CARBOLITE GERO 30-3000°C

Installation, Operation and Maintenance Instructions

Controller Manual

3016 Controller

3016 Controller

MEN-3016_CTRL (21-04-2022)

part of VERDER scientific

Contents

This manual is for guidance on the use of the Carbolite Gero product specified on the front cover. This manual should be read thoroughly before unpacking and using the furnace or oven. The model details and serial number are shown on the back of this manual. Use the product for the purpose for which it is intended.

1.0 Introduction

The 3016 programmable temperature controller is part of the EPC3000 range of temperature controllers.

It uses PID (Proportional Integral Derivative) algorithms to adjust the heating power and control the temperature within the product.

Users navigate through the controller by pressing the four buttons positioned below the display.

1.1 Features

The 3016 features:

- 1 program slot with up to 24 configurable segments
- Ramp, Dwell, Step, Call and End segment types
- 2 relay outputs that can be pre-configured as event outputs, or alarms (must be specified when ordered)
- Ethernet connection
- Cybersecurity communications robustness certification

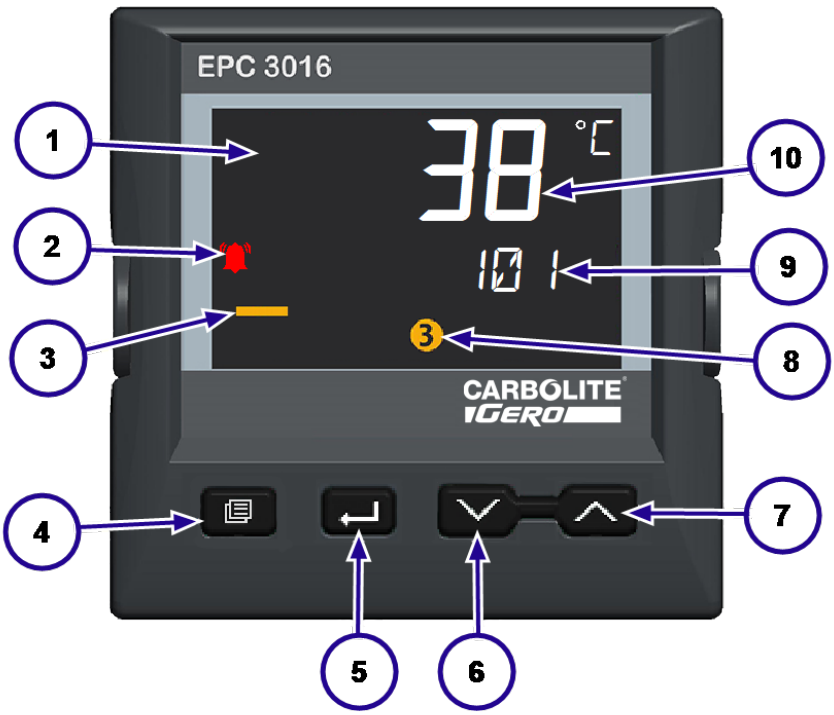
1.2 Technical Terms

Due to the complex nature of temperature control, this manual uses technical terms. Here is a list of some of the terms used within this manual, alongside their explanation:

Term	Description
Setpoint	The target temperature the furnace or oven is trying to reach (°C)
Over-Temperature Protection	A system to prevent the product or process being damaged if the temperature has increased above a temperature specified by the user (over-temperature setpoint). Power to the heating elements is stopped until either the temperature of the product drops below the over-temperature setpoint, or the user manually increases the over-temperature setpoint
Over-Temperature Setpoint	The temperature at which the over-temperature protection system triggers
Heating element	The electrically powered heating device used within the product (furnace or oven)
Thermocouple	A thermoelectric device for measuring temperature
PID	Proportional Integral Derivative - the mathematical control system used by the controller
Program	A series of instructions that tell the controller how to behave. A program is divided into sections called "segments"
Segment	A section of a program. A program can have 24 individual segments. There are 6 different segment types that can be configured. The segments define how the controller behaves when a program reaches that segment.The last segment of a program must always be an "End" type
Holdback	Used when running a program. Holdback is the amount (in °C /°F / K) by which the programmed setpoint can run ahead of the actual measured temperature before holdback operates and prevents the program from progressing until the actual temperature catches up. This can be applied to either heating, cooling or both, depending on the "Holdback Type" set by the user
Ramp Rate	The amount of degrees (°C /°F / K) the temperature should increase per second, minute or hour (dependant on "Ramp Units")
Ramp Units	Used to define whether the temperature should increase at **X**°C per second, **X**°C per minute or **X**°C per hour

2.0 Navigation

Users navigate through the controller by pressing the four buttons positioned below the display. For some functions, a combination of buttons must be pressed simultaneously.



1	Display
2	Alarm Indicator
3	Segment Indicator
4	Page Button
5	Scroll Button
6	Down Button
7	Up Button
8	Output Indicator
9	Setpoint Temperature
10	Actual Temperature

Note: The output indicator 1 icon will appear to show that power is being directed to the product heating elements. Output indicators 2 and 3 are linked to other outputs within the controller.

3.0 Start Up

When powered on, the 3016 controller will cycle through a series of initial test screens. After 7 seconds, it will default to the home display.

The home display shows an overview of the controller, including details such as the actual temperature and setpoint.

Functionality permissions are set as Operator Level 1 by default.

Note: If the controller is power-cycled while being used at a higher permission level, it will return to Operator Level 1 and the user must login again to access higher level functionality.

4.0 Operator Levels

There are 4 operator levels available within the 3016. These user levels control access to functionality within the controller via permissions.

The default operator level is **Level 1**.

Level 1

Level 2

Level 3

Config. Level

Functionality	Permissions			
Login / Change User Level	■	■	■	■
Access Home Display	■	■	■	
Change Setpoint (including Over-Temperature Setpoint)	■	■	■	■
Run a Pre-configured Program	■	■	■	■
Edit / Create a Program		■	■	■
Edit Controller Settings			■	■

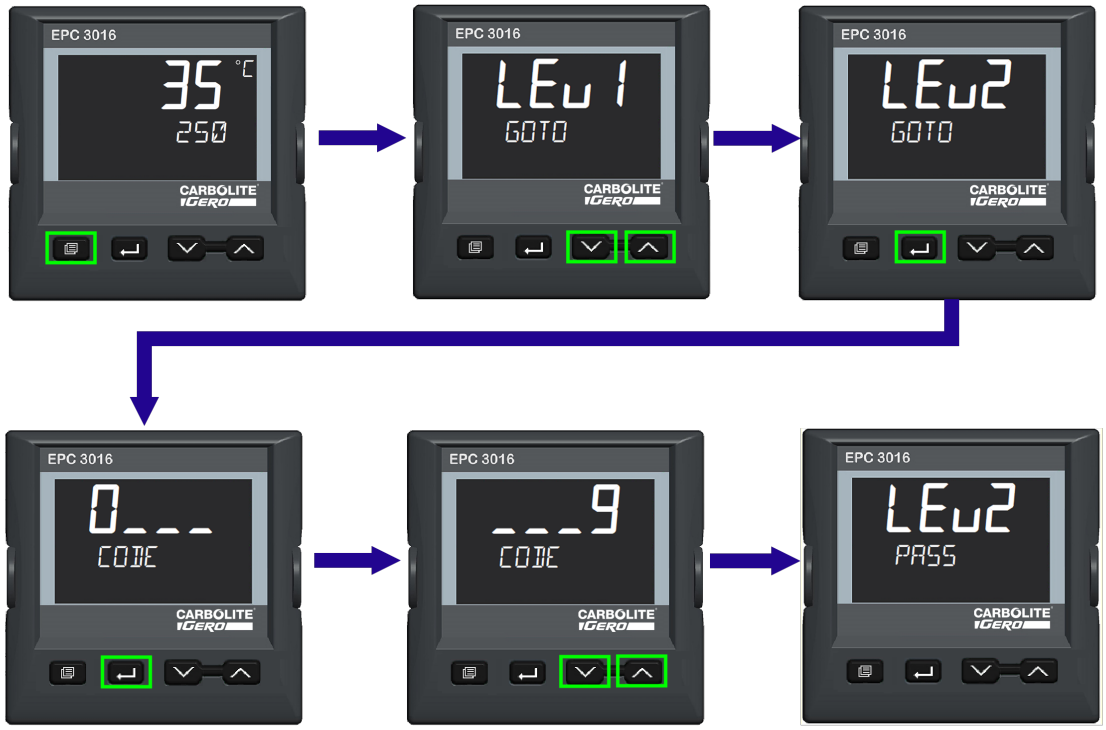
4.1 Changing Operator Level

4.1.1 Operator Level 2

To access Operator Level 2:

1. From the Home display, press and hold the page button for 3 seconds until the GOTO display appears.
2. Use the up and down arrow buttons to select the operator level you wish to access.
3. Press the scroll button to confirm. The CODE display will appear. You now have to input a passcode.
4. Use the up and down arrows to change the number input.
5. Press the scroll button to move to the next digit.
6. When you have finished inputting the passcode, wait for 2 seconds. If entered correctly, PASS will appear on the display and you will now have access to additional functionality.

Note: The passcode to access Operator Level 2 is 0009



Changing Operator Level to Level 2

4.1.2 Operator Level 3

To access Operator Level 3:

1. Press and hold the page button until LEu3 GOTO appears.
2. Press the scroll button to confirm. The CODE display will appear. You now have to input a passcode.
3. Use the up and down arrows to change the number input.
4. Press the scroll button to move to the next digit.
5. When you have finished inputting the passcode, wait for 2 seconds. If entered correctly, PASS will appear on the display and you will now have access to additional functionality.

Note: The passcode to access Operator Level 3 is 0005

4.1.3 Configuration Level

To access Configuration Level (Config):

1. Press and hold the page button until LEu3 GOTO appears.
2. Press the up button until CONF appears.
3. Press the scroll button to confirm. The CODE display will appear. You now have to input a passcode.
4. Use the up and down arrows to change the number input.

5. Press the scroll button to move to the next digit.
6. When you have finished inputting the passcode, wait for 2 seconds. If entered correctly, PASS will appear on the display and you will now have access to additional functionality.

Note: The passcode to access Configuration Level is 0095

4.1.4 Logging Out of Operator Level 3 and Configuration Level

To log out of operator levels with higher permissions:

1. Press and hold the page button until the GOTO display appears.
2. Use the up and down buttons to select the next user level you want to log into.

Note: If logging out of Configuration Level, the user can only log out to Operator Level **1**. The controller will go through a short test cycle to accept any new configuration applied.

Note: Passcodes are not required if changing from a higher operator level to a lower operator level, e.g. from Operator Level 2 to Operator Level 1.

5.0 Simple Temperature Control

The 3016 can be used as a programmer or as a simple temperature controller.

The controller has been configured so that it cannot heat above the maximum stated temperature for the product you have purchased.

To set a setpoint temperature:

1. Press the Up and Down buttons to increase or decrease the setpoint value. Holding a button down will adjust the value at a faster rate.
2. Once the buttons are released the 3016 will begin to control the temperature according to the new setpoint.

Changing the Setpoint

Note: The output indicator 1 icon will appear to show that power is being directed to the product heating elements.

6.0 Multi-Zone Operation

If your Carbolite Gero product is configured for 3-zone control, it will be fitted with three individual temperature controllers; one centre zone (main) controller, and two end zone (left or right) controllers.

It is possible to use these controllers via one of two methods:

- **Independent Control** - Each controller manages one particular heated zone, and all three can be set to have different temperature setpoints.
- **Retransmission of Setpoint** - The setpoint of the centre zone controller is transmitted to the end zone controllers, which then follow the same setpoint. e.g. if the centre zone is set to 300°C, the end zones will also try to reach 300°C.

Note: If your product is fitted with a 3016 controller as the main controller, then it is **ONLY** possible to use the independent control method. Products fitted with a 3008 controller as the main controller are capable of using both independent control and retransmission of setpoint methods.

6.1 Changing Control Methods

If your product is configured to operate using the retransmission of setpoint method, it is possible to switch to the independent control method, and vice versa.

Note: To change control method, the user must first be logged in at Operator Level **2** (see section 4.0).

To change control method:

1. From the home display, press the scroll button until RSP EN (Remote Setpoint Enable) appears.
2. Use the up and down arrow keys to select either On or OFF.
   - On - The product will operate using the retransmission of setpoint method.
   - OFF - The product will operate using the independent control method.

