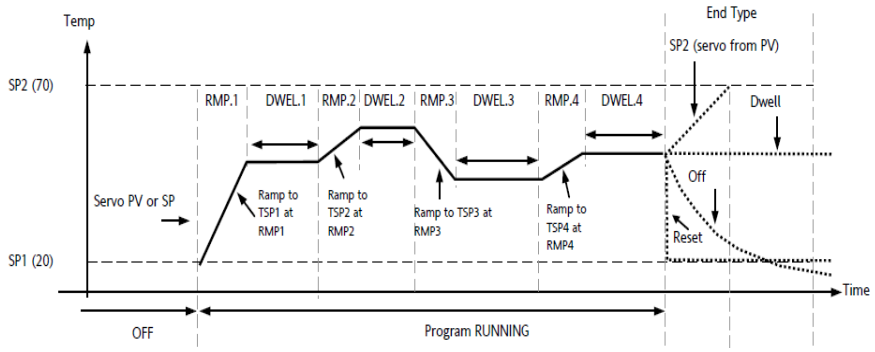
Timer Start Threshold

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 8 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 through parameters in level 2 and set the required **'END.T'** by pressing or .

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).

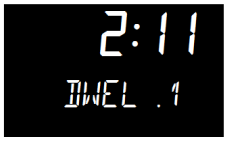
3. Now set the threshold by pressing SCROLL button to select **'THRES'**. Press UP or DOWN button to adjust the value (In this example, the dwell periods will not start until the PV is within 5 units of the set point).

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).

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).

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).

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).



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.

OR


OR


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	Value
1	P.STAT	Program Status	Level 1 + 2	Read/Write	Reset
2	T.REMN	Timer Remaining	Level 1 + 2*	Read Only	-
3	T.ELAP	Elapsed Time	Level 1 + 2*	Read Only	-
2	A1.DHI	Deviation High Alarm Set Point	Level 1+2	Read/Write	50
3	A2.HI	High Temperature Alarm Set Point	Level 2	Read Only	1225
4	SP.SEL	Set point Select	Level 1 + 2	Read/Write	SP1
5	SP1	Set point 1	Level 1 + 2	Read/Write	0-1200
6	SP2	Set point 2	Level 1 + 2	Read/Write	0-1200
7	RAMPU	Set point Ramp Units	Level 1 + 2	Read/Write	Mins
8	SP.RAT	Set point Rate Limit	Level 1 + 2	Read/Write	Off
9	A.TUNE	Auto Tune Enable	Level 1 + 2	Read/Write	Off
10	UNITS	Display Units	Level 1 + 2	Read/Write	Deg C
11	PROG	Current Program Number	Level 1 + 2	Read/Write	1 to 5
12	END.T	Program End Type	Level 1 + 2	Read/Write	Dwell
13	H.BACK	Program Holdback	Level 1 + 2	Read/Write	1
14	DWEL.U	Dwell Units	Level 1	Read Only	Mins
15			Level 2	Read/Write	
16	TSP.1 to TSP.8	Target Set point 1 to Target Set point 8	Level 2	Read/Write	550
17	RMP.1 to RMP.8	Ramp Rate 1 to Ramp Rate 8	Level 2	Read/Write	OFF
18	DWEL.1 to DWEL.8	Dwell Time 1 to Dwell Time 8	Level 2	Read/Write	1 hour
19	PB	Proportional Band	Level 2	Read/Write	15
20	TI	Integral Time	Level 2	Read/Write	95
21	TD	Derivative Time	Level 2	Read/Write	16
22	LBT	Loop Break Time	Level 2	Read/Write	Off
23	PV.OFS	PV Offset	Level 2	Read/Write	0
24	ADDR**	Comms Address	Level 2	Read/Write	1
25	BAUD**	BAUD RATE	Level 2	Read/Write	9600
26	IN.TYP	Input Type	Level 2	Read Only	Platinel II (T028) Thermocouple
27	ID	Customer ID	Level 2	Read Only	307 (without COMMS) 308 (with COMMS)

