CARBOLITE ®

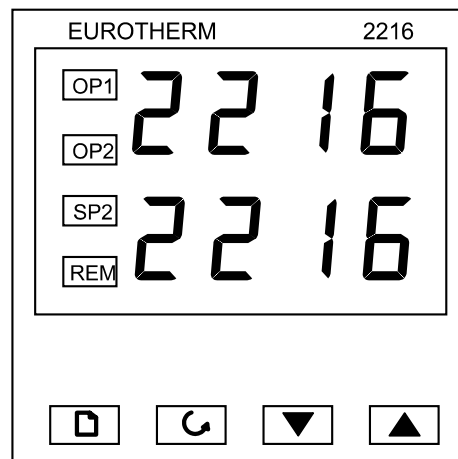# Operating Instructions
Temperature Controller
Eurotherm 2216
Including 2132 or 2116 Overtemperature Controller Instructions

EUROTHERM 2216

OP1 2216

OP2

SP2 2216

REM

<u>CONTENTS</u>

See also the main manual for the oven or other product to which the controller is fitted.

1   2216 – DESCRIPTION

1.1   2216 Controller

The model 2216 controller is made by Eurotherm, and is fitted by Carbolite configured for immediate use. It is a digital instrument with PID control algorithms. It is supplied as a sleeve fitted controller.

The 2216 is supplied configured for easy use as a simple temperature controller, where on setting the required temperature the controller immediately attempts to reach and maintain it.

A ramp-to-setpoint feature is available which may be used to limit the heating rate. This is shown diagrammatically in figs 1 & 2.

The controller does not contain a real-time calendar, and is not subject to century-end date problems.
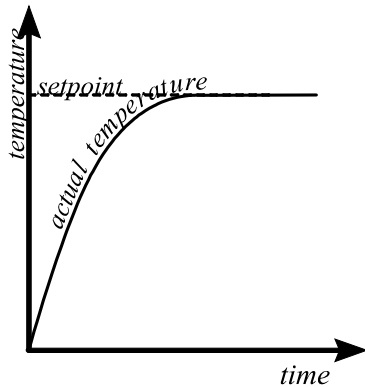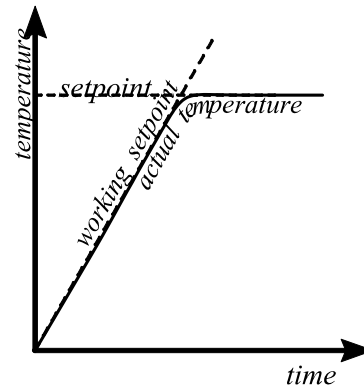

fig 1 – control without ramp-to-setpoint   **fig 2 – control with ramp-to-setpoint**
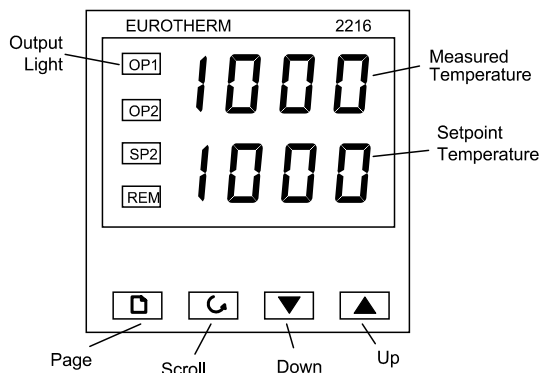
2   2216 – BASIC OPERATING INSTRUCTIONS

2.1   Furnace or Oven Controls

Most Carbolite products are fitted with an "Instrument Switch" which cuts off power to the controller and other parts of the control circuit. See the instruction manual for the furnace or oven for the overall operating instructions.

To operate the 2216 there must be power to the furnace or oven, and the Instrument switch must be on. If a time switch is included in the furnace or oven circuit, this must be in an On period.