6.2 Sensorbreak

If a thermocouple becomes disconnected or fails, the controller display will flash between the error messages 5.brk and bAd, indicating that the thermocouple is unable to read a temperature.

The controller will automatically switch to display a "high point" value i.e. the maximum temperature the product is configured to achieve, and further heating will be prevented.

Note: If any alarm relay outputs are configured, then the icons for these will also appear on-screen

7.0 Programming

The 3016 is supplied with one program slot containing 24 configurable segments.

All users can run a pre-existing program, however to create or edit a program the user must be logged in to Operator Level 2 (see section 4.0).

7.1 Run / Hold / Reset a Program

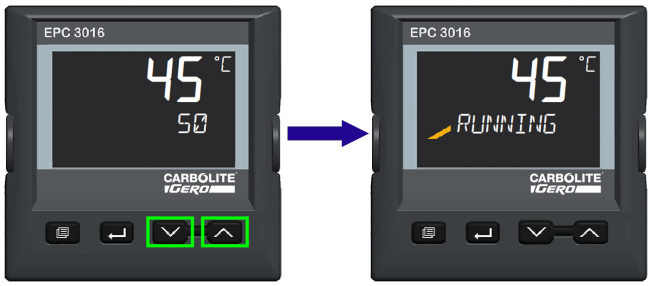
7.1.1 Run

To run an existing program:

1. From the home display, press the page button to access the *PROG LIST* (Program List) display.
2. Press the scroll button until you reach the *P MODE* (Program Mode) parameter.
3. Press the up and down buttons to change the program mode from *rESEt* to *run*. The program will start to run.

7.1.1.1 Shortcut: Run Program

- Press the up and down buttons together. The program will start to **run**.
- If scrolling text is configured, <*PROGRAM RUNNING*> will appear on the display.
- The segment indicator will appear to show whether the program setpoint is ramping up, dwelling, or ramping down.



7.1.2 Hold

To hold a program that is currently running:

1. From the home display, press the page button to access the *PROG LIST* (Program List) display.
2. Press the scroll button until you reach the *P MODE* (Program Mode) parameter.
3. Press the up and down buttons to change the program mode from *run* to *HOLd*. The program will hold until the operator either resumes or resets the program.

7.1.2.1 Shortcut: Hold Program

- Press the up and down buttons together while the program is running. The program will **hold** until the up and down buttons are pressed again.
- If scrolling text is configured, <PROGRAM HOLD> will appear on the display.

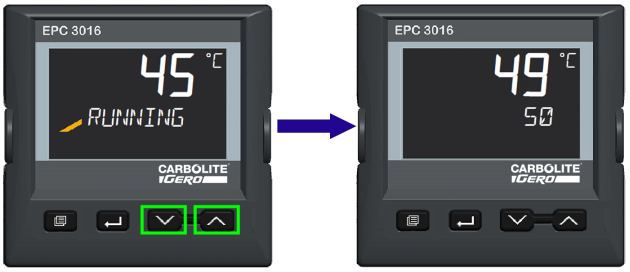
7.1.3 Reset

To reset a program that is currently running:

1. From the home display, press the page button to access the PROG LIST (Program List) display.
2. Press the scroll button until you reach the P MODE (Program Mode) parameter.
3. Press the up and down buttons to change the program mode from RUN to rESEt. The program will reset and stop running.

7.1.3.1 Shortcut: Reset Program

- Press and hold the up and down buttons for 3 seconds to **reset** the program.
- The program will stop running and return to the home display.



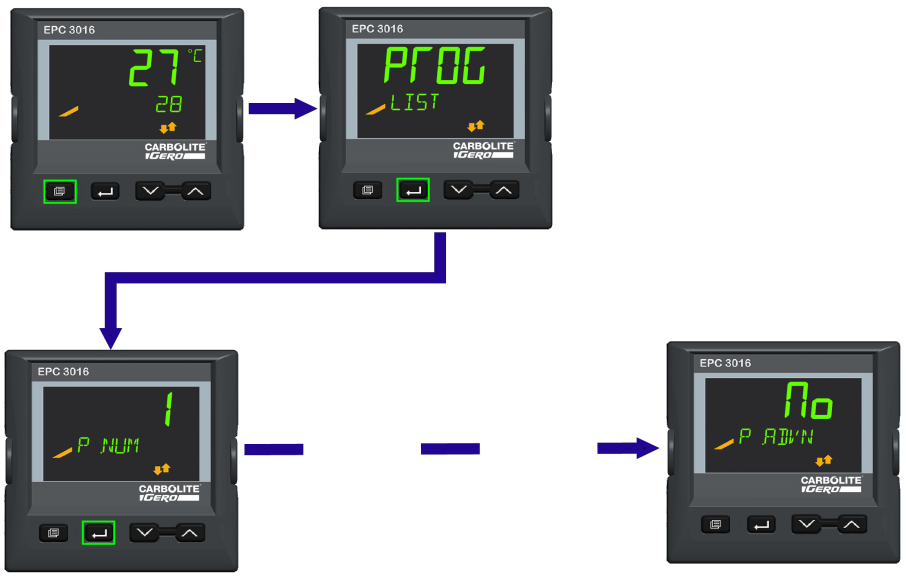
Note: When a program is running a "Programmer List" becomes available within the controller. (see section 7.2.)

7.2 Programmer List

When a program is running, additional parameters become available in the Programmer List menu.

To access the programmer list when a program is running:

1. From the home display press the page button display "PrOG LIST".
2. Press the scroll button to cycle through the available parameters.



PROG List *(Program running)*		
Display	**Parameter**	**Description/ Use**
P NUM	Program Number	Displays the program number. This parameter is read only.

P NAME	Program Name	Displays the name of the program. This parameter is read only.
P CUR	Current Program Number	Displays the number of the program currently running. This parameter is read only.
C NAME	Current Program Name	Displays the name of the program currently running. This parameter is read only.
P MODE	Program Mode	Displays the status of the current program. Can be adjusted using the up and down buttons: • RUN - The program is running. • HOLd - The program is paused. • RESEt - The program is stopped.
P SP	Program Setpoint	Displays the setpoint of the current program. This parameter is read only.
P TIM L	Program Time Left	Displays the amount of time left until the program completes. This parameter is read only. **Note:** The display will show a maximum time of 500 hours, however some programs may exceed this length of time. The value displayed does not take into account the effect of holdback within a program.
P CYC L	Program Cycles Left	Displays the amount of program cycles left to run. This parameter is read only.
S NUM	Segment Number	Displays the number of the current program segment. This parameter is read only.
S NAME	Segment Name	Displays the name of the current program segment. This parameter is read only.
S TYPE	Segment Type	Displays the segment type of the current program segment. This parameter is read only.
S TIM L	Segment Time Left	Displays the amount of time left until the current segment completes. This parameter is read only.
TSP	Target Setpoint	Displays the target setpoint of the current segment. This parameter is read only. **Note:** Only displayed if the current segment type is RAtE, tI mE, or SLEP.
R RATE	Ramp Rate	Displays the current ramp rate of the segment. **Note:** Only displayed if the current segment type is RAtE, tI mE, or SLEP.
EVT 1 / EVT 2	Event 1 /	Displays whether any event outputs or alarms are on or

	Event 2	off. The number displayed is dependent on the amount of outputs or alarms configured. This parameter is read only.
P ADVN	Program Advance	Enables the operator to force the program to advance to the next segment. • YES • No **Note:** This parameter can only be edited when logged in at Operator Level 2.

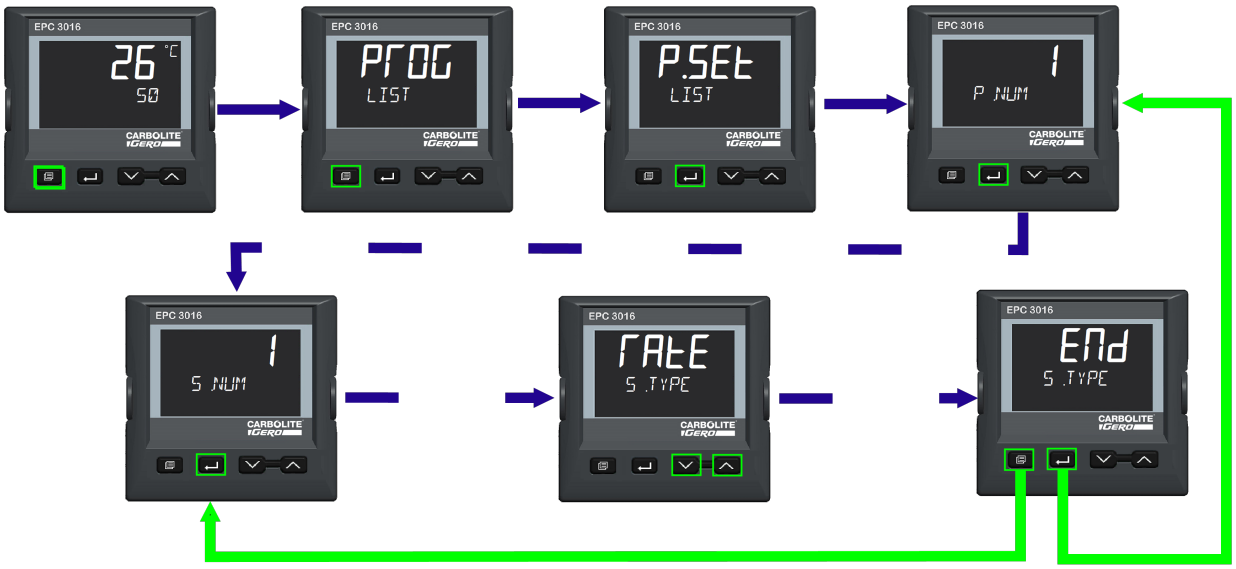
7.3 Create / Edit a Program

Note: To create a new program, or edit an existing program, the user must first be logged in at Operator Level **2** (see section 4.0).

To access program setup:

1. From the home display, press the page button twice to reach the P.SEt option.
2. Press the scroll button to access the list of parameters.
3. Continue to press the scroll button to navigate through the list of parameters.
4. Adjust parameter options using the up and down buttons.
5. When you have finished setting up the program, press the page button multiple times to return to the top of the menu you are currently in (S NUM > P NUM > P.SEt > Home display). Alternatively, the display will automatically return to the home display after 30 seconds of inactivity.

Note: The controller will initially scroll through the parameters that apply to the whole of the program. Continue to press the scroll button to reach parameters specific to a particular segment within the program.



Program Setup		
Display	**Parameter**	**Description/ Use**
P NUM	Program Number	Displays the program number. This parameter is 1 by default.
P NAME	Program Name	Displays the name of the program. This parameter is P1 by default.
HB STY	Holdback Style	Used to define whether the same holdback settings should apply for the entire program, or whether they can be defined for each individual segment. • If PROG is selected, you will be able to set parameters for "Holdback Type" and "Holdback Value". • If the SEGm style is selected, the HB TYP parameter will only become available when editing an individual segment.
HB TYP	Holdback Type	Used to define the Holdback Type for the entire program. • OFF – holdback does not operate • Low – holdback operates only during heating • Hi Gh – holdback operates only during cooling • bAnd – holdback operates during both heating and cooling
HB VAL	Holdback Value	Sets the number of degrees (°C) by which the program can run ahead of the actual temperature before holdback operates and prevents further heating or cooling (this parameter is not visible when the Holdback Type is set as OFF)
RAMP U	Ramp Units	Used to define whether the ramp units are °C per second

		(P.SEC), °C per minute (P.mI n), or °C per hour (P.HR).
dWEL U	Dwell Units	Used to define whether the dwell units are seconds (SECS), minutes (mI nS), or hours (HRS).
P CYC	Program Cycles	How many times the program is set to run. Setting the value to "cont" will set the program to cycle continuously until the operator manually intervenes.
P END	Program End Type	• dwEL - maintain the temperature achieved by the previous segment until the user manually intervenes to reset the program • rSEt - stop the program automatically and return to basic controller mode • trAn - this parameter is not supported and should not be used with any Carbolite Gero product.
Segment Setup		
S NUM	Segment Number	Displays the segment number. A program can have up to 24 segments. Use the up and down buttons to select the segment number that you wish to view/edit.
S NAME	Segment Name	Displays the name of the segment. The first segment is named S 1 by default.
S TYPE	Segment Type	Used to set the segment type (see below for further details on segment types). • rAtE • tI mE • dwEL • StEP • End **Note:** When first setting up a program the segment type is set to "End" by default. Changing the segment type will enable additional parameters and allow the operator to access and edit further segments within the program.
Segment Type	**Parameters**	**Description / Use**
rAtE	TSP	Used to define the Target Setpoint for that segment i.e. the temperature (°C) that is to be reached at that point in the program.
	R.RATE	The amount of degrees (°C) the temperature should increase per second/minute/hour (dependent on "Ramp Units" parameter).