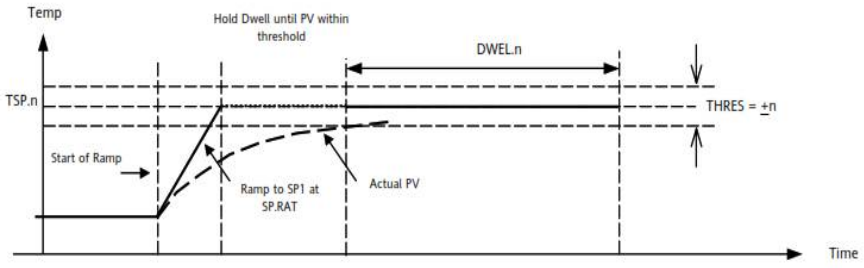
NOTE *Level 1+2 Read Only states that, Level 1 gives Read only access to user where as Level 2 gives Write access along with Read access.

NOTE **COMMS units only

Holdback Function

The temperature ramp rate of the program is quicker than the furnace can achieve. the program will wait until the temperature of the furnace 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 an 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 holdback will only apply once per Segment, therefore when control has been reestablished, the holdback will not apply again to that segment, even if the furnace or oven temperature go outside the holdback 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 holdback 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 holdback 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 1or 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 through parameters in Level 2 and set the required **'END.T'** by pressing or .

OR


OR


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 as many times as necessary to view **'PROG'.**

3. To configure the first Program, press DOWN or UP 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 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 button to select **'DWEL.U'** and then Press or 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 button to select **'TSP.1'**. Then Press DOWN or UP button to set the value.

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

8. To set the first Dwell, press SCROLL 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 1 parameter list.

OR


OR


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 3216c Mimic temperature controller

CC58434P control consoles have a 3216c mimic controller set-up for zones one and three. The mimic controller has two thermocouples attached to it in a bucking arrangement. The configuration of the thermocouples to mimic and primary controller are shown below in Figure 1.

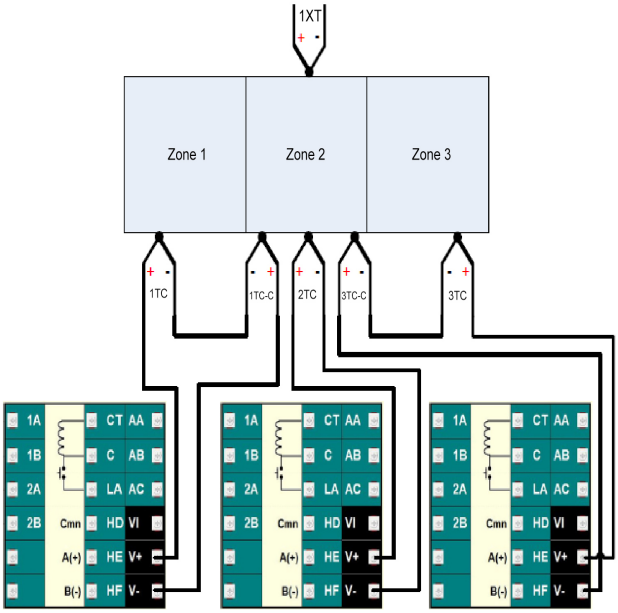


Figure 3

The mimic controller is not set up to take a thermocouple signal, but is instead configured to take a small range millivolt signal, and its PID control loop is tuned to zero out this signal.

The mimic setpoint deviation range is +/- 50C (+/- 120F) from primary temperature. Actual temperature readout of the mimic zone is working from bucked thermocouples which show a deviation from the primary temperature, not the actual value.

NOTE For primary controller functions, see "Main Controller: 1x8 & 5x16 Segment Programmable" section.

Mimic controllers will have the same functions as a 3216c listed in section "Main Controller: 1x8 & 5x16 Segment Programmable" with the exception of the timer/programmer and ramping functions.