2.2   The 2216 – Operation

```
          EUROTHERM        2216
Output
Light    OP1                              Measured
              1000                        Temperature
         OP2

         SP2                              Setpoint
              1000                        Temperature
         REM


              ▯    ↻    ▼    ▲

         Page      Scroll  Down    Up
```

When switched on, the controller lights up, goes through a short test routine, and then displays the measured temperature and starts to control. The output light glows or flashes as heating occurs.

The **Page** key ▯ allows access to parameter lists within the controller; most lists and parameters are hidden and cannot be accessed by the operator because they contain factory-set parameters which should not be changed.

A single press of the page key ▯ displays the temperature units, normally set to °C; further presses reveal the lists indicated in the Navigation Diagram in section 2.6. The **Scroll** key ↻ allows access to the parameters within a list. Some parameters are display-only; others may be altered by the operator. Some parameters only appear in appropriate circumstances – for example, working setpoint does not appear if setpoint ramp rate is Off.

A single press of the scroll key ↻ displays the temperature units; further presses reveal the parameters in the current list indicated in the Navigation Diagram.

To return to the Home list at any time, press Page ▯ and Scroll ↻ together, or wait for 45 seconds.

The **Down** ▼ and **Up** ▲ keys are used to alter the setpoint or other parameter values.

2.3   Basic Operation

Normally no operator action is required other than entering the setpoint, as the 2216 starts to control on being switched on, as described above.

2.4   Altering the Setpoint

With the display at "home", showing the measured temperature, press Down ▼ or Up ▲ once to display the setpoint; press again or hold down to adjust it. The display returns to the measured temperature when no key is pressed for 0.5 seconds.

2.5   Altering the Ramp Rate

It is possible to limit the rate of heating by setting a ramp rate. Press Scroll ↺ until the legend 5Prr (SetPoint ramp rate) is displayed. Use Down ▼ or Up ▲ to display and adjust the value.

The ramp rate sets the maximum rate of heating or cooling in degrees per minute. A value of OFF cancels the ramp rate, allowing heating and cooling at the maximum rate. When this feature is in use, there is a "working setpoint" which can be viewed at any time by scrolling to w.5P and pressing ▼ or ▲.

Fig 1 and fig 2 indicate the possible difference between running without and with a ramp-to-setpoint value (depending on the load and the value used).

2.6   2216 Navigation Diagram
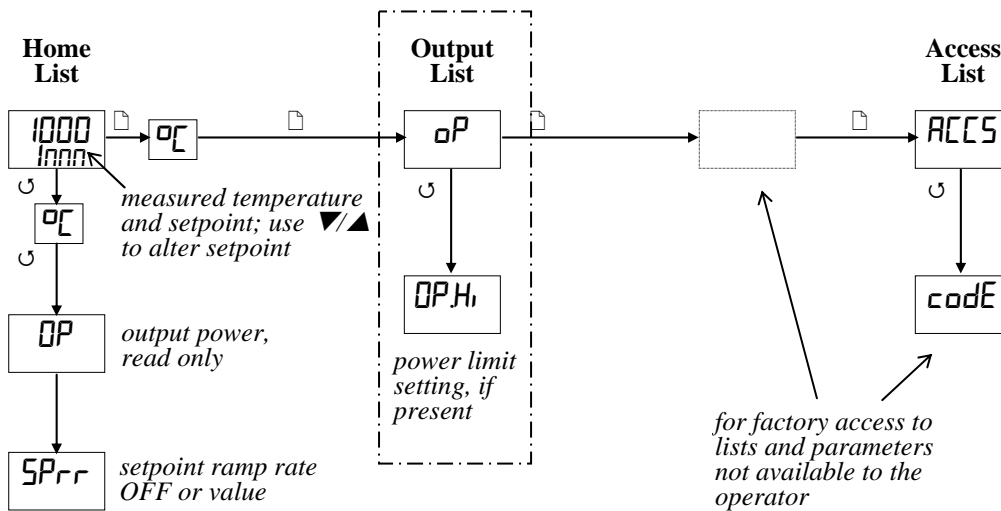
3   ALTERING THE POWER LIMIT

3.1   Overview

Depending on the furnace or oven model the power limit parameter $\mathit{OP.Hi}$ (Output High) may be accessible or hidden.

