2132 and 2116  PID Temperature Controllers

Installing and Operating Instructions

Thank you for choosing the 2132 or 2116 Temperature Controller. Supplied in 1/32 and 1/16 DIN panel sizes they are designed for accurate, stable control of ovens, chillers, sterilisers and other heating and cooling processes. Two outputs are configurable for heating, cooling and alarms.

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This controller meets the European Directives on safety and EMC.

To Install the Controller

Please read the safety information on pages 11 & 12 before proceeding.
1. Prepare the panel cut-out to the size shown
2. Insert the controller through the cut-out.
3. Spring the panel retaining clips into place. Secure the controller in position by holding it level and pushing both retaining clips forward.
4. Peel off the protective cover from the display

Unplugging the Controller

The controller can be unplugged from its sleeve by easing the latching ears outwards and pulling it forward out of the sleeve. When plugging it back into its sleeve, ensure that the latching ears click back into place to maintain the IP65 sealing.

Output ratings
Logic Output: 9Vdc, 12mA (non-isolated from sensor input).
Used for: Heating, Cooling or Alarm.
relay Output: 2A, 264V ac resistive.
Used for: Heating, Cooling or Alarm.
Contact Closure Input (replaces Logic Output).
Used for: Alarm Acknowledge or Timer start/reset

Dimensions and Installation

Model 2132

Model 2116

Electrical Connections

Wire Sizes
The screw terminals accept wire sizes from 0.5 to 1.5 mm (16 to 22AWG). Hinged covers prevent hands or metal making accidental contact with live wires. The rear terminal screws should be tightened to 0.4Nm (3.5Ib in).
Typical Wiring Diagram

OPERATION
Switch on the controller. Following a 3 second self-test sequence, you will see the display shown below. It is called the HOME display.

![Typical Wiring Diagram](image)

**OP1** illuminates when the logic output is ON (normally heating).

**OP2** illuminates when the relay output is ON (normally cooling or alarm).

If **OP1 or OP2** are configured as alarm outputs (instead of heating and cooling), they will flash when a new 'unacknowledged' alarm occurs and go steady when the alarm is acknowledged but still true.

TO ACKNOWLEDGE A NEW ALARM
Press and release quickly the + and - button. This will also reset any latched alarms that are no longer true.

ALARM MESSAGES
If an alarm occurs a message will be flashed in the display. This alternates with the measured temperature as shown below:

<table>
<thead>
<tr>
<th>Possible messages</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>-FHL</td>
<td>Alarm - Full Scale High</td>
</tr>
<tr>
<td>-FSL</td>
<td>Alarm - Full Scale Low</td>
</tr>
<tr>
<td>-dEL</td>
<td>Alarm - Deviation</td>
</tr>
<tr>
<td>-dHL</td>
<td>Alarm - Deviation High</td>
</tr>
<tr>
<td>-dLO</td>
<td>Alarm - Deviation Low</td>
</tr>
<tr>
<td>Sbr</td>
<td>Sensor Break</td>
</tr>
<tr>
<td>Lbr</td>
<td>Loop Break</td>
</tr>
<tr>
<td>LdF</td>
<td>Load Fail</td>
</tr>
<tr>
<td>End</td>
<td>End of Timing</td>
</tr>
</tbody>
</table>

In place of the dash the alarm number is shown - Alarm 1 or 2 or 3.

TO ADJUST THE REQUIRED TEMPERATURE (SETPOINT)
Press and release quickly the + or - button. The setpoint will be displayed for 2 seconds.

TO VIEW THE DISPLAY UNITS
Press and release quickly the + or - button. The display units will be flashed for 0.5 sec.

WARNING
Snubbers pass 0.6mA at 110V and 1.2mA at 230Vac, which may be sufficient to hold on high impedance loads. Do not use in these installations.

* When switching inductive loads such as contactors or solenoid valves, wire the 22nF/100Ω ‘snubber’ supplied across relay terminals AA & AB. This will prolong contact life and reduce interference.

Display Units
- Deg Centigrade
- Deg Fahrenheit
- Deg Kelvin
- Linear inputs - no units displayed

If you get lost, pressing + and - together will always return you to the HOME display.

If, at any time, no key is pressed within 45 seconds, the display will always return to the HOME display.
**TO VIEW THE OUTPUT POWER**

Do this if you want to see how much heating or cooling energy is being demanded by the controller. Note: This is not a measure of actual power.

To turn the controller off:

1. Press twice quickly to select the HOME display.
2. Press to select the OP parameter.
3. Press to set the heating output power to 0.

**Warning!**

In manual standby mode (see ‘To Use The Timer’) the output power can be adjusted by the operator, causing heating or cooling to be permanently applied. To prevent this make the OP parameter read only (see ‘To Hide, Reveal And Promote Parameters’).

**TO SELECT OR CHANGE OTHER PARAMETERS**

Parameters are settings in the controller which you can change to suit the process. They are found under list headings.

Press the button to step through the list headings as shown below.

**HOME display**

Press twice quickly

Press or to view the

Keep pressing to select more list headings, eventually returning to the HOME display. This is a continuous loop.

Turn to page 4 to see all of the list headings.

These lists are used to:

- Change alarm setpoints
- Tune the controller to the process
- Manually select PID values
- Change setpoint limits and access the in-built timer
- Change input and output limits

**TO ADJUST THE ALARM SETPOINTS (TRIP LEVELS)**

Alarm setpoints are found under the list.

Press twice to choose the list.

There are three alarm setpoints. The first character is the alarm setpoint number, the next three the alarm type, as follows:

- Low alarm
- High alarm
- Deviation
- Deviation
- Deviation
- Deviation

If an alarm has been disabled, it will not appear in this list.

Press or to change the setpoint.

Press and together to return to the HOME display.