Table 4 Parameter Description and Accessibility in 3216C

No.	Parameter	Description	Level	Access	Value
1	A1 DH1	Deviation High Alarm Set Point	Level 1 + 2	Read/Write	25
2	A2.HI	High Temperature Alarm Set Point	Level 2	Read Only	112
3	A3 LO	Low Temperature Alarm Set Point	Level 2	Read Only	-112
4	SP.SEL	Set point Select	Level 1+2	Read/Write	SP1
5	SP1	Set point 1	Level 1+ 2	Read/Write	-50- +50
6	SP2	Set point 2	Level 1 + 2	Read/Write	-50- +50
7	A.TUNE	Auto Tune Enable	Level 1 + 2	Read/Write	Off
8	UNITS	Display Units	Level 1 + 2	Read/Write	Deg C
9	PB	Proportional Band	Level 2	Read/Write	36
10	TI	Integral Time	Level 2	Read/Write	240
11	TD	Derivative Time	Level 2	Read/Write	60
12	LBT	Loop Break Time	Level 2	Read/Write	Off
13	PV.OFS	PV Offset	Level 2	Read/Write	0
14	ADDR**	Comms Address	Level 2	Read/Write	1 or 3
15	BAUD**	Baud Rate	Level 2	Read/Write	9600
16	IN.TYP	Input Type	Level 2	Read Only	mV(millivolt)***
17	ID	Customer ID	Level 2	Read Only	312 (without COMMS);313(with COMMS)
18	InHigh	Linear Input High	-	-	+5
19	InLow	Linear Input Low	-	-	-5

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 **COMMS units only

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 5 Default settings for the Excess temperature controller

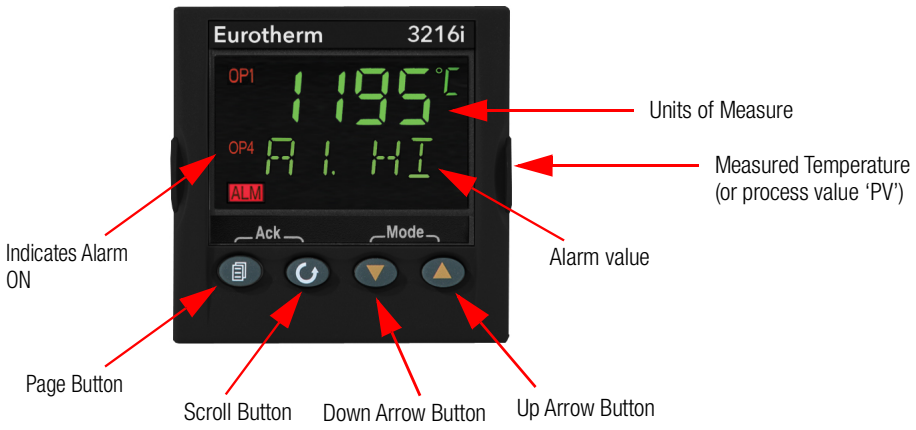
Parameter	Description	Factory Default Value	Access
ALARM.1.Threshold	Excess temp threshold	1250°C	Level 1+2 Read/Write
ALARM.1.Hysteresis	Alarm Hysteresis	1°C	Level 2 Read only
INPUT.Units	Display Units	°C	Level 1+2 Read/Write
INPUT.PVInValue	PV Input Value	Displays Process Value	Level 1+2* Read only
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".

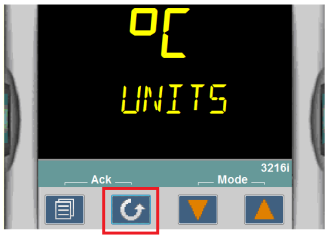
Following image will be displayed after acknowledging the ALARM and load (heating element) will be turned on.

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.

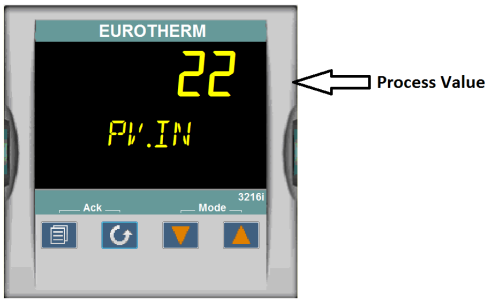
   Press PAGE button to return to HOME display.

   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.