For silicon carbide heated furnaces the parameter is accessible to allow for compensation for element ageing (see the appropriate section in the furnace manual). In wire-heated chamber or tube furnaces, reducing the power limit is a convenient method of improving control at low temperatures, as outlined below.

The power limit may be set to zero to permit demonstration of the controls without heating.

In many models the power limit setting depends on the supply voltage; usually the furnace or oven manual contains details: if in doubt, contact Carbolite for advice.

The power limit parameter does not apply to the overtemperature controller, if present.

3.2   Altering the value

Press Page ☐ until oP (output list) is displayed. Press Scroll ↺ until $\mathit{OP.Hi}$ (Output High) is displayed. Press Down ▼ or Up ▲ once to display the value of $\mathit{OP.Hi}$ <u>and write down the value</u>. To alter the value, use Down ▼ or Up ▲. Note that setting the value to zero prevents the furnace or oven from heating.

Caution: Do not increase the power limit value to a value above the design level for the oven or furnace model, or to a value above that correctly calculated for Silicon Carbide elements. The heating elements could burn out, or other damage could be caused.

3.3   Control at Low Temperatures

If a product is to be used at temperatures much lower than its design maximum, control stability can often be improved by reducing the power limit. Remember to make a record of the original setting before altering the power limit.

Example: It is desired to run a 1200°C furnace at 300°C. The normal control settings can be expected to cause excessive overshoot as the furnace reaches temperature. If the power limit $\mathit{OP.Hi}$ is normally set to 100%, try a setting of 40%. This should greatly reduce the overshoot. (There is no firm calculation rule to get this example setting of 40% – experiment may be required to achieve a good result. Avoid power limits below about 30% – control accuracy falls off at such levels.)

note: the following sections apply only when overtemperature control is fitted

4   2132 & 2116 – DESCRIPTION
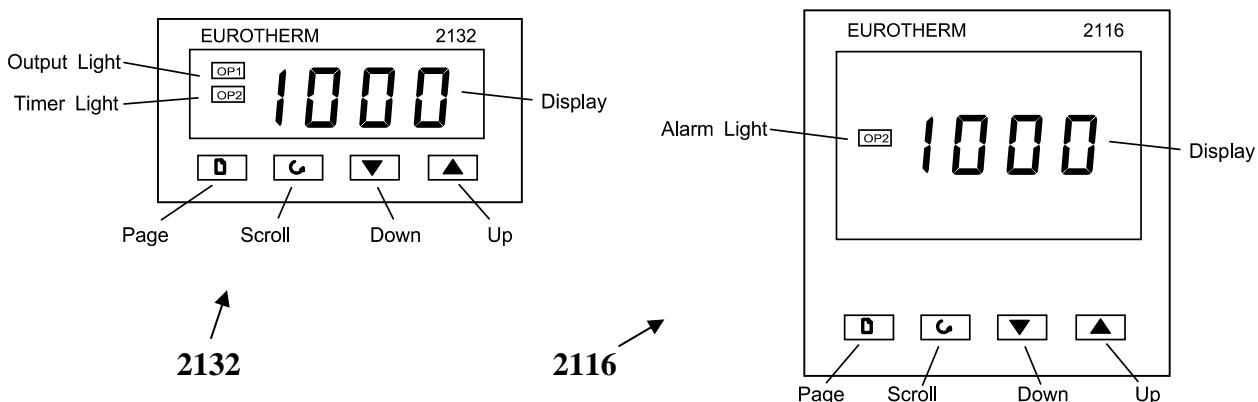
The model 2132 and 2116 overtemperature controllers are made by Eurotherm, and are fitted by Carbolite configured for immediate use. They are digital instruments with a latching alarm, requiring no additional panel controls for its use. The instruments are similar in function, but the 2116 is physically larger.

The controllers feature easy setting of overtemperature setpoint, and reading of current temperature at the overtemperature sensor.