Note: The other parameters listed on pages 4 and 5 are accessed and adjusted in exactly the same way as this example.
**PARAMETER LISTS**

**Home List**
- **OP**: Output Power demand in %
- **wSP**: Working Setpoint
- **m-A**: Manual/Auto Select
- **d1 SP**: Home Display Options

**Adjustable Range**
- -100 = max cooling, 100.0 = max heating.
- Displays the output power - for use as a manual station. (Only applies to software version 1.4)
- Blank Display (only alarm messages flashed)
- Displays the Process Value only
- Displays the Alarm 2 Setpoint only
- Displays the Process Value with Alarm 2 Setpoint accessed by the and buttons

**Default setting**
- Read only
- Read only
- Auto
- Manual standby selected

**Customer setting**
- Std
- Displays the output power - for use as a manual station. (Only applies to software version 1.4)
- Alarm List (See page 3)
- Alarm 1 Setpoint
- Alarm 2 Setpoint
- Alarm 3 Setpoint

**Adjustable Range**
- Between low and high setpoint limits
- Full Scale Low
- Full Scale High
- Deviation
- Deviation High
- Deviation Low

**Default Setting**
- 0
- 0
- 0

**Customer setting**
- 0
- 0

**Notes:**
1. In place of dashes, the last three letters depend on the alarm type. See “Adjusting the alarm setpoints” on page 3.
2. Either the PID list or the On/Off list will be present depending upon the configuration of the controller.

---

**Summary**
1. Press to step across the list headings.
2. Press to step down the parameters within a particular list. You will eventually return to the list heading.
3. Press to view the value of a selected parameter. Keep pressing to decrease the value.
4. Press to view the value of a selected parameter. Keep pressing to increase the value.

---

**X2**

### Summary
- Press to step across the list headings.
- Press to step down the parameters within a particular list. You will eventually return to the list heading.
- Press to view the value of a selected parameter. Keep pressing to decrease the value.
- Press to view the value of a selected parameter. Keep pressing to increase the value.

---

**Parameter Tables**

<table>
<thead>
<tr>
<th>Home List</th>
<th>Adjustable Range</th>
<th>Default setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP</td>
<td>Output Power demand in %</td>
<td>-100 = max cooling, 100.0 = max heating.</td>
<td></td>
</tr>
<tr>
<td>wSP</td>
<td>Working Setpoint</td>
<td>Only appears when setpoint rate limit enabled</td>
<td>Read only</td>
</tr>
<tr>
<td>m-A</td>
<td>Manual/Auto Select</td>
<td>Auto Automatic control selected</td>
<td>Manual standby selected</td>
</tr>
<tr>
<td>d1 SP</td>
<td>Home Display Options</td>
<td>Std Standard - Shows the process value with the setpoint accessed by pressing the and buttons.</td>
<td>STD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OP Displays the output power - for use as a manual station. (Only applies to software version 1.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NonE Blank Display (only alarm messages flashed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pj Displays the Process Value only</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A1SP Displays the Alarm 2 Setpoint only</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PuAR Displays the Process Value with Alarm 2 Setpoint accessed by the and buttons</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alarm List (See page 3)</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1--3</td>
<td>Alarm Setpoint</td>
<td>In place of dashes, the last three letters indicate the alarm type:</td>
<td>Between low and high setpoint limits</td>
</tr>
<tr>
<td>2--3</td>
<td>Alarm Setpoint</td>
<td>Full Scale Low</td>
<td>0</td>
</tr>
<tr>
<td>3--3</td>
<td>Alarm Setpoint</td>
<td>Full Scale High</td>
<td>0</td>
</tr>
<tr>
<td>HY</td>
<td>Alarm Hysteresis</td>
<td>to 9999 in display units (This value is common to all alarms)</td>
<td>Hysteresis is used to prevent the alarm output 'chattering' by setting a difference between the alarm switch ON and switch OFF points</td>
</tr>
<tr>
<td>Lb t</td>
<td>Loop Break Time</td>
<td>OFF to 9999 minutes</td>
<td>OFF</td>
</tr>
</tbody>
</table>

---

**Shaded boxes are hidden when shipped from the factory.**
### Automatic Tuning List

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>tuneE</td>
<td>Automatic Tune Enable</td>
<td>OFF or ON</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>Adc</td>
<td>Automatic Manual reset calculation (when P+D control)</td>
<td>OFF or ON</td>
<td>OFF</td>
<td></td>
</tr>
</tbody>
</table>

### PID List (See page 10)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Proportional Band</td>
<td>1 to 999.9 display units</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Integral Time</td>
<td>OFF to 9999 seconds</td>
<td>360</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Derivative Time</td>
<td>OFF to 9999 seconds</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>rES</td>
<td>Manual Reset Value (only present if I = OFF)</td>
<td>-100 to 100.0 %</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Lcb</td>
<td>Low Outback</td>
<td>Auto to 9999 display units</td>
<td>Auto</td>
<td></td>
</tr>
<tr>
<td>Hcb</td>
<td>High Outback</td>
<td>Auto to 9999 display units</td>
<td>Auto</td>
<td></td>
</tr>
<tr>
<td>rELC</td>
<td>Relative Cool Gain</td>
<td>0.01 to 999</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

### Setpoint List (See “To Use the Timer” on page 6)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>Setpoint Low Limit</td>
<td>-9999 to 9999</td>
<td>As per order</td>
<td></td>
</tr>
<tr>
<td>SH</td>
<td>Setpoint High Limit</td>
<td>-9999 to 9999</td>
<td>As per order</td>
<td></td>
</tr>
<tr>
<td>Sp-r</td>
<td>Setpoint Rate Limit</td>
<td>OFF to 9999 display units per minute</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>tmOP</td>
<td>Timer Operating Mode</td>
<td>OFF: 1 to OP:5</td>
<td>OP: 1</td>
<td></td>
</tr>
<tr>
<td>tmr</td>
<td>Time Remaining</td>
<td>0 to 9999 minutes</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>dwEl</td>
<td>Dwell Time</td>
<td>OFF to 9999 minutes</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>StAt</td>
<td>Timer Status</td>
<td>OFF or ON</td>
<td>OFF</td>
<td></td>
</tr>
</tbody>
</table>