		Note: The minimum possible rate value is 0.1°C per ramp unit. It is possible to set a ramp rate that far exceeds the achievable ramp rate of the product. Only set ramp rates that can be reasonably achieved. Tube furnaces with ceramic work tubes need slow heating rates in order to protect the work tube. Please refer to the "Operation" section of the product manual.
	EV.OP	**Note:** The 3016 is available with 2 optional relay outputs which may be configured as event outputs or alarms. Any parameters above 3 are not applicable to this controller and should not be used. Do not use values above the number of events configured. If the 3016 has been ordered without the relay option, the EV.OP parameter will not appear. • 0 - All event outputs are OFF • 1 - Only event output 1 is ON • 2 - Only event output 2 in ON • 3 - Both event output 1 and 2 are ON
tIme	TSP	Used to define the Target Setpoint for that segment i.e. the temperature (°C) that is to be reached at that point in the program.
	R.TIME	The desired time (in hours, minutes or seconds) that the user wants the controller to take to reach the desired setpoint. Dependent on "Ramp Units" parameter. Maximum time values if the "Ramp Units" are: • SECS= 99:59 • mins = 99:59 • HRS = 500.0
	EV.OP	**Note:** The 3016 is available with 2 optional relay outputs which may be configured as event outputs or alarms. Any parameters above 3 are not applicable to this controller and should not be used. Do not use values above the number of events configured. If the 3016 has been ordered without the relay option, the EV.OP parameter will not appear. • 0 - All event outputs are OFF • 1 - Only event output 1 is ON • 2 - Only event output 2 in ON • 3 - Both event output 1 and 2 are ON
dwEL	DUR	The length of time (in hours, minutes or seconds) that the controller should maintain the temperature achieved by

		the previous segment in the program. Dependent on "Dwell Units" parameter. Maximum values if the "Dwell Units" are: • SECS = 99:59 • mins = 99:59 • HRS = 500.0
	EV.OP	**Note:** The 3016 is available with 2 optional relay outputs which may be configured as event outputs or alarms. Any parameters above 3 are not applicable to this controller and should not be used. Do not use values above the number of events configured. If the 3016 has been ordered without the relay option, the EV.OP parameter will not appear. • 0 - All event outputs are OFF • 1 - Only event output 1 is ON • 2 - Only event output 2 in ON • 3 - Both event output 1 and 2 are ON
STEP	TSP	Used to define the Target Setpoint for that segment i.e. the temperature (°C) that is to be reached at that point in the program.
	EV.OP	**Note:** The 3016 is available with 2 optional relay outputs which may be configured as event outputs or alarms. Any parameters above 3 are not applicable to this controller and should not be used. Do not use values above the number of events configured. If the 3016 has been ordered without the relay option, the EV.OP parameter will not appear. • 0 - All event outputs are OFF • 1 - Only event output 1 is ON • 2 - Only event output 2 in ON • 3 - Both event output 1 and 2 are ON
End	-	Used to trigger the end of the program. The behaviour of the controller during at the end of a program is determined by the "End Type" parameter.

7.4 Event Outputs - Customer Notes

The 3016 has eight available event outputs; connections must be specified at the time of order.

If you have ordered the 3016 with multiple event outputs, please make a note of what the event output function is. This is for your own future reference:

Event Output 1	
Event Output 2	
Event Output 3	
Event Output 4	
Event Output 5	
Event Output 6	
Event Output 7	
Event Output 8	

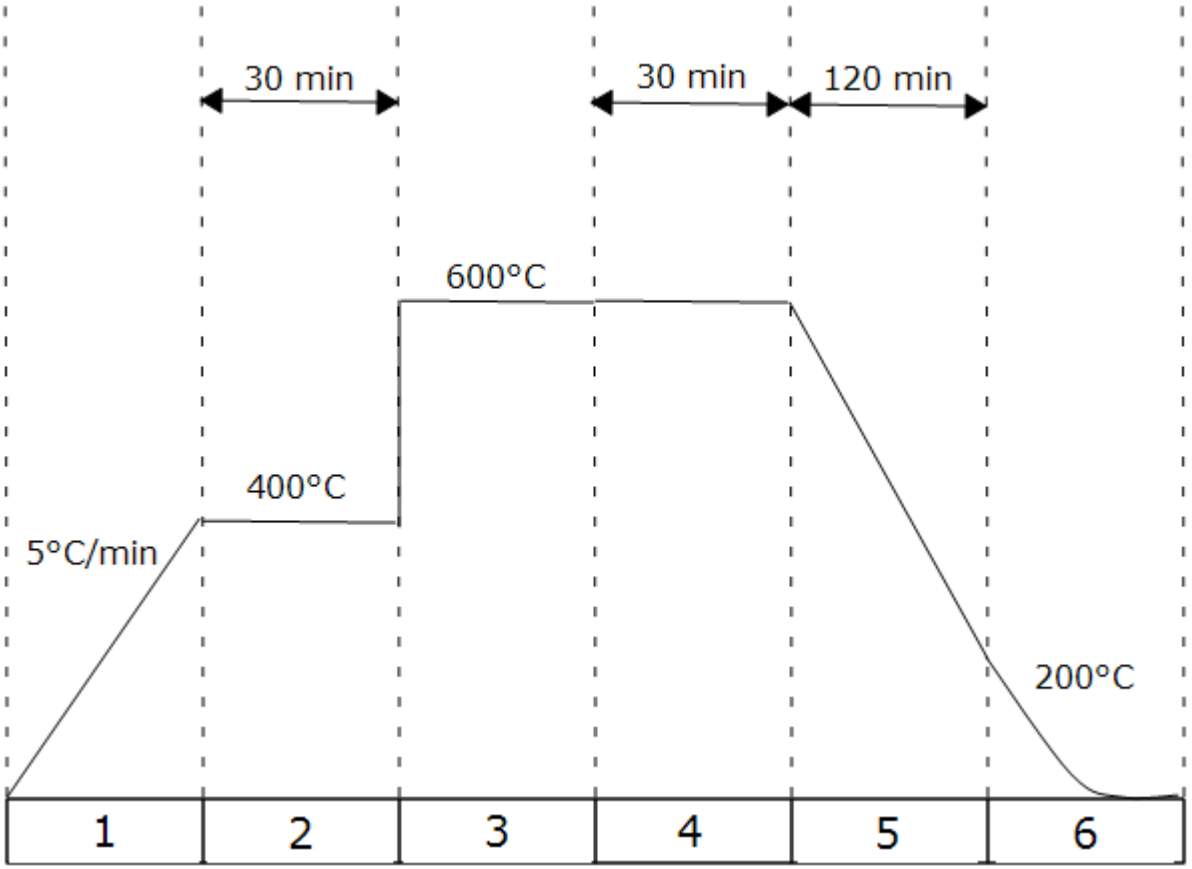
7.5 Program Example

Note: This program example is for a high-temperature furnace product. For products with lower maximum temperatures, such as ovens, lower temperature values should be used.

1. Log in at Operator Level 2.
2. From the home display, press the page button until PSEt appears.
3. Press the scroll button until HB .TYP appears.
4. Press the up and down buttons to select OFF, then press the scroll button.
5. Press the up and down buttons until the RAMP U value reads P.mI N, then press the scroll button.
6. Press the up and down buttons until the DWEL U value reads mI NS, then press the scroll button P END appears.
7. Press the up and down arrows to select rSEt.
8. Press the scroll button to access values for segment 1.
9. Press the scroll button until S .TYPE appears.
10. Press the up and down buttons until rAtE appears, then press the scroll button.
11. Press the up and down buttons until the TSP reads 400°C then press the scroll button.
12. Press the up and down buttons to adjust the R RATE until it reads 5.0°C, then press the scroll button.
13. Press the scroll button to access values for segment 2.
14. Press the scroll button until S .TYPE appears.
15. Press the up and down buttons until dwEL appears, then press the scroll button.
16. Press the up and down buttons until the DUR value reads 00:30, then press he scroll button.
17. Press the scroll button to access values for segment 3.
18. Press the scroll button until S .TYPE appears.
19. Press the up and down buttons until the TSP reads 600°C then press the scroll button.
20. Press the scroll button to access values for segment 4.

21. Press the scroll button until S .TYPE appears.
22. Press the up and down buttons until dwEL appears, then press the scroll button.
23. Press the up and down buttons until the DUR value reads 00:30, then press he scroll button.
24. Press the scroll button to access values for segment 5.
25. Press the scroll button until S .TYPE appears.
26. Press the up and down buttons until tI mE appears, then press the scroll button.
27. Press the up and down buttons until the TSP reads 200°C then press the scroll button.
28. Press the up and down buttons until the R .TIME value reads 0 1:20, then press the scroll button.
29. Press the scroll button to access values for segment 6.
30. Press the scroll button until S .TYPE appears. The default value is End.

The program is now ready to run.



Segment					
1	2	3	4	5	6
Type 'Rate'	Type 'Dwell'	Type 'Step'	Type 'Dwell'	Type 'Time'	Type 'End'
Target 400°C	Duration 30 min	Target 600°C	Duration 30 min	Target 200°C	End Type 'Reset'
Rate 5.0°/Min				Time 120 min	

8.0 Alarm Relays (optional)

The 3016 controller has two available relays (electrically operated switches) that are used to control additional features and components, such as door locks, solenoid valves, fans and audible alarms; they can also be used to control external equipment if necessary.

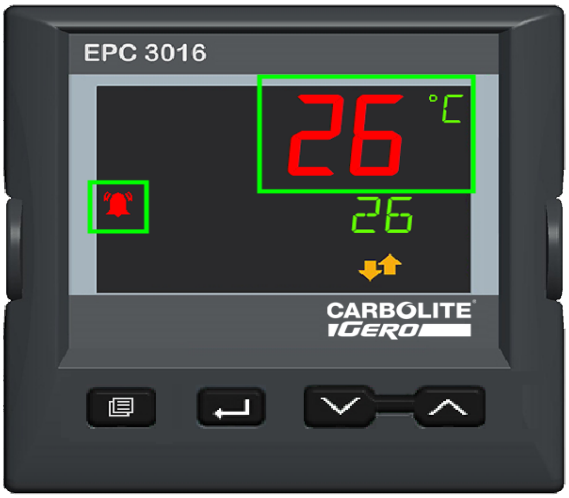
Relays can be set to trigger during a particular point in a program (referred to as an event output - see section 7.3) or when the product reaches a specific temperature:

- If a product is fitted with a door lock, this can be linked to a relay. The user can input a temperature at which the relay will trigger, e.g. if the temperature increases above 200°C, lock the door. The door will remain locked until the temperature drops below 200°C.

Note: The alarm activation temperatures can be set by adjusting the threshold (THLD) or deviation (DEV) parameter in controller settings (see section 9.0).

8.0.1 Alarm State

When the controller is in an alarm state, a red "alarm bell" icon will begin flashing, and the text on the top of the screen will turn red. When the alarm is acknowledged, the alarm bell icon will stop flashing, but the controller will remain in the alarm state until the conditions that triggered the alarm cease.



For example:
If an alarm is set to activate when the temperature increases above 300°C, the controller will remain in the alarm state, and the alarm bell icon and red text will remain on the display until the temperature drops below 300°C.

To acknowledge an alarm when the controller is in an alarm state:

1. From the home display, press the scroll button until the ACK parameter is displayed.
2. Use the up and down buttons to adjust the parameter from no to YES. The alarm will now be acknowledged.

Acknowledging an Alarm

Note: An alarm can also be acknowledged by simultaneously pressing both the page and scroll buttons.

8.0.2 Hysteresis

Hysteresis is the difference between the point at which an alarm switches **ON** and the point at which it switches **OFF**.

It can be used to define a short temperature range wherein the alarm relay activates in order to prevent the relay switching on and off repeatedly if the product temperature fluctuates by a few degrees when close to the threshold / deviation value.