4. 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.

5. To change the ALARM HYSTERSIS

Press the SCROLL button until "A1.HYS" is displayed, then press the UP or DOWN button for the desired HYSTERSIS 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.

6. 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)

7. 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

8. Sensor Break

Check for Thermocouple connection if controller displays below message.

9. 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

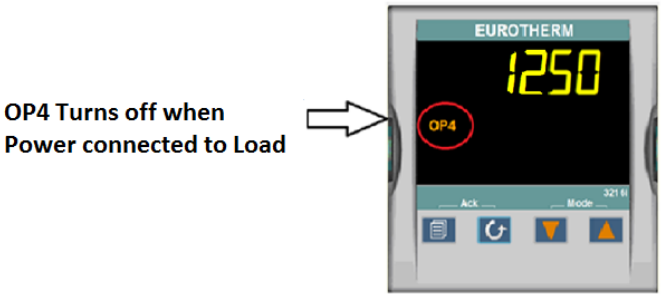
Press SCROLL button until TIME shows on the controller display. The value shown on display is Time in Alarm.

(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.



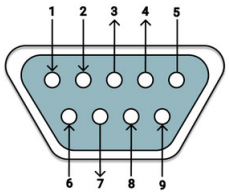
Communication Option

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.

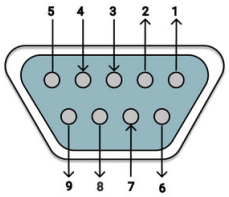
NOTE The RS 485 pin should match with your DB9 to USB or 232 adapters for the communication option to work.

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

DB-9 Male



DB-9 Female



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 adapters need driver softwares & port access privileges on your PC/Laptop for proper functioning. Please contact your local IT for assistance.

NOTE Contact Thermo Fisher Scientific for availability for serial cable connection.

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 data logging & control software is required for data logging & control of the furnace using the RS 485 communication. Thermo Fisher Scientific does not providie any software - please refer to specialized software suppliers like SpecView or Eurotherm. These softwares can communicate with either a single Furnace or a network of Furnaces with the communication option.

Controller Parameters for Communication

Table 6 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

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 “Controller Parameters for Communication” .

Maintenance & Cleaning

CAUTION : Maintenance should only be performed by trained personnel.

WARNING : Disconnect furnace from main power before attempting any maintenance to control consoles.

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

NOTE It is recommended to maintain unit minimum once every 12 months or unless otherwise specified.

Cleaning and Decontamination

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

Clean/Disinfect all exterior surfaces with a general-use laboratory disinfectant, such as quaternary ammonium. Wipe 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.

Control Module Replacement

To replace the control module, complete the following steps:

1. Disconnect main power and switch the circuit breaker to the OFF position.
2. Remove both side panels by removing four screws from ean panel. Pull the top panel off. The front control panel will hinge forward to access the module.
3. Note the terminal connections of the wires and label them for reattachment. Remove power input and output wires from the back of the control module. Observe polarity for the thermocouple lead wire. Red is always negative.
4. Remove top and bottom panel retaining clips on controller holding it to the panel.
5. Remove the module.
6. Install the replacement instrument by reversing the above procedure.
7. Hinge the front panel upward in a vertical position and slide top panel on. Re-attach side panels.

Solid-State Relay Replacement

To replace the SSR(s), complete the following steps:

1. Remove the control console side panels. The SSR(s) are mounted on the inside surface of the back panel.
2. Disconnect the wires from the SSR, label the wires for reinstallation.
3. Undo the two screws holding the SSR to the rear panel and remove the SSR.
4. Smear a thin layer of heat sink paste under the new SSR before fitting. Alternatively use a SSR thermal pad instead of paste.

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 troubleshoot control console/furnace problems.