### Input List (See "User Calibration" on page 9)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIltC</td>
<td>Input Filter Time Constant</td>
<td>OFF to 9999 seconds</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>CJC*</td>
<td>Cold Junction Temperature measured at rear terminals</td>
<td>Read only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mV</td>
<td>Millivolt Input measured at the rear terminals</td>
<td>Read only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>oFS</td>
<td>Process value Offset</td>
<td>-9999 to 9999 display units</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>calP</td>
<td>Calibration Password</td>
<td>0 to 9999</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CAL</td>
<td>User Calibration Enable</td>
<td>FACT: Re-instates factory calibration</td>
<td>FACT:</td>
<td></td>
</tr>
<tr>
<td>PnL</td>
<td>Low Calibration Point</td>
<td>-9999 to 9999 display units</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OFSL</td>
<td>Low Point Calibration Offset</td>
<td>-9999 to 9999 display units</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PnH</td>
<td>High Calibration Point</td>
<td>-9999 to 9999 display units</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>OFSH</td>
<td>High Point Calibration Offset</td>
<td>-9999 to 9999 display units</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### Output List

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPLa</td>
<td>Low Output Power Limit</td>
<td>-100 to 100.0 %</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>OPHh</td>
<td>High Output Power Limit</td>
<td>-100 to 100.0 %</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>CyCH</td>
<td>Heating Output Cycle Time</td>
<td>0.2 to 9999 seconds</td>
<td>10 Lgc 20 Rly</td>
<td></td>
</tr>
<tr>
<td>CyCC</td>
<td>Cooling Output Cycle Time</td>
<td>0.2 to 9999 seconds</td>
<td>50 Lgc 20 Rly</td>
<td></td>
</tr>
<tr>
<td>onTH</td>
<td>Heating Output Minimum On Time</td>
<td>Auto to 9999 seconds (Auto = 50ms)</td>
<td>Auto</td>
<td></td>
</tr>
<tr>
<td>onTC</td>
<td>Cooling Output Minimum On Time</td>
<td>Auto to 9999 seconds (Auto = 50ms)</td>
<td>Auto</td>
<td></td>
</tr>
</tbody>
</table>

### On Off Output List

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>hVSH</td>
<td>Heating Hysteresis</td>
<td>1 to 9999 display units</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>hVSC</td>
<td>Cooling Hysteresis</td>
<td>1 to 9999 display units</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>HCdb</td>
<td>Heat/Cool Deadband</td>
<td>0 to 9999 display units</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

### Access List (See “To Hide, Reveal and Promote" parameters on page 6)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Adjustable Range</th>
<th>Default Setting</th>
<th>Customer setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>cOdE</td>
<td>Access Pass Number</td>
<td>0 to 9999</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>cGot</td>
<td>Go To Required Access Level</td>
<td></td>
<td>DPE</td>
<td></td>
</tr>
<tr>
<td>cOnF</td>
<td>Configuration Pass Number</td>
<td>0 to 9999</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

---

**Issue 2, Nov-98. Applies to software versions 1.3 & 1.4**

**HA026270**
TO HIDE, REVEAL AND PROMOTE PARAMETERS

Press \[\text{ACC}\] until the Access List Heading is reached.

Press \[\text{PASS}\] to enter the password. The factory default is \[\text{PASS}\].

Press \[\text{Ed}\] to select \[\text{Ed}\] level. Other options are:

- \[\text{OPE}\]: Operator level - shows selected parameters
- \[\text{FULL}\]: Reveals the ‘FULL’ set of parameters
- \[\text{Conf}\]: Gives access to configuration level.

Press \[\text{OPE}\] to return to the Access list header.

Example:

High alarm 2 has been selected.  When \[\text{Hi}\] or \[\text{dE}\] is pressed, instead of displaying the parameter value, its availability to in Operator level is shown as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[\text{Hi}]</td>
<td>The parameter will be alterable</td>
</tr>
<tr>
<td>[\text{dE}]</td>
<td>The parameter will be hidden</td>
</tr>
<tr>
<td>[\text{rEFd}]</td>
<td>The parameter will be read-only</td>
</tr>
<tr>
<td>[\text{Pro}]</td>
<td>The parameter will be ‘promoted’ into the HOME list (see below).</td>
</tr>
</tbody>
</table>

The \[\text{Pro}\] (Promote) option

Up to twelve commonly used parameters can be ‘promoted’ into the HOME list. This will give the operator quick access to them by simply pressing the \[\text{OPE}\] button. This feature, used in combination with ‘hide’ and ‘read only’, allows you to organise the way in which you want your controller formatted.

Example:

Time Remaining has been selected.  Press \[\text{Pro}\] to choose \[\text{Pro}\].

The parameter \[\text{Emr}\] will now appear in the HOME list. Repeat the procedure for any other parameters you wish to promote.

To remove a parameter go to \[\text{Ed}\] level, select the parameter from the relevant list and change the choice from \[\text{Pro}\] back to \[\text{Alt}\], \[\text{rEFd}\] or \[\text{dE}\].

Returning to Operator level

Repeat the above procedure for all the parameters you wish to hide, promote, or make read-only then return to operator level:

1. Press \[\text{OPE}\] until you reach the \[\text{ACC}\] list heading
2. Press \[\text{OPE}\] until you reach \[\text{Goto}\]
3. Press \[\text{OpE}\] to select \[\text{OPE}\]
4. Press \[\text{OPE}\] to return to Operator level

TO USE THE TIMER

- Press \[\text{OPE}\] until you reach the \[\text{SP}\] list
- Press \[\text{OPE}\] until you reach the \[\text{m-A}\] parameter
- Press \[\text{OpE}\] to select the timer operating mode, \[\text{OpE}\] as follows:

**\[\text{OpE}\] - Mode 1, Dwell and Switch Off**

In reset

In reset, you can switch between automatic control and standby mode, using the parameter \[\text{m-A}\] in the HOME list. The controller is supplied with the \[\text{m-A}\] parameter hidden. You must first reveal it. See ‘To Hide, Reveal and Promote Parameters’.