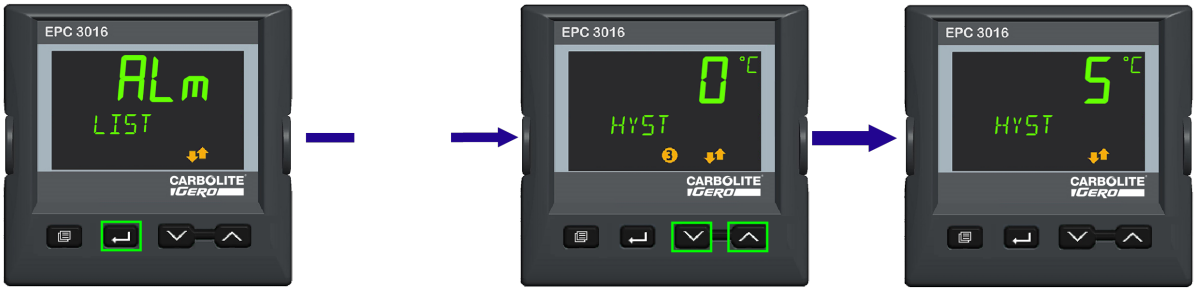
Example:

A product is configured to have a "High" alarm, and the threshold value is set to 100°C. The alarm activates a door lock. The product temperature is fluctuating slightly between 99°C and 100°C. To prevent the relay from switching ON and OFF too rapidly as the temperature changes, a hysteresis value can be set to create a buffer. A hysteresis value of 5°C would only deactivate the door lock at 95°C, so any small temperature fluctuations would not continually influence the relay in this scenario.

Note: The hysteresis parameter (HYST) is accessible only when logged in at Operator Level **3** or Configuration Level (see section 10.0).

To adjust the hysteresis:

1. From the home display, press the page button until ALm list appears.
2. Press the scroll button until the HYST parameter appears.
3. Use the up and down arrows to adjust the parameter.



Adjusting the Hysteresis Value

8.1 Alarm Outputs - Customer Notes

The 3016 has six available alarm outputs; connections must be specified at the time of order.

If you have ordered the 3016 with multiple alarm outputs, please make a note of what the alarm function is. This is for your own future reference:

Alarm Output 1	
Alarm Output 2	
Alarm Output 3	
Alarm Output 4	
Alarm Output 5	
Alarm Output 6	

9.0 Controller Settings

Additional controller settings are accessible from the home display. Limited access is granted at Operator Level **1**. To access the full list of settings, the user must first be logged in at Operator Level **2** (see section 4.0).

To adjust controller settings:

1. From the home display, press the scroll button.
2. Press the scroll button to cycle through the parameters available.
3. Press the up and down buttons to adjust the parameter values as desired.

Scrolling through Controller Settings at Operator Level 2

Parameter List		
Display	**Parameter**	**Description/ Use**
W.OUT	Working Output	Displays the amount of power being used by the product. **Note:** This parameter is also available when logged in at Operator Level 1.
CS.ID	Customer ID	Displays the customer identification number. This maybe used to identify one of many units for production or quality control systems. **Note:** This parameter is also available when logged in at Operator Level 1.
ACK	Acknowledge	Used to acknowledge an alarm when the controller is in an

		alarm state. Values: • YES - The alarm will be acknowledged, but the alarm state may remain until the required conditions are met. • no - The alarm is not acknowledged and the controller remains in an alarm state. **Note:** This parameter is also available when logged in at Operator Level 1.
THLD	Threshold	Only available if an "Absolute High" or "Absolute Low" alarm has been configured. The desired alarm type must be specified at the time of order. Used to set the temperature threshold that will determine when an alarm relay will activate for High (AbS.H)or Low (AbS.L) alarms. • **High** - the alarm relay will activate when the temperature exceeds the threshold value • **Low** - the alarm relay will activate when the temperature drops below the threshold value **Note:** If a deviation alarm is specified at time of order, the THLD parameter will be replaced by the DEV (deviation) parameter. **Note:** If more than one Absolute High and/ or Absolute Low alarm is specified at the time of order, multiple THLD parameters will be available. They appear in the order that the alarms were set up, so if Alarm 1 is an AbS.H, and Alarm 2 is an AbS.L, the threshold value for the AbS.H alarm will be appear first when scrolling though the parameter list.
DEV	Deviation	Only available if a Deviation alarm has been configured. The desired alarm type must be specified at the time of order. Used to set the amount by which the temperature can deviate from the Reference (REF) value (see section 10.0 for more details on REF values). • **Deviation High** - The alarm relay will activate if the temperature rises above the sum of the Reference and Deviation values [REF + DEV], and will remain activated until the temperature drops below the sum of the Reference and Deviation values minus any Hysteresis value set [REF + DEV - HYST] • **Deviation Low** - The alarm relay will activate if the

		temperature drops below the sum of the Reference and Deviation values [REF + DEV], and will remain activated until the temperature rises above the sum of the Reference and Deviation values plus any Hysteresis value set [REF + DEV + HYST] • **Deviation Band** - The alarm relay will activate if the temperature deviates above or below the Reference value plus or minus the Deviation value [REF ± DEV], and will remain activated until the temperature returns within the deviation band, plus or minus any Hysteresis value set [REF ± DEV ± HYST] (e.g. if the target setpoint is 500°C, the alarm relay will activate if the temperature is outside the range of 450°C and 550°C, and deactivate when the temperature is between 450°C and 550°C) **Note:** See section 8.0 for more information on **Hysteresis**. **Note:** If more than one Deviation alarm is specified at the time of order, multiple DEV parameters will be available. They appear in the order that the alarms were set up, so if Alarm 1 is an dEU.H, and Alarm 2 is an dEU.L, the deviation value for the dEU.H alarm will be appear first when scrolling though the parameter list.
LANG	Language	Used to set the language of the scrolling text within the controller. • NONE - The controller defaults to the last language selected • En - English • Fr - French • dE - German • It - Italian • ES - Spanish

Note: Additional controller configuration settings are available in Operator Level **3** and Configuration Level (see section 10.0)

10.0 Controller Configuration

Note: The adjustment of the parameters mentioned in this section is not required for day to day operations. Any adjustments should be carried out by suitably qualified and trained personnel. Please contact Carbolite Gero for advice before proceeding to change any configuration parameter values.

Additional controller settings can be viewed and adjusted when logged in at Operator Level **3** or Configuration Level.

A series of menu lists featuring a range of parameters can be accessed by pressing the page button.

Note: Not all parameters displayed within the 3016 are applicable to Carbolite Gero products. Only parameters referenced in this manual should be regarded or adjusted! Changing non-referenced parameter values may damage the product and prevent it from functioning safely!

To access the menu lists:

1. From the home display, press the page button to scroll through the menu lists.
2. When you reach your desired menu list, press the scroll button to access parameters.
3. If the parameter is adjustable, use the up and down arrows to change the value.

Note: When logged in at Configuration Level, the home display shows CONF LIST, and does not show the current temperature and setpoint.

Scrolling through all available Menu Lists - (Greyed-out lists should be disregarded)

10.0.1 Menu Lists

Note: Lists and parameters other than those mentioned below may appear at Operator Level 3 and Configuration Level, however these parameters are not applicable to Carbolite Gero products and should not/cannot be adjusted.

Display	Parameter	Description/ Use
AI List		
LIN	Linearisation	Displays the type of thermocouple used in the product.
RNG HI	Range High	Displays the maximum temperature of the product.
RNG LO	Range Low	Displays the minimum temperature of the product.
PV OFS	PV Offset	Used during offset calibration to adjust the display temperature. Refer to section 11.0 for offset calibration instructions. The default value is 0.0.

		Note: Also adjustable at Operator Level 3.
FILT .T	Filter Time Constant	A filter is provided to reduce the frequency of electrical noise picked up by the controller, which may interfere with its function. The higher the Filter Time Constant value, the more the effects of electrical noise are reduced. The default value is 1.6. **Note:** The higher the Filter Time Constant value, the slower the the measured temperature will be to respond to any fluctuations. Only adjust this value if necessary. **Note:** Also adjustable at Operator Level 3.
SB.OUT	Sensor Break Output	Indicates whether a sensor break has been detected. This usually occurs when a thermocouple fails or is disconnected. • OFF - No sensor break detected • On - Sensorbreak detected
PV	Process Variable	Displays the current actual temperature of the product.
PV .ST	Process Variable Status	Displays the status of the Process Variable (actual temperature). If the PV.Status displays anything but Good, please contact Carbolite Gero Service.
LOOP List		
S.LIST	Sublist	Use the up and down arrows to view sublists of additional parameters. Use the scroll button to select a sublist. • mAIn - Access parameters relating to Main Control Loop • AtUn - Access parameters relating to Autotune
mAIn Sublist:		
R-L	Remote-Local Select	Used to set the source of the setpoint. • Loc - The controller uses the setpoint input within the controller • rEm - The controller uses the setpoint from a remote source e.g. another controller. This option is most commonly used in products with multiple heated zones, or cascade control. **Note:** Also adjustable at Operator Level 3.
PV	Process Variable	Displays the current actual temperature.

TGT SP	Target Setpoint	Used to adjust the setpoint temperature. **Note:** Also adjustable at Operator Level 3.
W SP	Working Setpoint	Displays the current working setpoint.
W OUT	Working Output	Displays the current power output in %.
ATUN Sublist:		
TUNE	Autotune Enable	Used to enable or disable an autotune. • On - Autotune is enabled • OFF - Autotune is disabled **Note:** Also adjustable at Operator Level 3.
T HI	Autotune Maximum Output	Used to set a maximum output limit during tuning. The default value is 100. **Note:** Also adjustable at Operator Level 3.
T LO	Autotune Minimum Output	Used to set a minimum output limit during tuning. The default value is -100. **Note:** Also adjustable at Operator Level 3.
T STAT	Autotune Status	Displays the current status of the autotune. • OFF - Autotune is unavailable. • rdy - The controller is ready to run an autotune • trIG - An autotune has been triggered to run, but is waiting for another process to complete before running. • run - The autotune function is running. • donE - The autotune completed successfully and tuneset parameters have been updated. • Abor - The autotune has been aborted. • tOut - If the autotune sequence exceeds two hours in duration, it will timeout and be aborted. • OFLw - A buffer overflow occurred while collecting processing data. Contact Carbolite Gero Service for support.
STAGE	Stage of Autotune	• IdLE - Not autotuning. • moni - The process is being monitored. This stage lasts one minute and the setpoint can be adjusted during this time. • Init - An initial oscillation is being established. • Hi - Maximum output applied.

		• Lo - Minimum output applied. • r2G - Relative channel 2 gain test is running. • Pd - The autotuner is trying to control to the setpoint and is examining the response. • AnLS - The autotuner is calculating the new tuning parameters.
STG .T	Time Elapsed in Stage	Displays the time elapsed during the current autotune stage. If an autotune stage lasts longer than 2 hours a timeout will occur and the autotune will be aborted.
Pid Sublist:		
SET	Active Tune Set	Displays the PID terms set being used: • SEt 1 • SEt 2
BND .1	Tune Set Switching Point 1	Used to set the level at which PID set 1 changes to PID set 2. **Note:** Also adjustable at Operator Level 3.
GS HYS	Switching Hysteresis	Used to set the hysteresis level around when the controller switches between PID terms. **Note:** Also adjustable at Operator Level 3.
OP HI	Output High Limit	Used to set the gain scheduled upper limit for PID set 1. **Note:** Also adjustable at Operator Level 3.
OP HI2	Output High Limit 2	Used to set the gain scheduled upper limit for PID set 2. **Note:** Also adjustable at Operator Level 3.
OP Sublist:		
OUT HI	Output High Limit	Used to set the maximum output power (%) delivered by the heating elements of the product. Depending on the design of the product and the voltage of the intended power supply, the Output High value may be adjusted in order to protect the heating elements from overloading and unnecessary wear. **Note:** Also adjustable at Operator Level 3.
OUT LO	Output Low Limit	Used to set the minimum output power (%) delivered by the heating elements of the product.
OP UP	Output Rate Up	Used to limit the rate at which the output from the PID

		terms can increase (% per second). **Note:** Also adjustable at Operator Level 3.
OP .DWN	Output Rate Down	Used to limit the rate at which the output from the PID terms can decrease (% per second). **Note:** Also adjustable at Operator Level 3.
dI AG Sublist:		
L .BRK .T	Loop Break Time	Used to set the loop break time. If there is a loss of control within the control loop, this parameter determines the amount of time before the loop break alarm (L .BRK)is activated. **Note:** Also adjustable at Operator Level 3.
L .BRK .D	Loop Break Delta PV	Used to set the minimum change in the PV that the system would expect to see within 2x Loop Break Times. If the controller output is saturated and the PV has not moved by this amount in 2x L .BRK .T, then the loop break alarm will be activated. **Note:** Also adjustable at Operator Level 3.
L .BRK	Loop Break Detected	Indicates whether a loop break has been detected. • YES - A loop break has been detected • No - The loop is functioning normally
DEMO	Enable Demo Mode	Used to turn on a simulation for demonstration purposes. • On - Demo mode is enabled • OFF - Demo mode is disabled **Note:** Also adjustable at Operator Level 3.
PrOG List **Note:** The following parameters are only accessible at Configuration Level. When logged in at Operator Level 3, the parameters displayed are the same as those available at Operator Level 2. See section 7.3		
E ACCS	Edit Access	Used to determine the lowest operator level at which edit permissions are granted. The default value is LEv2.
R ACCS	Run Access	Displays the lowest operator level granted permission to run a program. This parameter is read only.
RECOV	Recovery Strategy	Used to detmine how a program behaves if the product is power cycled.