Table 7. Troubleshooting

Problem	Solution
Absence of current and presence of voltage on element input terminal.	Heating element is cracked or open. Replace broken element.
Controller process value temperature display decreases when furnace is heating	Check thermocouple polarity. Red is always negative
Controller process value temperature display does not increase or decrease when the furnace is heating	1. Check all thermocouple wires for a short. a. Visually inspect the thermocouple wires for a cut in the wire. b. Check that the wires at the connections do not touch each other. 2. Check the controller. Use a secondary temperature display device, design for PLII thermocouple, to check thermocouple temperature. If thermocouple temperature is correct, the controller may be faulty.
Furnace temperature is too high or Heating element fail to shut off.	Thermocouple: a. Heating element fail to shut off. Check the thermocouple visually for breaks. If a break is evident replace the thermocouple. b. Check the ceramic thermocouple support tube for cracks which result in the thermocouple wires touching in breaking area. If the wires are touching break the thermocouple. c. Check all thermocouple connections. Connections should be clean and free of corrosion. d. Check the reductions of diameter in the wire immediately behind the welded junction. If there is reduction, replace thermocouple. e. Check for reduction of diameter in the wires immediately behind the welded junction. if there is reduction, replace thermocouple.

Problem	Solution
Indicator Lights	
Red light is on. Furnace does not heat.	1. Check the controller output Power (OP) display. 2. Check the controller configuration. 3. Check the heating elements for continuity. Replace any broken heating elements. 4. Check the fuses for continuity. Replace any deactive or blown fuses.
Red light is off. Furnace does not heat.	1. Check that the control circuit breaker is on. 2. Check that the red light is working. Replace the light If necessary. 3. Check that the door interlock switch has a closed circuit when the door/lid is closed. Adjust or replace the switch if necessary. 4. Check that the Alarm Setpoint on the controller is set above the operating temperature.

Table 8. 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.

Replacement Parts

Table 9 Model CC58434, CC584343 Series Control Console, 1200°C

Description	Item
Thermocouple lead wire (PLII)	33940-006
Wire harness	38850G26
Wire harness, Mimic (CC58434P units only)	38850G26A
Main circuit breaker	302795H10
Contactor, 240 VAC	119750
Solid state relay	102460
Controller (3216c) w/o COMMS	CN71X305
Controller (3216c) w/COMMS	CN71X306
Controller (3216p) w/o COMMS	CN71X307
Controller (3216p) w/COMMS	CN71X308
Controller (3216i)	CN71X1202
Fuse - Furnace protection	104839
Circuit Breaker(3 Amp)	21642H01
Fuse Holder (3 Pole for 30 A Fuse)	33501-033
Thermocouple Jack (Type K)	33931-002
Heatsink	7212-2209-001
SSR Thermal Pad	303201H01
Controller (3216C) mimic w/o COMMS (CC58434P units only for Zone 1 and Zone 3)	CN71X312
Controller (3216C) mimic w/COMMS (CC58434P units only for Zone 1 and Zone 3)	CN71X313
Mains Terminal Block (2 Pole)	33402-002
Heater Terminal Block (6 Pole)	33407-003
Door Switch Terminal Block (2 Pole)	33407-001
Indicator Light, Red (250V)	33002-001
Thermocouple Extension wire (PLII) - 3 meters long	332211G01
External COMMS Wire (RS485: DB9 Female to stripped ends)	303401G02

Description	Item
Internal Communication Kit (RS485)	7115-10
EMI Filter	331823H01
Operation Manual	304118H04
Wiring Diagram CC58434PB	38651I04
Wiring Diagram CC58434B & CC584343PB	38649I05