From the HOME display press \[\text{OPE}\] until the \[\text{m-A}\] parameter is displayed.

Press \[\text{OpE}\] to select:

- \[\text{Auto}\]: Automatic control
- \[\text{Standby}\]: Standby mode, (the MAN beacon below OP2 will illuminate)

Press \[\text{OpE}\] and \[\text{OpE}\] together to return to the HOME display

‘Automatic control’ means control at setpoint, with heating (and cooling) being applied.

‘Standby mode’ means: the controller is in a manual with zero output power. See ‘Warning!’ on Page 3.

During Running

The controller will always switch to automatic control. Heating (or cooling) will be applied and the temperature will rise (or cool) to the setpoint. When the temperature is within 1°C of setpoint, the timer will start counting down.

During End

When the timer times out, the controller will switch to standby mode. The MAN beacon will light and \[\text{End}\] will be flashed in the main display. The process will cool down. The timer will remain indefinitely in this state until reset.

When Reset

\[\text{End}\] will stop flashing. The controller will return to reset in standby mode. It can be returned to automatic control by setting the parameter \[\text{m-A}\] in the HOME list to \[\text{Auto}\].

**\[\text{OpE}\] - Mode 2, Dwell No Switch Off**

This is the same as mode 1 except that at the end of the timing period the controller will continue indefinitely in automatic control.
Timer Operating Modes continued

**Mode 3, Time from Cold and Switch Off**

This is the same as mode 1 except that the timer will start counting down immediately without waiting for the temperature to reach setpoint.

**Mode 4, Time from Cold No Switch Off**

This is the same as mode 2 except that the timer will start counting down without waiting for the controller to reach setpoint.

**Mode 5, Delayed Switch On**

This mode applies a time delay before turning on the heating (or cooling). When the timer is started, the controller will always switch to standby mode and start counting down. When the timer has timed out, the controller will switch into automatic control, apply heating (or cooling) and control indefinitely at the setpoint.

To Program a Ramp-Dwell profile

A simple ramp-dwell profile can be programmed using $SP_{rr}$ (setpoint rate limit) in combination with the timer. To use this feature, first reveal $SP_{rr}$ and $wSP$ (the working setpoint) using the method described in “To Hide, Reveal and Promote” parameters.

$wSP$ will then appear in the HOME list.

Set $SP_{rr}$ to the required ramp rate. It is adjustable in $1/10$th of the least significant display units per minute. That is if the display is configured 0 to 1000°C, setpoint rate limit can be adjusted between 0.1 and 999.9 °C per minute.

When setpoint rate limit has been enabled and the timer is started, the working setpoint, $wSP$, will first step to the measured temperature and then ramp at the setpoint rate limit, $SP_{rr}$, to the target setpoint.

In modes 1 and 2 timing will start when the measured temperature is within 1 °C of the target setpoint. In modes 3 and 4 it will start when $SP_{rr}$ is within 1 °C of the target setpoint.

### To Start and Reset the Timer

There are two methods:

**Method 1.**

This is the simplest method to control the timer.

- Press $\Delta$ until you reach the $SP$ list
- Press $\nabla$ until you reach the $\text{Em}$ parameter (time remaining).

![Timer Status Diagram]

Press $\nabla$ or $\Delta$ to enter the required timing period in minutes (0 to 9999).

Press $\nabla$ to return to the HOME display

**TIP:** Promote $\text{Em}$ to the HOME list for quick access, as described in “To Hide, Reveal, and Promote Parameters.”

As soon as a value is entered into $\text{Em}$ timing will commence. $\text{Em}$ will count down towards zero. During the timing period $\text{Em}$ can be increased or decreased according to the demands of the process. Setting the value to zero will end the timing period.

When $\text{Em}$ reaches zero, $\text{End}$ will flash in the main display. The timer will remain indefinitely in this state until a new value is entered, when the timer will restart.

To reset the timer, press $\nabla$ and $\Delta$ together. $\text{End}$ will stop flashing.

To restart the timer, enter a new value into $\text{Em}$.

**Method 2.**

Use this method if you want to set a fixed time and use the $\text{Start}$ parameter to start and stop the timer.

![Timer Status Diagram]

Press $\Delta$ to reach the $SP$ List heading.

Press until you reach $dwEl1$

Press $\nabla$ or $\Delta$ to enter a timing period in minutes (0-9999).

Press $\nabla$ to return to the HOME display.

The $\text{Start}$ parameter can also be switched between $\text{OFF}$ and $\text{run}$ by configuring the logic I/O as a $\text{Off/Run}$ contact closure input.

Open the external contact to select $\text{run}$. This is an edge triggered action. Close the contact to select $\text{OFF}$. $\text{OFF}$ is forced whenever the contact is closed.
**CONFIGURING THE CONTROLLER**

Select configuration level to change: • The type of control • The display units • The input sensor type • The scaling of linear inputs • The alarm configuration • The passwords.

To select configuration level

Press [ACS] to reach the Access List Heading.

Press [Code] to enter the password. The factory default is 1.  PASS will be displayed when the correct password has been entered.

Press [Go to conf] to select conf.

Press [Conf PASS] to enter the configuration level password. The factory default is 2.  PASS will be displayed when the correct password has been entered.

Press to enter configuration level.

Press [ ] to step across the configuration list headings.

Having selected a list heading, press [ ] to select a parameter within a particular list. Press [ ] and [ ] to change the setting.