		rAmP - The controller will ramp to the target setpoint at the rate prior to the power outage. rSEt - The program will be reset. CONt - The program will continue to run from the point at which it was interrupted.
r RESN	Ramp Rate Resolution	Used to set the display resolution of segment ramp rate parameters when read/written via scaled integer comms. • nnnnn - No decimal places • nnnn.n - One decimal place (default) • nnn.nn - Two decimal places • nn.nnn - Three decimal places • n.nnnn - Four decimal places
RESN	Program Resolution	Used to set the time resolution of the segment time left and the program time left. • SEC - Seconds • mIn - Minutes • HOur - Hours
P.SEt List - (See section 7.3 for details on the Program Setup List)		
ALm List		
INST	Alarm Number	Used to select the alarm whose parameters you wish to edit. There are 6 alarms available. **Note:** Also adjustable at Operator Level 3.
TYPE	Type	Displays the alarm type (see section 8.0)
STAT	Alarm Status	Displays the status of the alarm. • OFF - The alarm is off • ACt - The alarm is active, but has been acknowledged. • InA - The alarm is active and the conditions that triggered the alarm have passed, however the alarm has not been acknowledged • ANA - The alarm is still active and has not been acknowledged
IN	Input	Displays the value being monitored by the alarm.
THLD	Threshold	Only available if an "Absolute High" or "Absolute Low" alarm has been configured. The desired alarm type must be specified at the time of order. Used to set the temperature threshold that will determine when an alarm relay will activate for High (AbSH)or Low

		(AbSL) alarms. • **High** - the alarm relay will activate when the temperature exceeds the threshold value • **Low** - the alarm relay will activate when the temperature drops below the threshold value **Note:** Also adjustable at Operator Level 3.
HYST	Hysteresis	Used to set the amount of hysteresis applied. (See section 8.0 for details on hysteresis.) **Note:** Also adjustable at Operator Level 3.
LATCH	Latching Type	Used to set the latching type of the alarm. • nonE - No latching methodology i.e. when the alarm condition is removed the alarm will become inactive without being acknowledged. • Auto - The alarm will remain active until the alarm condition has been removed and the alarm has been acknowledged. The alarm can be acknowledged at any time after the alarm has become active. • mAn - The alarm will remain active until the alarm condition has been removed and the alarm has been acknowledged. The alarm can only be acknowledged after the alarm condition has been removed. • EUnt - Same as a non-latching alarm except the alarm is used as a trigger and therefore will not be announced
ACK	Acknowledge	Used to acknowledge an alarm when the controller is in an alarm state. • YES - The alarm will be acknowledged, but the alarm state may remain until the required conditions are met. • no - The alarm is not acknowledged and the controller remains in an alarm state. • **Note:** Also adjustable at Operator Level 3.
REF	Reference	A reference point for deviation alarms. For deviation band alarms, this reference becomes a "centre point" for the band. **Note:** Also adjustable at Operator Level 3.
DEV	Deviation	Only available if a Deviation alarm has been configured. The desired alarm type must be specified at the time of order.

		Used to set the amount by which the temperature can deviate from the Reference (REF) value. • **Deviation High** - The alarm relay will activate if the temperature rises above the sum of the Reference and Deviation values [REF + DEV], and will remain activated until the temperature drops below the sum of the Reference and Deviation values minus any Hysteresis value set [REF + DEV - HYST] • **Deviation Low** - The alarm relay will activate if the temperature drops below the sum of the Reference and Deviation values [REF + DEV], and will remain activated until the temperature rises above the sum of the Reference and Deviation values plus any Hysteresis value set [REF + DEV + HYST] • **Deviation Band** - The alarm relay will activate if the temperature deviates above or below the Reference value plus or minus the Deviation value [REF ± DEV], and will remain activated until the temperature returns within the deviation band, plus or minus any Hysteresis value set [REF ± DEV ± HYST] (e.g. if the target setpoint is 500°C, the alarm relay will activate if the temperature is outside the range of 450°C and 550°C, and deactivate when the temperature is between 450°C and 550°C) **Note:** Also adjustable at Operator Level 3.
Comm List		
S LIST	Sublist	Use the up and down arrows to view sublists of additional parameters. Use the scroll button to select a sublist. • mAIn - Access parameters relating to Main Sublist • Nwrk - Access parameters relating to Network Sublist
mAin Sublist:		
INTF	Interface	Displays the type of connection interface. • EtH - Ethernet • r485 - RS485
N STA	Status	Displays the status of communications used by Modbus TCP. • OFFL - Offline and not communicating • InIt - Initialising communications • rdY - Ready to accept connection. Not used by Modbus TCP. • run - Ready to accept connections or controller communicating

W .TIME	Watchdog Time	If the communications stop addressing the instrument longer than this configurable period, the Watchdog Flag will become active.
W ACTN	Watchdog Action	• mAn - The Watchdog flag must be cleared manually • Auto - The Watchdog flag will clear automatically **Note:** Also adjustable at Operator Level 3.
W RCOV	Watchdog Recovery	Only displayed when W ACTN is set to Auto. The Watchdog Recovery is a timer that determines the delay before the Watchdog Flag is cleared after the reception of valid messages resumes. A value of 0 will reset the Watchdog Flag when the first valid messageis received. All other values will require a minimum of 2 valid messages to be received.
W FLAG	Watchdog Flag	• On - The communications have stopped addressing the controller longer than the W .TIME value • OFF - Communications are being received normally..
T FMT	Time Formation	Used to set the resolution of time parameters on the communications port when read/written via scaled integer comms. • mSEC - Milliseconds • SEC - Seconds • mIn - Minutes • HOur - Hours **Note:** Also adjustable at Operator Level 3.
Nwrk Sublist:		
IP A1	IP Address	1st byte of the IP Address: XXX.xxx.xxx.xxx. Default: 192
IP A2	IP Address 2	2nd byte of the IP Address: xxx.XXX.xxx.xxx. Default: 168
IP A3	IP Address 3	3rd byte of the IP Address: xxx.xxx.XXX.xxx. Default: 111
IP A4	IP Address 4	4th byte of the IP Address: xxx.xxx.xxx.XXX. Default: 222
IP S1	Subnet Mask	1st byte of the Subnet Mask: XXX.xxx.xxx.xxx. Default: 255
IP S2	Subnet Mask 2	2nd byte of the Subnet Mask: xxx.XXX.xxx.xxx. Default: 255
IP S3	Subnet Mask 3	3rd byte of the Subnet Mask: xxx.xxx.XXX.xxx. Default: 255
IP S4	Subnet Mask 4	4th byte of the Subnet Mask: xxx.xxx.xxx.XXX. Default: 0

IP G1	Default Gateway	1st byte of the Default Gateway: XXX.xxx.xxx.xxx. Default: 0
IP G2	Default Gateway 2	2nd byte of the Default Gateway: xxx.XXX.xxx.xxx. Default: 0
IP G3	Default Gateway 3	3rd byte of the Default Gateway: xxx.xxx.XXX.xxx. Default: 0
IP G4	Default Gateway 4	4th byte of the Default Gateway: xxx.xxx.xxx.XXX. Default: 0
MAC 1	Mac 1	1st byte of the MAC address in decimal: XX:xx:xx:xx:xx:xx
MAC2	Mac 2	2nd byte of the MAC address in decimal: xx:XX:xx:xx:xx:xx
MAC3	Mac 3	3rd byte of the MAC address in decimal: xx:xx:XX:xx:xx:xx
MAC4	Mac 4	4th byte of the MAC address in decimal: xx:xx:xx:XX:xx:xx
MAC5	Mac 5	5th byte of the MAC address in decimal: xx:xx:xx:xx:XX:xx
MAC6	Mac 6	6th byte of the MAC address in decimal: xx:xx:xx:xx:xx:XX
B STM	Broadcast Storm	Indicates whether a broadcast storm is active. If the reception rate of Ethernet broadcast packets rises too high, broadcast storm mode will become active and the reception of broadcast packets will be disabled until the rate drops. • YES - Broadcast Storm active • No - Broacdact Storm inactive
R PRT	Rate Protection	Indicates whether Rate protection active. If rate at which Ethernet unicast packets are received becomes too high, the instrument will enter a special mode that slows down Ethernet processing to preserve core functionality. • YES - Rate Protection active • No - Rate Protection inactive
INSt List		
INST	Instrument	Use the up and down arrows to view sublists of additional parameters. Use the scroll button to select a sublist. • INFO - Access parameters relating to controller information • Hmi - Access parameters relating to the controller HMI (Human Machine Interface)
INFO Sublist:		
LANG	Language	Used to set the language of the scrolling text within the

		controller. • NONE - The controller defaults to the last language selected • En - English • Fr - French • dE - German • It - Italian • ES - Spanish
T UNIT	Temperature Unit	Used to set the temperature unit displayed by the controller. • dEG.C - °Celcius • dEG.F - °Farenheit • K - Kelvin
CS ID	Customer ID	Used to set the product identification number can be entered if required. This may be used to identify one of many units for production or quality control systems.
Hml Sublist:		
H DISP	Home Display	Used to select the information that appears on the home display. • PV.SP - The home display shows the actual temperature and setpoint. • PV.Pt - The home display shows the actual temperature and program time left. • LPV - The home display shows only the actual temperature. • PV 1 - The home display shows only the PV for analogue input 1. • PV.PS - The home display will show the actual temperature and the current running program number and segment number.
K LOCK	Keylock	Used to disable the buttons on the front of the controller. • On - The controller buttons are disabled • OFF - The controller buttons are enabled **Note:** Once the controller accepts the On value, the buttons will no longer function and the controller must be linked to iTools for further configuration or use.

11.0 Offset Calibration

After prolonged use the controller and/or thermocouple could require recalibration. A quick check using an independent thermocouple and temperature indicator should be made from time to time to determine whether full calibration is required.

For some processes the difference of just a few degrees can have negative implications, so it is highly important that temperature readings are as accurate as possible.

Note: All independent thermocouples and indicators should be calibrated and tested prior to use to avoid incorrect calibration of your Carbolite Gero product.

11.1 Single-Point Calibration

When using an independent thermocouple and temperature indicator, the difference between the readings on the product controller and the readings shown by the independent temperature indicator should be considered the potential offset value.

This method can also be applied if the user wishes to measure the temperature at a particular position of interest within the product, e.g. by their load / samples. The difference between the temperature read by the control thermocouple and the independent thermocouple by their samples could be calculated as the offset value.

For example:

If the controller is displaying a temperature of 1080°C, and the independent thermocouple reads 1075°C, this means that the control thermocouple in the product is reading an extra 5°C. This would make the offset value **-5**, as the controller needs to display a temperature 5°C less than what it is currently displaying.

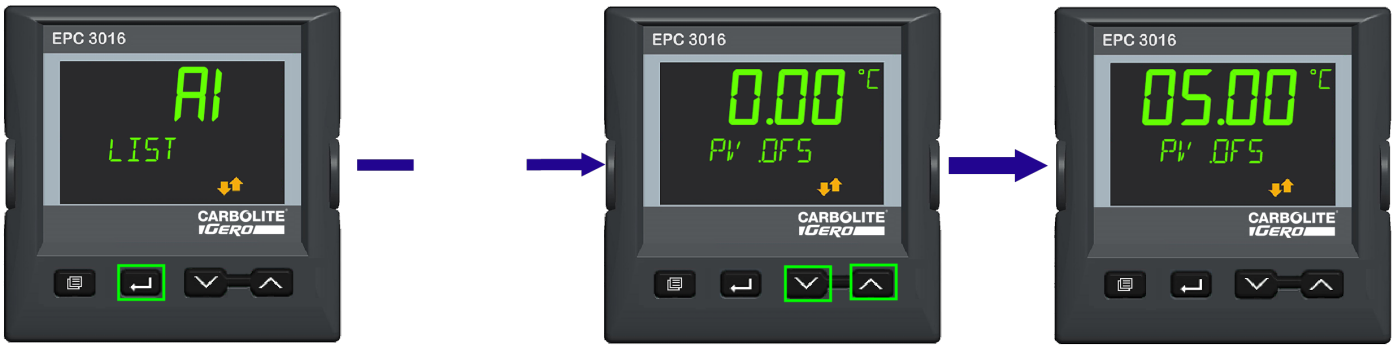
You can use the offset calibration function to adjust the temperature displayed on the controller so that it gives a more accurate reading to a maximum of **-25** or **+25**.