Wiring Diagram

38651104

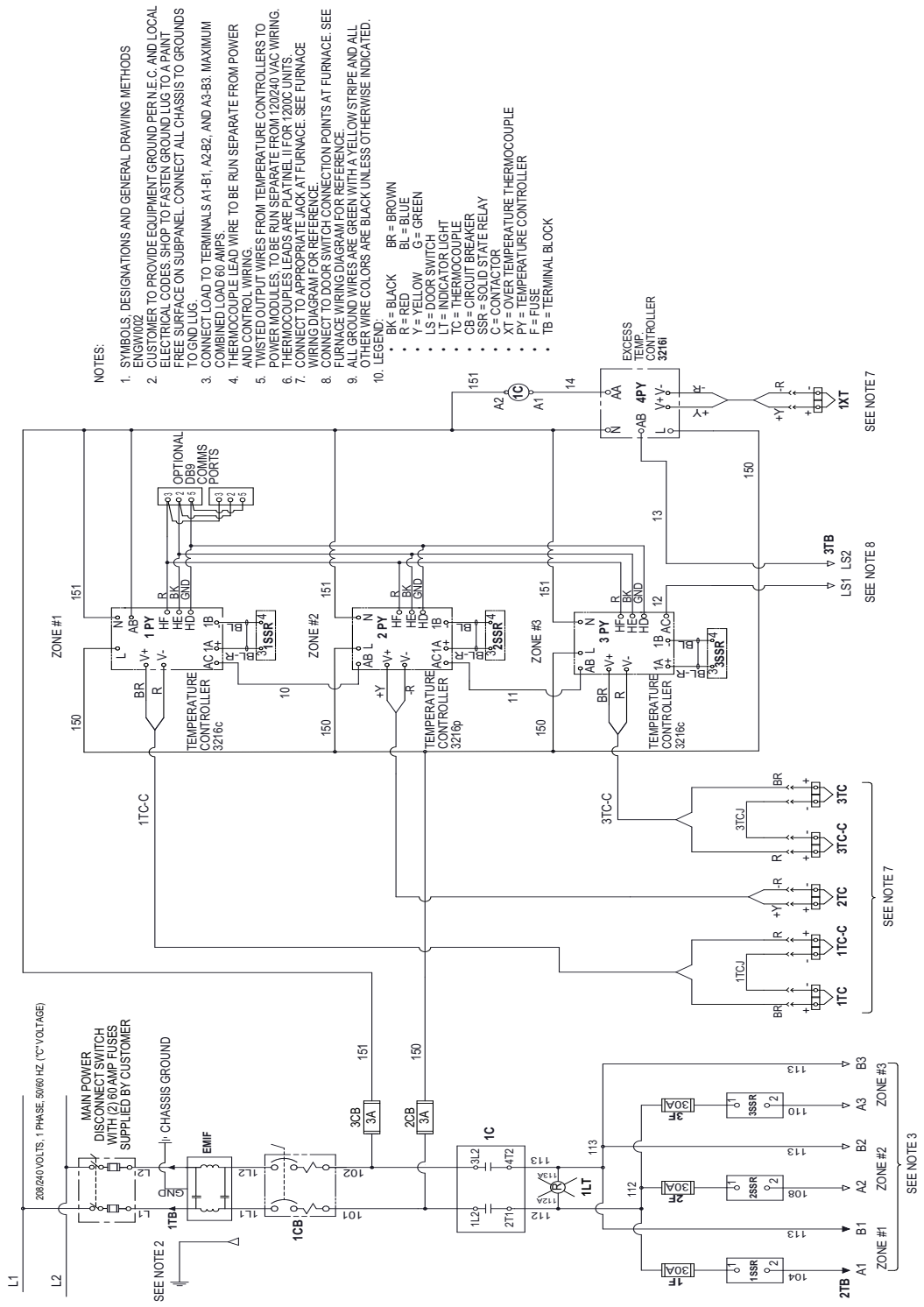


Figure 4 Wiring Diagram (CC58434PB with primary/mimic zone controllers)