### Instrument Configuration

<table>
<thead>
<tr>
<th>Inst</th>
<th>Instrument Configuration</th>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>uInE</td>
<td>Display units</td>
<td>°C</td>
<td>Centigrade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>°F</td>
<td>Fahrenheit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>°K</td>
<td>Kelvin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>dECP</td>
<td>Decimal places in display</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One</td>
<td>One</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two</td>
<td>Two</td>
</tr>
<tr>
<td>Ctrl</td>
<td>Control type</td>
<td>P.d</td>
<td>PID Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On/OF</td>
<td>On/off Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AL</td>
<td>Converts the controller to an alarm unit</td>
</tr>
<tr>
<td>Act</td>
<td>Control action</td>
<td>rE</td>
<td>Reverse (normal action for temperature control)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>uE</td>
<td>Direct (output decreases as PV falls below SP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dE</td>
<td>In Auto holds manual reset value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>uE</td>
<td>In Auto tracks output for bumpless A/M transfer</td>
</tr>
</tbody>
</table>

### Input Configuration

<table>
<thead>
<tr>
<th>Inst</th>
<th>Sensor Input</th>
<th>Options</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>lPE</td>
<td>Input type</td>
<td>Jtc</td>
<td>J thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ktc</td>
<td>K thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ltc</td>
<td>L thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>rtc</td>
<td>R thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>btc</td>
<td>B thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ntc</td>
<td>N thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ttc</td>
<td>T thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stc</td>
<td>S thermocouple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PL 2</td>
<td>Platinum II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PL 1.5K</td>
<td>100Ω Pt thermistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>mV</td>
<td>Linear mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ctc</td>
<td>Custom input (C=default)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inst</th>
<th>Linear input scaling</th>
<th>Options</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>lPL</td>
<td>mV input low</td>
<td>Displayed value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mV input high</td>
<td>Displayed value</td>
<td></td>
</tr>
<tr>
<td>UALL</td>
<td>Displayed value low</td>
<td>Displayed value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Displayed value high</td>
<td>Displayed value</td>
<td></td>
</tr>
<tr>
<td>lP</td>
<td>Sensor break input impedance</td>
<td>OFF</td>
<td>Off (Linear inputs only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AUTO</td>
<td>1.5KΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H</td>
<td>5KΩ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H H</td>
<td>15KΩ</td>
</tr>
</tbody>
</table>

### Alarm Configuration

The AL list configures the three internal 'soft' alarms and causes the appropriate alarm message to be flashed in the HOME display. At this stage the alarm is indication only (known as a 'soft alarm'). To make the alarms operate the relay or logic outputs, follow the instructions under "Relay and Logic input/output Configuration.

<table>
<thead>
<tr>
<th>Inst</th>
<th>Alarm</th>
<th>Type</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL 1</td>
<td>Alarm 1</td>
<td>OFF</td>
<td>The alarm is disabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSL</td>
<td>Full Scale Low alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FSH</td>
<td>Full Scale High alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dE</td>
<td>Deviation band alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dH</td>
<td>Deviation high alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dLo</td>
<td>Deviation low alarm</td>
</tr>
<tr>
<td>Letch</td>
<td>Alarm latching</td>
<td>no</td>
<td>Non-latching</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td>Latched with automatic* resetting.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Latched with manual* resetting.</td>
</tr>
<tr>
<td>bLoc</td>
<td>Alarm blocking</td>
<td>no</td>
<td>No blocking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>YES</td>
<td>Blocked until first good</td>
</tr>
</tbody>
</table>

The above sequence is repeated for:

**AL 2** (Alarm 2) and **AL 3** (Alarm 3)

**SPL** | Alarm setpoint limits | DO | Limited by display range |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>lPL</td>
<td></td>
<td>5</td>
<td>Limited by setpoint limits</td>
</tr>
</tbody>
</table>

*Automatic resetting means that, once the alarm has been acknowledged, it will automatically clear when it is no longer true.
*Manual resetting means that the alarm must first clear before it can be reset.
Relay and Logic input/output Configuration

Note: The logic I/O can be configured as an output or a contact closure input for alarm acknowledge, keylock, or timer run/reset.

<table>
<thead>
<tr>
<th>AR</th>
<th>Relay output</th>
<th>Options</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>i d</td>
<td>Identity of output</td>
<td>r EL,Y</td>
<td>Relay</td>
</tr>
<tr>
<td>LOG</td>
<td>Logic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Func</td>
<td>Function</td>
<td>d t</td>
<td>Digital (alarm) output</td>
</tr>
<tr>
<td>HEAT</td>
<td>Heating output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOL</td>
<td>Cooling output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>These functions are only appear for the logic I/O</td>
<td>5Sr 1</td>
<td>PDSIO mode 1</td>
<td></td>
</tr>
<tr>
<td>5Sr 1</td>
<td>Alarm Acknowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locb</td>
<td>Keylock digital input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>Run/reset timer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dGF</td>
<td>Digital output functions</td>
<td>nGh</td>
<td>No change</td>
</tr>
<tr>
<td>CLr</td>
<td>Clear all alarms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFSL</td>
<td>Alarm 1 (See note 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2FSL</td>
<td>Alarm 2 (See note 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3FSL</td>
<td>Alarm 3 (See note 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SBr</td>
<td>Sensor break alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LBr</td>
<td>Loop break alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDF</td>
<td>Load fail alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man</td>
<td>Man mode active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End</td>
<td>End of timing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tml1</td>
<td>Timer running</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dml2</td>
<td>Timer counting down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dml3</td>
<td>Timer running</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dml4</td>
<td>Timer counting down</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sens</td>
<td>Sense of the output</td>
<td>nor</td>
<td>Normal (heating or cooling outputs)</td>
</tr>
<tr>
<td>i nu</td>
<td>Inverted (alarming de-energises in alarm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The logic I/O can be configured as an output or a contact closure input for alarm acknowledge, keylock, or timer run/reset, see the AR List.