Note: It is possible to set offset values beyond the +/- 25 range, however this is not recommended. If an offset value outside of this range is required then it is likely that the thermocouple and/or temperature controller require repair or replacement.
DO NOT operate the product if excessively high or low offset values have been set as this increases the risk of damaging the product. Contact Carbolite Gero Service for assistance.

To adjust the offset value:

Note: To adjust offset values the user must be logged in at **Operator Level 3** or higher.

1. From the home display, press the page button until AI list appears.
2. Press the scroll button until you reach the Pv OFS (Process Value Offset) parameter.
3. Use the up and bown buttons to adjust the value. The new value will be automatically accepted after 3 seconds.
4. If no further adjustments are required, log out of **Operator Level 3**.



Adjusting the Offset Value

12.0 Using Autotune to Optimise Temperature Control

All Carbolite Gero products are preconfigured for optimum performance when used within their normal expected operating temperature range.

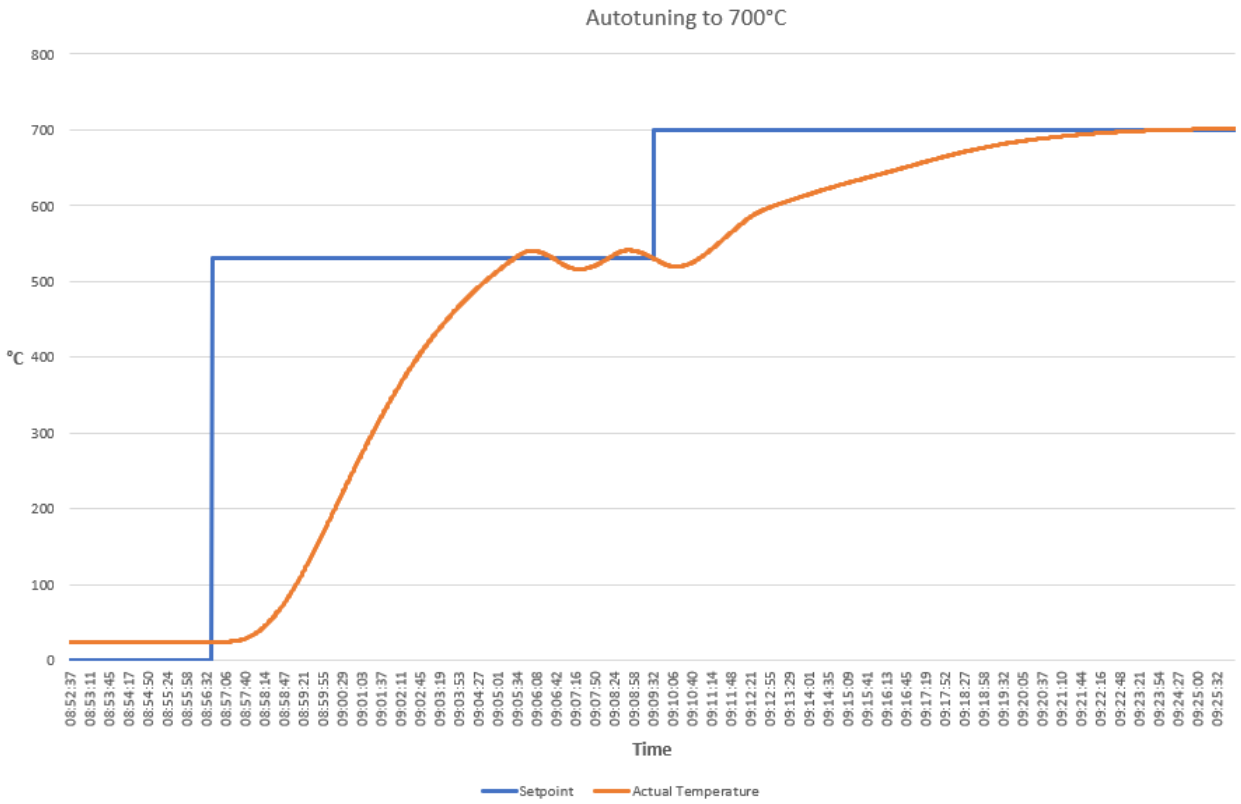
Depending on the intended application, it may be necessary for the product to be used outside of this normal range, in which case some tuning may be required in order to optimise the PID controls within the temperature controller e.g. if a high temperature product is to be used at a significantly lower temperature than it was originally designed for, or if a particularly heavy sample/load is to be heated.

Note: The following instructions are intended for use on single-zone products. Please contact Carbolite Gero Service for assistance if it is necessary to auto-tune a product with multiple heated zones or cascade control fitted.

Note: The 3016 contains two sets of PID terms, therefore it may be necessary to autotune at temperatures within both PID sets.

To use the Autotune function:

1. Ensure that the product is cold (at ambient temperature) before proceeding.
2. On the home display, set the setpoint temperature to 0°C .
3. Log in as Operator Level **3** (see section 4.0).
4. Navigate to the AtUn sublist in the main controller (see section 10.0).
5. Use the up and down buttons to switch the TUNE parameter from OFF to On. The auto-tune function will now go into stand-by mode for 30 seconds
6. Before the stand-by mode period lapses, navigate to the home display and set the product setpoint to the temperature you wish to optimise the product for e.g. 400°C
7. The controller will remain in stand-by mode for a few minutes. <AUTOTUNE ACTIVE> will scroll along the bottom of the home display when the product begins the auto-tuning cycle:
    - The controller heats until it is within a few degrees (°C / °F / K) of the programmed setpoint
    - The controller then cuts off power to the heating elements
    - The controller allows the temperature to overshoot the target setpoint
    - When the temperature drops below the point at which the controller stopped heating, it turns the power to the heating elements back on
    - The controller will then allow the temperature to undershoot (not reach the target setpoint)
    - The controller analyses the information it received from the overshoot and undershoot scenarios, and calculates new PID terms that will optimise temperature control for the new temperature range
    - The new PID terms are applied, and the controller then heats as normal until it reaches the target setpoint, then maintains that setpoint



Graphical Example of Autotuning a Product to 700°C

8. When the autotuning cycle successfully completes, the autotune status (T STAT) parameter in the AtUn list will display donE.

Tip: If you are tuning to optimise the controller for low temperature use, the output power (OUT HI) value can be reduced before autotune is used. Output power can be returned to a higher value if the product is subsequently required to operate at higher temperatures.
The OUT HI parameter can be found within the OP sublist in the controller configuration (see section 10.0).

13.0 Communications Connections

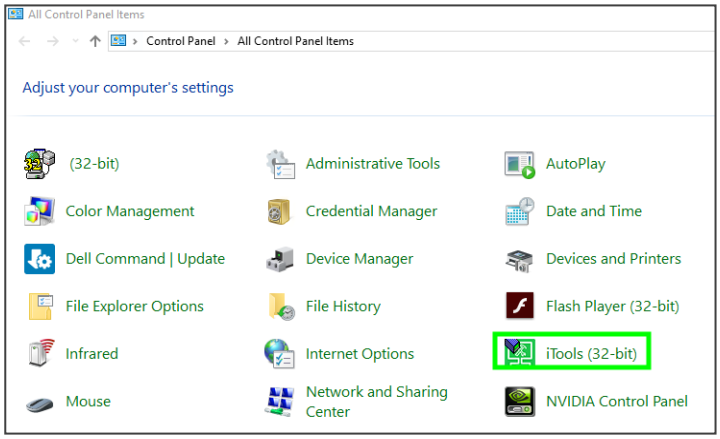
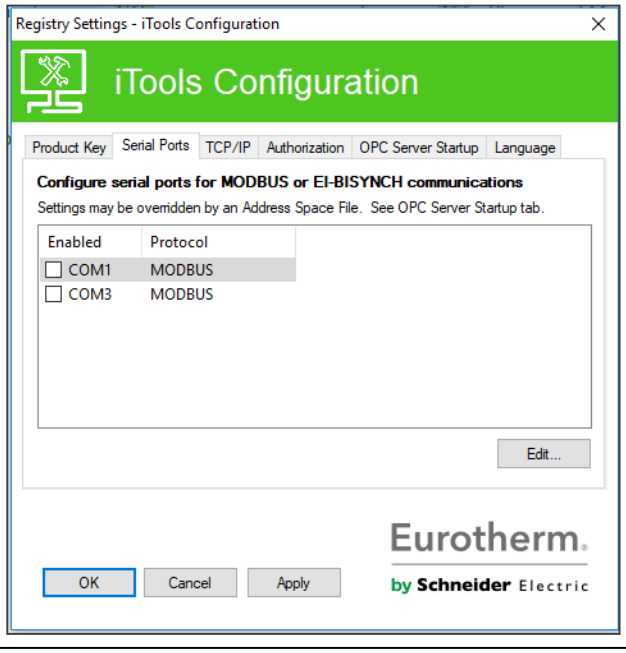
The 3016 enables ethernet or RS485 communications (optional) connections to allow users to monitor functions, create programs and load data into the controller via Eurotherm's iTools Engineering Studio software.

Note: Please refer to the separate iTools Quick Start Guide for instructions on installing iTools.

13.1 Configuring iTools Communications Settings

Before trying to connect the 3016 to iTools, it is first necessary to configure the communications settings.

To do this:

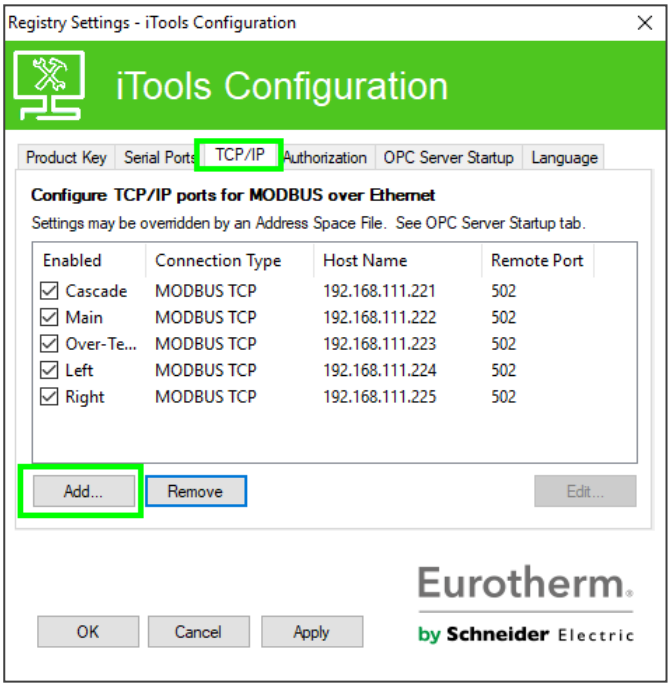
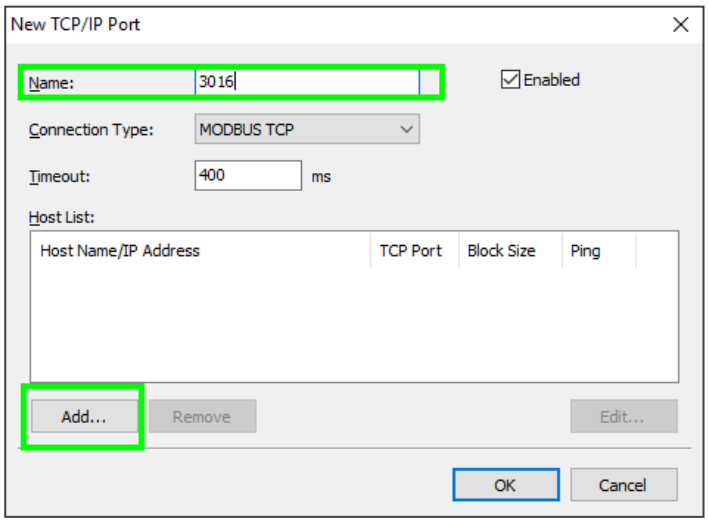
• Open the Control Panel on your computer and double-click on the iTools icon.	
• The "Registry Settings - iTools Configuration" window will appear.	