38649I05

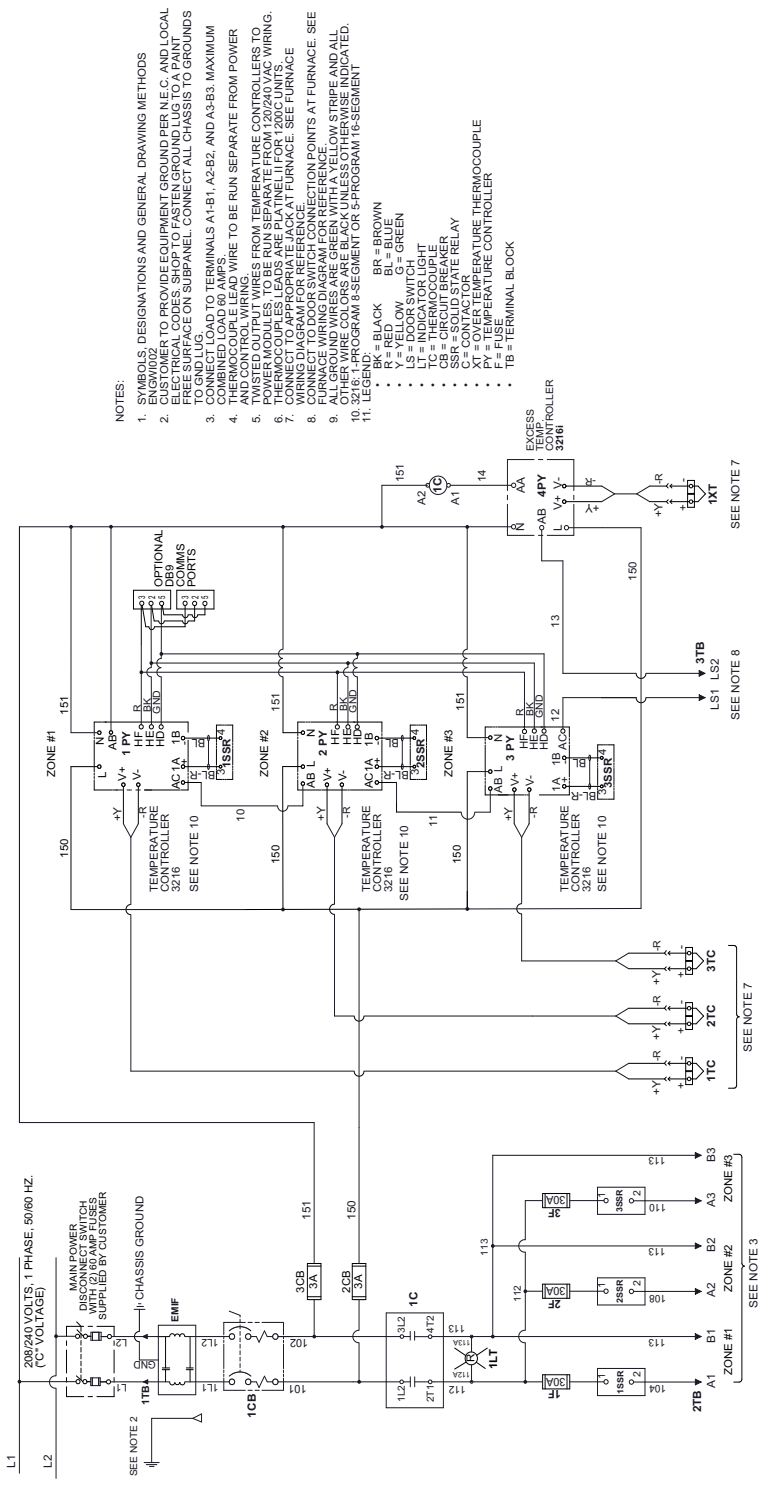


Figure 5 Wiring Diagram (CC58434B and CC584343PB with independent zone controllers)

End of Life Care

Some considerations and suggestions are listed below for proper disposal of this product. While addressing these actions for safe recycling and disposal, please follow all guidelines, Safety Data Sheets (SDS), or regulations applicable to your country and region.

- This product has materials and components that may be recycled or reused according to local guidelines and regulations.
- Clean up any chemical or biological safety hazards using appropriate methods.

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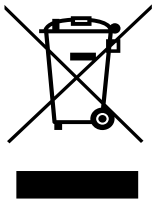

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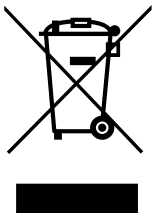

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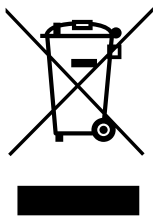

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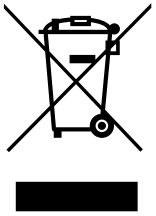

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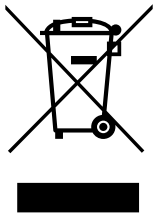

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