To Clear Alarms from an Output
1. Press until to reach dGF
2. Press or to select CLr
3. Leave for 2 seconds. The display returns to dGF which disconnects all alarms from the relay.

Passwords

<table>
<thead>
<tr>
<th>PRSS</th>
<th>Passwords</th>
<th>Range</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACCP</td>
<td>Full and Edit level password</td>
<td>0-9999</td>
<td>1</td>
</tr>
<tr>
<td>EnFP</td>
<td>Configuration level password</td>
<td>0-9999</td>
<td>2</td>
</tr>
<tr>
<td>CALP</td>
<td>User calibration password</td>
<td>0-9999</td>
<td>3</td>
</tr>
</tbody>
</table>

To leave Configuration level
Press to reach the ’Ei t’ display
Press or to select ’YES’. After 2 seconds the display will blink and return to the HOME display in Operator level.

Diagnostic Alarms

In addition to the normal process alarms, the following diagnostics alarm messages are provided.

<table>
<thead>
<tr>
<th>Message</th>
<th>Meaning and (Action)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEEr</td>
<td>Electrically Erasable Memory Error: A parameter value has been corrupted. Contact Eurotherm Controls.</td>
</tr>
<tr>
<td>HuEr</td>
<td>Hardware error: (Return for repair)</td>
</tr>
<tr>
<td>LLLL</td>
<td>Low display range exceeded. (Check input signal)</td>
</tr>
<tr>
<td>HHHH</td>
<td>High display range exceeded. (Check input signal)</td>
</tr>
<tr>
<td>Error</td>
<td>Error 1: ROM self-test fail. (Return for repair)</td>
</tr>
<tr>
<td>Error</td>
<td>Error 2: RAM self-test fail. (Return for repair)</td>
</tr>
<tr>
<td>Error</td>
<td>Error 3: Watchdog fail. (Return for repair)</td>
</tr>
<tr>
<td>Error</td>
<td>Error 4: Keyboard failure. Stuck button, or a button was pressed during power up.</td>
</tr>
<tr>
<td>Error</td>
<td>Error 5: Input circuit failure. (Return for repair)</td>
</tr>
<tr>
<td>PwrF</td>
<td>Power failure. The line voltage is too low.</td>
</tr>
<tr>
<td>tUEr</td>
<td>Tune Error. Appears if auto-tuning exceeds 2 hours.</td>
</tr>
</tbody>
</table>

USER CALIBRATION

Your controller has been calibrated for life against known reference sources. User calibration allows you to apply offsets to compensate for sensor and other system errors. The parameter DFS in the P list applies a fixed offset over the whole display range. You may also apply a 2-point calibration as follows:

- Press until you reach the P list
- Press or until you reach the CAL parameter
- Press or to enter the password. The factory default is 3. PRSS will be displayed when the correct has been entered.
- Press to reach the CAL parameter
- Press or to select USER (FACT will restore the factory calibration)
- Press to select in turn the four parameters shown in the graph below. Use or to set the desired calibration points and the offsets to be applied at each point. The P list on page 5 describes each of the parameters.

![Calibration Graph]

Displayed Value

User calibration

Factory calibration

Factory calibration
AUTOMATIC TUNING

In PID control, the output from the controller is the sum of three terms: Proportional, Integral and Derivative. These three terms deliver just the right amount of power to hold the temperature at setpoint without oscillation. For stable control, the PID values must be ‘tuned’ to the characteristics of the process being controlled. In the 2132 and 2116 this is done automatically using advanced tuning techniques. Automatic tuning is performed by switching the output of the controller On and Off to induce an oscillation in the measured temperature. From the amplitude and period of the oscillation, the PID values, shown in the table below, are calculated.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Display</th>
<th>Meaning or Calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportional band</td>
<td>( P_b )</td>
<td>The bandwidth in ( ^\circ C ) or ( ^\circ F ) over which the output power is proportioned between minimum and maximum.</td>
</tr>
<tr>
<td>Integral time</td>
<td>( E_t )</td>
<td>Determines the time taken by the controller to remove steady-state error signals.</td>
</tr>
<tr>
<td>Derivative time</td>
<td>( E_d )</td>
<td>Determines how strongly the controller will react to the rate-of-change of temperature.</td>
</tr>
<tr>
<td>Low cutback</td>
<td>( L_c b )</td>
<td>The number of ( ^\circ C ) or ( ^\circ F ) below setpoint at which the controller will cutback the output power to prevent overshoot on heat up.</td>
</tr>
<tr>
<td>High Cutback</td>
<td>( H_c b )</td>
<td>The number of ( ^\circ C ) or ( ^\circ F ) above setpoint at which the controller will increase the output power to prevent undershoot on cool down.</td>
</tr>
<tr>
<td>Relative cool gain</td>
<td>( rE_LC )</td>
<td>Only present if cooling has been configured. Sets the cooling proportional band by dividing the ( P_b ) value by the ( rE_LC ) value.</td>
</tr>
</tbody>
</table>

If the process cannot tolerate 100% heating or cooling during tuning, the power can be restricted by the heating and cooling limits in the Output list. However, the measured value must oscillate to some degree for the tuner to determine values.

Tuning is normally performed only once during the initial commissioning of the process. However, if the process under control subsequently becomes unstable (because its characteristics have changed), you can re-tune again at any time.

It is best to tune starting with the process at ambient temperature. This allows the tuner to calculate more accurately.

Heating and Cooling Output Cycle Times

Before commencing a tuning cycle, set the values of \( CYC_H \) (heating output cycle time) and \( CYC_C \) (cooling output cycle time) in the \( oP_n \) (output) list.

For a logic heating output (switching a SSR), set \( CYC_H \) to 10 sec.

For a relay output, set \( CYC_H \) to 200 sec.

For a logic cooling output used to control a solenoid valve, set \( CYC_C \) to 50 sec.