13.1.1 Ethernet Connections

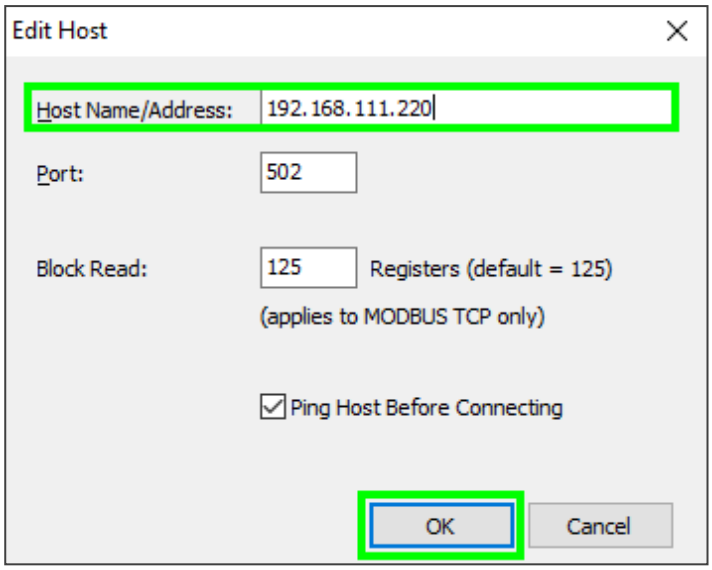
1. Connect the product to the computer/network via an ethernet cable. If required, you can use an Ethernet-to-USB adapter to connect a product directly to a single computer.

Note: Ethernet-to-USB adapters must be configured with IP addresses **different** to those of the controller, but within the same address range, in order to establish a successful iTools connection.

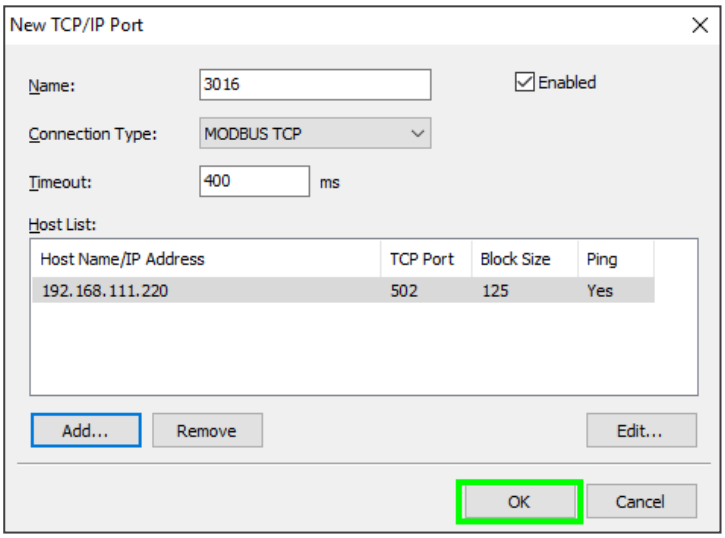
2. Switch on the product.

• Select the **TCP/IP** tab. • Click on the **Add** button.	
• In the **Name** field, type the name you wish to give to the port connection. In this example, the port has been named "3016". • Click on the **Add** button.	

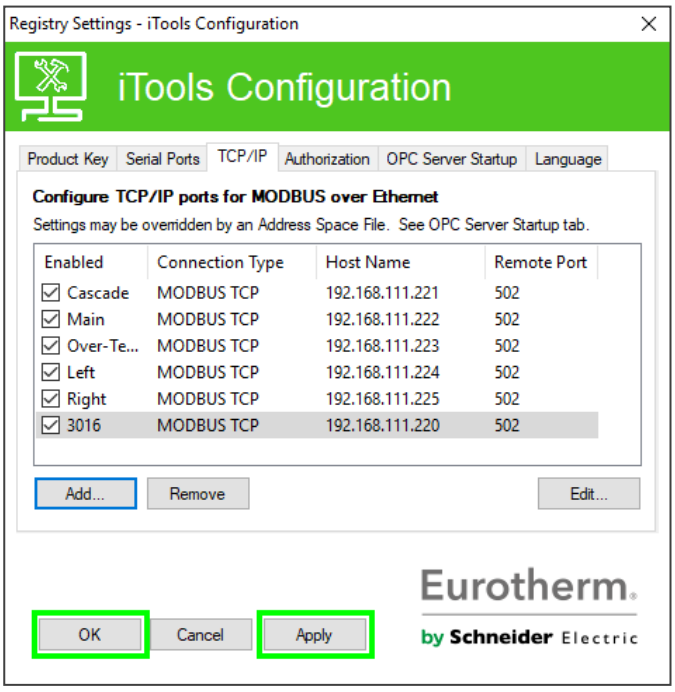
- Enter the desired IP address. (The default address is **192.168.111.222**).
- Click the **OK** button.



- Click the **OK** button.



- Click the **Apply** button, then the **OK** button.
- Restart iTools Engineering Studio for the new port to be recognised.



13.1.2 RS485 Connections (optional)

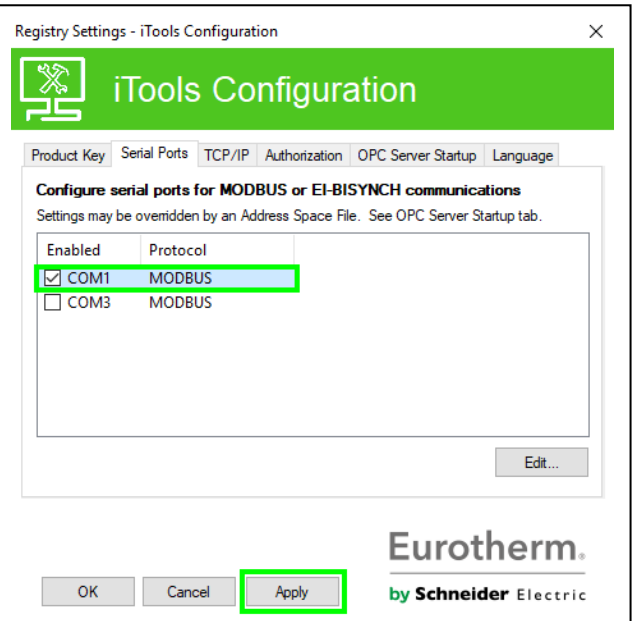
1. Connect the computer's 9 pin serial connector (male) to the 9 pin connector on the product (female) via an adapter cable supplied by Carbolite Gero.

Note: A 9 pin "RS485 to USB" converter may be required to connect through a USB port on the computer. These can be purchased from Carbolite Gero.

- Select a port by clicking on the checkbox. This will enable the serial port to be used for the connection. In this example the computer has two serial ports **COM1** and **COM3**.

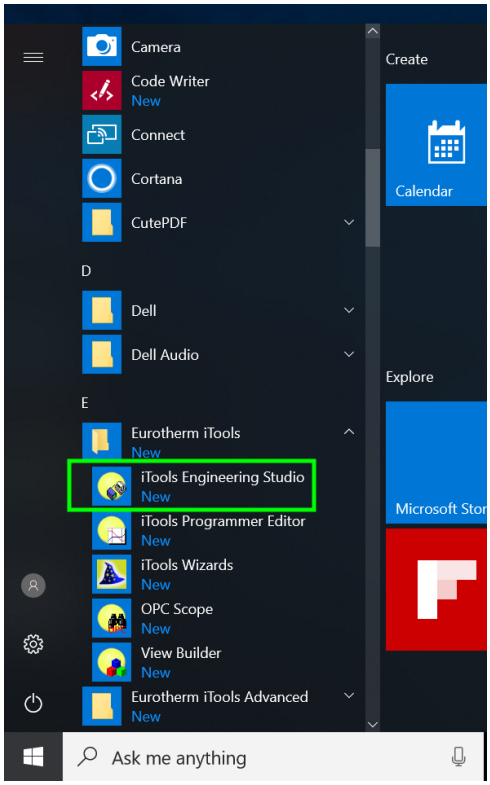
Note: If using a 9 pin RS485 to USB converter and a connection is moved to a different USB port on the same computer, it may have a different COM port number. The Carbolite Gero supplied converter will retain the port numbers.

- Click **Apply** and close this window and close the control panel window.
- Restart iTools for the new port to be recognised.

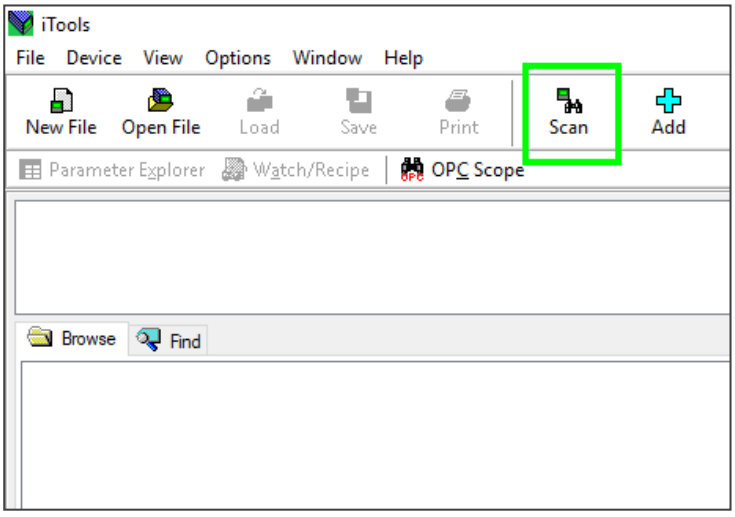


13.2 Establishing a Connection (Windows 10)

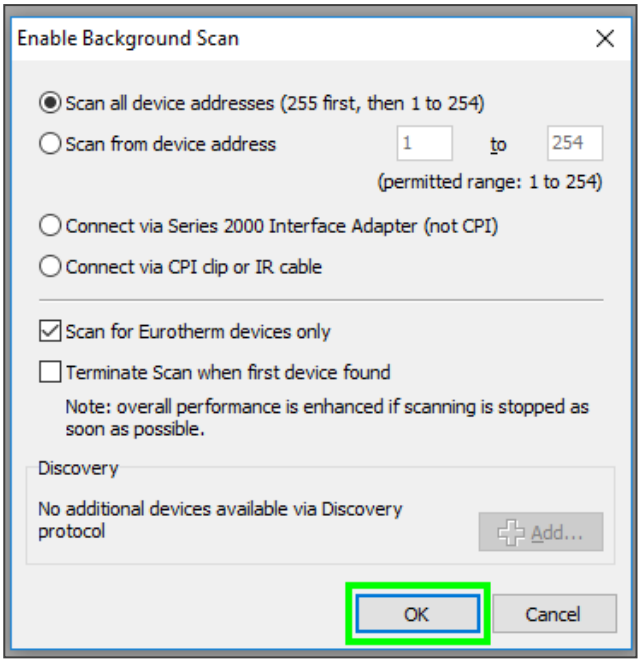
- Ensure that the controller is conntected to the computer.
- Click on the Windows icon in your toolbar, then scroll through the list of programs until you find **Eurotherm Tools**.
- Expand the folder and double-click on **iTools Engineering Studio**.



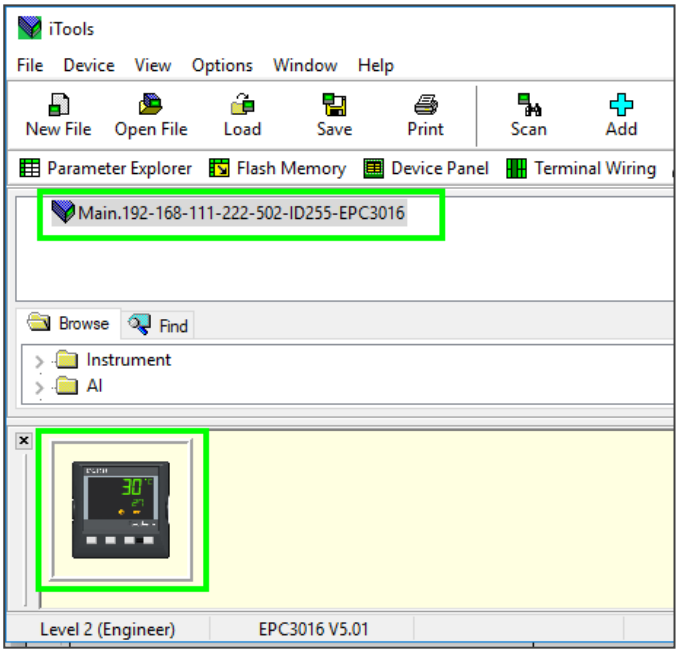
- Within iTools Engineering Studio click on **Scan**. The **Enable Background Scan** window will appear.