They do not contain a real-time calendar, and are not subject to century-end date problems.

To operate the controller there must be power to the furnace or oven, and the Instrument switch must be on. If a time switch is included in the furnace or oven circuit, this must be in an On period.

When an overtemperature condition occurs, the controller cuts the power to a contactor, which in turn cuts power to the heating elements. Power is not restored until the controller is "reset". Other components do not generally have power to them cut on overtemperature; oven fans usually remain running, but may not do so if other options (such as a door switch) are fitted.

5   2132 & 2116 – OPERATION

When switched on, the controller lights up, goes through a short test routine, and then displays the measured temperature or the overtemperature setpoint.

The **Page** key ☐ allows access to parameter lists within the controller; most lists and parameters are hidden and cannot be accessed by the operator because they contain factory-set parameters which should not be changed.

A single press of the page key ☐ displays the temperature units, normally set to °C; further presses reveal the lists indicated in the Navigation Diagram in section 5.6.

The **Scroll** key ↻ allows access to the parameters within a list. Some parameters are display-only; others may be altered by the operator.

A single press of the scroll key ↻ in the Home list displays the temperature units; further presses reveal the parameters in the current list indicated in the Navigation Diagram.

To return to the Home list at any time, press Page ☐ and Scroll ↻ together, or wait for 45 seconds.

The **Down** ▼ and **Up** ▲ keys are used to alter the setpoint or other parameter values.

5.1   Basic Operation

Use **Down** ▼ and **Up** ▲ to alter the overtemperature setpoint. This should normally be set a little above the maximum working temperature (say 15°C above). The unit is supplied at 15°C above the furnace or oven maximum working temperature.

Press **Scroll** ↻ to view the present temperature as seen by the overtemperature controller. Press it twice, because the first press shows the temperature units (°C).

5.2   Overtemperature Alarm

If an overtemperature condition occurs, the OP2 indicator flashes, and an alarm message 2FSH also flashes, alternating with the setpoint. Power to the heating elements is disconnected.

5.3   Resetting the Overtemperature Alarm

To acknowledge the alarm press **Scroll** and **Page** together.

If the alarm is acknowledged while there is still an overtemperature condition, the OP2 indicator stops flashing but continues to glow. The 2FSH alarm continues to flash until the over-temperature condition is cleared (by the temperature falling), when normal operation resumes.

If the alarm is acknowledged when the temperature has dropped (or after the overtemperature setpoint has been raised) such that the overtemperature condition no longer exists, then the furnace or oven immediately resumes normal operation.

5.4   Sensor Break

The overtemperature cut-out system also operates if the overtemperature control thermocouple breaks or becomes disconnected. The message S.br flashes instead of 2FSH.

5.5   Audible Alarm

If an audible alarm is supplied for use with the overtemperature controller, then it is normally configured to sound on overtemperature condition, and to stop sounding when the alarm is acknowledged as given in section 5.3. Note that the alarm may sound during controller start-up.

 It is not possible to cover in this manual other possible alarm features which may be included by customer special order.

5.6   2132 & 2116 Navigation Diagram
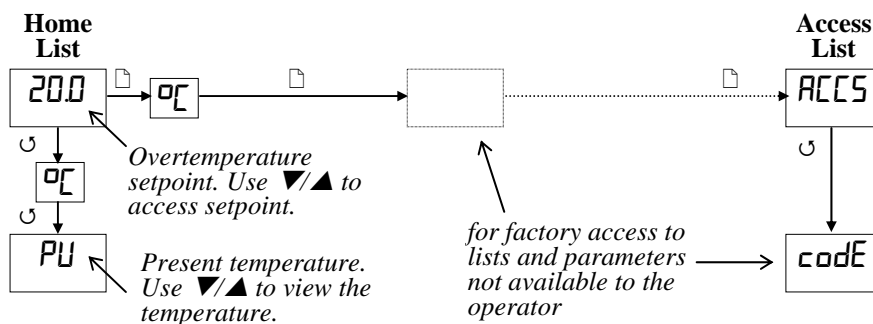
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