Tuning procedure

1. Set the setpoint to the value at which you will normally operate the process.
2. In the \( AfTun \) list, select \( tunE \) and set it to ‘on’.
3. Press the Page and Scroll buttons together to return to the HOME display. The display will flash ‘tunE’ to indicate that tuning is in progress.
4. The controller will induce an oscillation in the temperature by turning the heating on and then off.
5. After two cycles of oscillation the tuning will be completed and the tuner will switch itself off.
6. The controller will then calculate the tuning parameters and resume normal control action.

If you want ‘Proportional only’ or ‘P+D’ or ‘P+I’ control, you should set the \( E_t \) or \( E_d \) parameters to ‘OFF’ before commencing the tuning cycle. The tuner will leave them off and will not calculate a value for them.

Typical automatic tuning cycle

Calculation of the cutback values

When low cutback or high cutback is set to \( L_c b \) their values will be fixed at three times the proportional band, and will not be altered during automatic tuning. If set to any other value, they will be calculated as part of the tuning process.

MANUAL TUNING

If for any reason automatic tuning gives unsatisfactory results, you can manually tune the controller.

Proceed as follows:

With the process at its normal running temperature:

1. Set the \( I ntegral \ Time \ E_t \) and \( Derivative \ Time \ E_d \) to OFF.
2. Set \( High \ Cutback \ H_c b \) and \( Low \ Cutback \ L_c b \) to ‘Auto’.
3. Ignore the fact that the temperature may not settle precisely at the setpoint.
4. Reduce the proportional band \( P_b \) until the temperature just starts to oscillate. If the temperature is already oscillating, increase the proportional band until it just stops oscillating.

Allow enough time between each adjustment for the temperature to stabilise. Make a note of the proportional band value ‘B’ and the period of oscillation ‘T’.

5. Set the PID parameter values according to the formula below:

<table>
<thead>
<tr>
<th>Type of control</th>
<th>Proportional band ( P_b )</th>
<th>Integral time ( E_t )</th>
<th>Derivative time ( E_d )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P + I )</td>
<td>2xB</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>( P + I + D )</td>
<td>2.2xB</td>
<td>0.8xT</td>
<td>0.12xT</td>
</tr>
</tbody>
</table>

Setting the cutback values

The above procedure sets up the parameters for optimum steady state control. If unacceptable levels of overshoot or undershoot occur during start-up or for large step changes in temperature, then manually set the cutback parameters \( L_c b \) and \( H_c b \).

Proceed as follows:

1. Set the low and high cutback settings to 3 x the proportional band (that is to say, \( L_c b = H_c b = 3 \times P_b \)).
2. Note the level of overshoot or undershoot that occurs for large temperature changes (see the diagrams below).

In example (a) increase \( L_c b \) by the overshoot value. In example (b) reduce \( L_c b \) by the undershoot value.

When the temperature approaches the setpoint from above, you can set \( H_c b \) in a similar manner.

Manual reset

When \( E_t = OFF \) manual reset \( rE_S \) appears in the \( P \), \( d \), \( L \), \( St \). This parameter sets the output power when the error signal is zero. It can be manually adjusted to remove steady state error - the function normally performed by the Integral term.
ORDERING CODE

The controller is supplied configured according to the ordering code shown below.

<table>
<thead>
<tr>
<th>Model number</th>
<th>Function</th>
<th>Supply voltage</th>
<th>Manual</th>
<th>Output 1 (Logic)</th>
<th>Output 2 (Relay)</th>
<th>Sensor input</th>
<th>Setpoint min</th>
<th>Setpoint max</th>
<th>Units</th>
<th>External relay module</th>
<th>Input adaptor</th>
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</table>

Supply voltage
- VH: 85-264Vac
- VL: 20-29V dc or ac

Function
- CC: PID controller
- NF: On/Off controller
- TC: PID controller + timer
- TN: On/Off controller + timer

Output 1: Logic
- XX: Disabled

Logic output
- LH: Heating
- LC: Cooling
- MI: PDSIO mode 1
- FH: High alarm 1
- FL: Low alarm 1
- DB: Dev band alarm 1
- DL: Dev. low alarm 1
- DH: Dev. high alarm 1
- NW: New alarm

Logic input
- AC: Alarm ack/reset
- KL: Keylock
- TM: Timer Run/Reset

Output 2: Relay
- XX: Disabled

Sensor input
- RH: Heating
- RC: Cooling
- FH: High alarm 2
- FL: Low alarm 2
- AL: High alarm 2 & low alarm 3
- DA: Dev band alarm 2
- DL: Dev. low alarm 2
- DH: Dev. high alarm 2
- NW: New alarm

Display range and Setpoint min & max limits
Thermocouples
- J: Type J -210 to 1200 -340 to 2192
- K: Type K -200 to 1372 -325 to 2500
- T: Type T -200 to 400 -325 to 750
- L: Type L -200 to 900 -325 to 1650
- N: Type N -200 to 1300 -325 to 2370
- R: Type R -50 to 1768 58 to 3200
- S: Type S -50 to 1768 -58 to 3200
- B: Type B 0 to 1820 32 to 3308
- P: Platinum II 0 to 1369 32 to 2496

Resistance thermometers
- Z: Pt100 -200 to 850 -325 to 1562

Custom downloaded inputs
- T: Type T -200 to 470 -340 to 1202
- N: Type N -200 to 1300 -325 to 2370
- K: Type K -200 to 1372 -325 to 2500
- J: Type J -210 to 1200 -340 to 2192
- S: Type S -50 to 1768 -58 to 3200
- L: Type L -200 to 900 -325 to 1650
- F: Type F -200 to 900 -325 to 1650

Process inputs (linear)
- M: 0 to 2319 32 to 4200

Technical Specification

Panel sealing: IP65 (EN 60529), or 4X (NEMA 250)

Operating ambient: 0 to 55°C. Ensure that the enclosure is adequately ventilated. 5 to 95%RH, non-condensing.