- Ensure the **Scan all device addresses (255 first, then 1 to 254)** and **Scan for Eurotherm devices only** options are selected, then click **OK**.



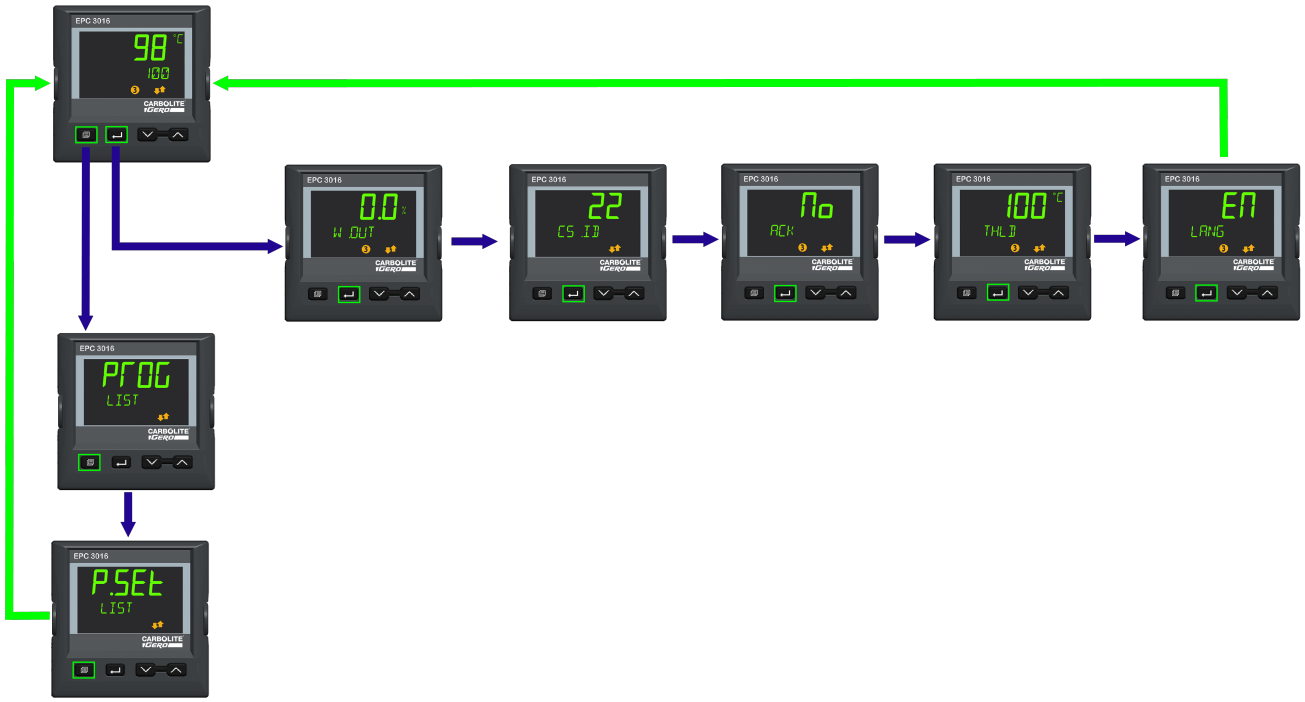
- When iTools scans the address of the controller connected to the computer, an image of the instrument will appear.
- The connection between the controller and the computer is established.
- Once all controllers have been found and connected, click on **Scan** to stop searching.



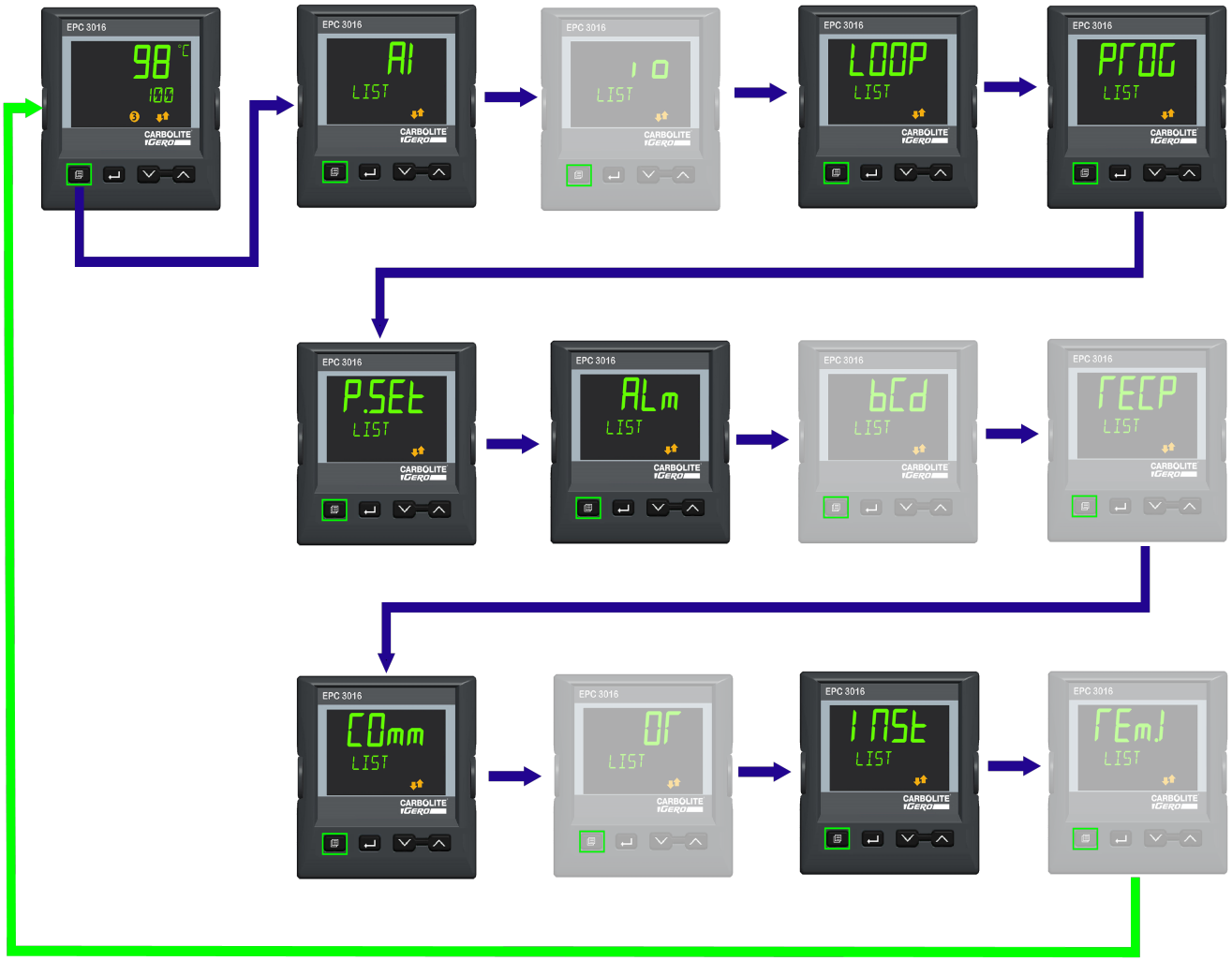
14.0 Navigation Diagrams

14.1 Operator Level 1

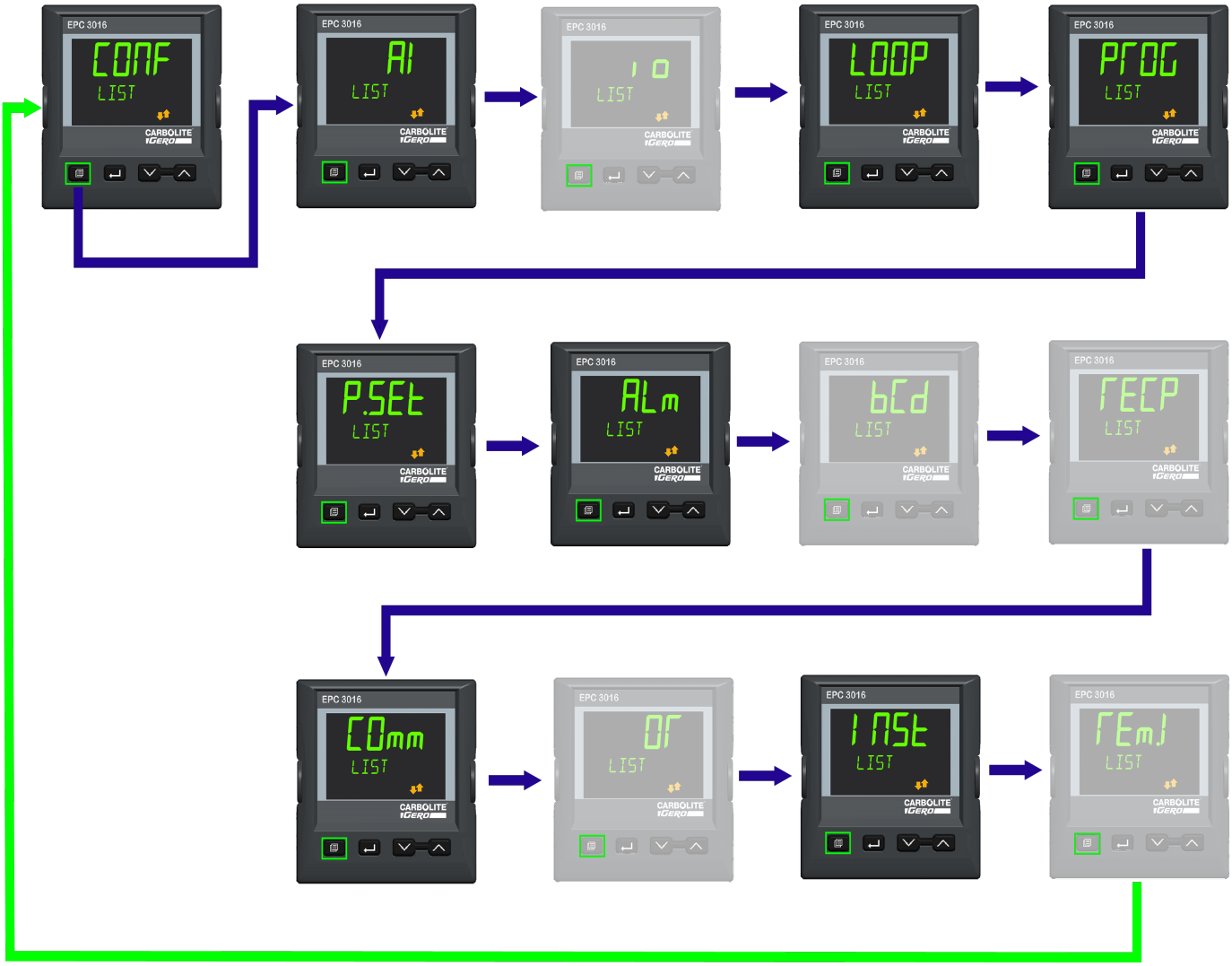
14.2 Operator Level 2



14.3 Operator Level 3



14.4 Configuration Level



14.5 Controller Replacement

Note: Disconnect the product from the electrical supply before carrying out any maintenance procedures.

Note: Before handling the controller, wear an anti-static wrist strap and avoid any possibility of damage to the unit by static electricity. Refer to the detailed instructions supplied with the replacement controller.

1. Ease apart the two lugs at the side.
2. Grip the instrument and withdraw it from its sleeve.
3. Push in the replacement.

Notes

Service Record

Engineer Name	Date	Record of Work

The products covered in this manual are only a small part of the wide range of ovens, chamber furnaces and tube furnaces manufactured by Carbolite Gero for laboratory and industrial use. For further details of our standard or custom built products please contact us at the address below, or ask your nearest stockist.

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