Storage temperature: -30°C to +75°C. (Protect from humidity and dust)

Atmosphere: Not suitable for use above 2000m or in explosive or corrosive atmospheres.

Power supply: High voltage unit: 100 to 240Vac -15%, +10%, 48-62Hz, 5Watts maximum consumption
Low voltage unit: 24Vdc/ac +/- 20%. DC to 62Hz, 5Watts maximum consumption

Relay rating (isolated): Maximum: 264Vac, 2A resistive. Minimum: 12Vdc, 100mA
Mechanical life > 10^7 operations. Electrical life at 1A, 240vac resistive load > 5 x 10^6 operations

Wire sizes: Use a minimum of 0.5mm² or 16awg wire for plant connections.

Over current protection: Use independent 2A fuses for the indicator supply and relay output. Suitable fuses are EN60127 (type T)

Logic output/input rating: 9V at 12mA, non-isolated from sensor input

Electrical safety: Meets EN 61010 (Voltage transients on the power supply must not exceed 2.5kV). Pollution degree 2.

Isolation: All isolated inputs and outputs have reinforced insulation to protect against electric shock. (See live sensor note)

Cold junction compensation: >30 to 1 rejection of ambient temperature changes in automatic mode. Uses INSTANT ACCURACY™ cold junction sensing technology to eliminate warm up drift and to respond quickly to ambient temperature changes.

Safety and EMC Information

Safety
This controller complies with the European Low Voltage Directive 73/23/EEC, amended by 93/68/EEC, by the application of the safety standard EN 61010.

Electromagnetic compatibility
It conforms with the essential protection requirements of the EMV Directive 89/336/EEC, amended by 93/68/EEC, by the application of a Technical Construction File. It satisfies the general requirements of the industrial environment defined in EN 50081-2 and EN 50082-2.

General
The information contained in these instructions is subject to change without notice. While every effort has been made to ensure the accuracy of the information, Eurotherm Controls shall not be held liable for errors contained herein.

Unpacking and storage
The packaging should contain the controller with two panel retaining clips and this instruction leaflet.
If the packaging or the controller are damaged, do not install the product and this instruction leaflet.

Issue 2, Nov-98. Applies to software versions 1.3 & 1.4

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SERVICE AND REPAIR
This controller has no user serviceable parts. Contact your nearest Eurotherm Controls agent for repair.

Caution: Charged capacitors
Before removing the controller from its sleeve, switch off the supply and wait two minutes to allow capacitors to discharge. Failure to observe this precaution may damage the indicator or cause some discomfort to the user.

Electrostatic discharge precautions
When the controller is removed from its sleeve, it is vulnerable to damage by electrostatic discharge from someone handling the controller. To avoid this, before handling the unplugged controller discharge yourself to ground.

Cleaning
Do not use water or water based products to clean labels or they will become illegible. Isopropyl alcohol may be used to clean labels. A mild soap solution may be used to clean other exterior surfaces of the product.

Safety Symbols
The following safety symbols are used on the controller:

Caution. Refer to the accompanying documents

Personnel
Installation must be carried out by qualified personnel.

Enclosure of live parts
The controller must be installed in an enclosure to prevent hands or metal tools touching parts that may be electrically live.

Caution: Live sensors
The logic input/output is electrically connected to the sensor input (e.g. thermocouple). In some installations the temperature sensor may become live. The controller is designed to operate under these conditions, but you must ensure that this will not damage other equipment connected to the logic input/output and that service personnel do not touch this connection while it is live. With a live sensor, all cables, connectors and switches for connecting the sensor and non-isolated inputs and outputs must be mains rated.

Wiring
Wire the controller in accordance with the wiring data given in these instructions. Take particular care not to connect AC supplies to the low voltage sensor input or logic outputs. Only use copper conductors for connections, (except thermocouple). Ensure that the installation complies with local wiring regulations. In the USA use NEC Class 1 wiring methods.

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Countries not listed enquiries/orders
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Fax (+1 703) 787 3436

Power Isolation
Include a power isolating switch or circuit breaker which disconnects all current carrying conductors. The device should be mounted in close proximity to the controller, within easy reach of the operator and marked as the disconnecting device for the controller.

Voltage rating
The maximum continuous voltage applied between any connection and ground must not exceed 264Vac. For the above reason the controller should not be wired to a three phase supply with an non-grounded star connection. Under fault conditions such a supply could rise above 264Vac with respect to ground and the product would not be safe.

Over-temperature protection
When designing any control system it is essential to consider what will happen if any part of the system should fail. In temperature control applications the primary danger is that the heating will remain constantly on. This could damage the product, the machinery being controlled, or even cause a fire.

Reasons why the heating might remain constantly on include:
• the temperature sensor becoming detached from the process
• thermocouple wiring becoming short circuit;
• the controller failing with its heating output constantly on
• an external valve or contactor sticking in the heating condition

Where damage or injury is possible, we recommend fitting a separate over-temperature protection unit, with an independent temperature sensor, which will isolate the heating circuit.

Please note that the alarm relays within the controller will not give protection under all failure conditions.

Conductive pollution
Electrically conductive pollution must be excluded from the cabinet in which the indicator is mounted. For example, carbon dust is a form of electrically conductive pollution. Where condensation is likely, for example at low temperatures, include a thermostatically controlled heater in the cabinet.

Installation requirements for EMC
• For general guidance refer to Eurotherm Controls EMC Installation Guide, HA025464.
• It may be necessary to fit a filter across the relay output to suppress conducted emissions. The filter requirements will depend on the type of load. For typical applications we recommend Schaffner FN321 or FN612.

Routing of wires
To minimise the pick-up of electrical noise, the sensor input wiring should be routed away from high-current power cables. Where it is impractical to do this, use shielded cables with the shield grounded at both ends.