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CAMBRIDGE PROCESS CONTROLS

401 TEMPERATURE PROGRAMMER

OPERATING INSTRUCTIONS

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1 DESCRIPTION

The 401 unit is a combined Temperature controller and Programmer, designed to fire electrically heated pottery kilns to a precise temperature/time program. Control of the entire firing cycle is fully automatic, giving accurate and repeatable firings.

Each of the 5 complete programs will follow this sequence of 5 segments:

1. Start-up time delay.
2. A controlled heating ramp (in degrees/hour) from cold, up to the first set-point temperature.
3. A second controlled heating ramp (in degrees/hour), from the first set-point temperature, to the second set-point temperature.
4. A "soak" time, when the kiln temperature is held at the second set-point temperature.
5. The kiln will switch off at the end of this "soak" time, which completes the program.

All the program values, which are chosen by the user, are stored in memory, and will remain there until changed.

Any segment of a program can be omitted if required.

During a firing, green lights on the graphic display show which part of the program is currently in operation. The display also shows when the program has finished.

2 SPECIFICATION

Temperature display	0 to 1600°C span.
Delay & Soak times	0 to 99 hours 59 minutes.
Ramp rates	1 to 1000°C per hour.
Set-point temperatures	0 to 1350°C.

5 Programs, with linking option available.

All program values are retained in memory.

Automatic switch-off at completion of the program.

Display shows kiln temperature, program values and status.

Broken thermocouple protection (1999 temperature display)

Reverse thermocouple protection (program cut off for 0° temp.)

Thermocouple cold junction compensation.

Available for use with type R,K,S thermocouples.



Wall mounting case.
Sealed membrane control panel.
Automatic continuation of firing after power cut.
Output relay provides power to kiln contactor coil.
Available with cable & plug for direct connection to kiln.
220/240v 50/60 Hz AC input.

NOTE For type K thermocouple versions, the following changes apply:

Temperature display	0 to 1300°C span.
Set-point temperatures	0 to 1200°C.

3 INSTALLATION

IMPORTANT SAFETY NOTICE!

CPC recommend that this unit be installed by a qualified electrician, and that a heat fuse or similar over-temperature safety device be fitted to the kiln.

The unit should be fixed to a wall near to the kiln. Do not position it closer than 600mm to the kiln, to prevent damage due to radiated heat. Hang the unit on two no.8 round head screws fixed to the wall, using the two "keyhole" slots on the rear face of the unit.

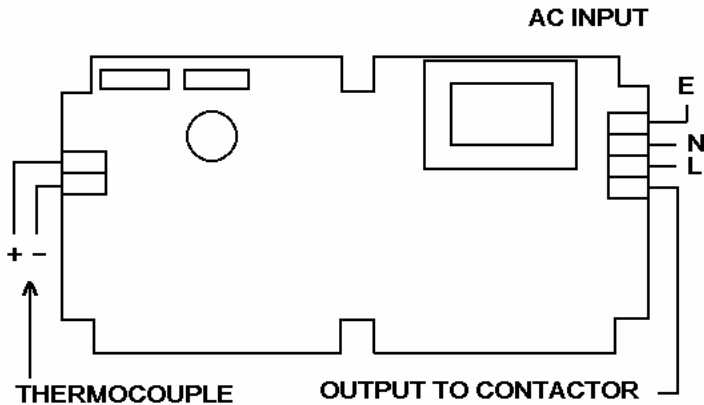
The screws should be spaced 110mm apart.

Wiring Connections

Colour }	Thermocouple
White }	Thermocouple
Brown	AC Input live
Blue	AC Input Neutral
Green/Yel	Earth
Red	Output live
Black	Output neutral

CAUTION

Before fitting the connector plug to the kiln socket, check carefully that the pattern of pins on the connector plug matches exactly that of the kiln socket.



Any difference in the pin/socket positions will cause damage to the programmer if connected and switched on. If in doubt, or a difference exists, contact your instrument supplier.

4 PROGRAMMING

When the instrument is switched on, the numeric display will show the kiln temperature. To enter a program, press the STEP and UP/DOWN buttons as shown here:

- STEP (display program number)
- UP or DOWN to change program number
- STEP (display DELAY hours. minutes)
- UP or DOWN to change delay
- STEP (display 1st. RAMP RATE degrees/hr)
- UP or DOWN to change ramp rate
- STEP (display 1st. SETPOINT temperature)
- UP or DOWN to change setpoint
- STEP (display 2nd. RAMP RATE degrees/hr)
- UP or DOWN to change ramp rate
- STEP (display 2nd. SETPOINT temperature)
- UP or DOWN to change setpoint
- STEP (display SOAK TIME hours. minutes)
- UP or DOWN to change soak time
- STEP (display LINKING select)
- UP or DOWN to select linking on/off
- STEP (display kiln temperature)

As the STEP button is pressed, red lights on the mimic diagram display will correspond to the displayed program value. An illustration of these displays is printed on the top left-hand corner of the mimic diagram on the instrument.



A single press of the UP or DOWN buttons will change the displayed value by 1. If the button is held down, the displayed value will continue to change, initially at a slow rate and then speeding up. When the approximate required value is shown, release the button. Final small corrections can then be made by single presses of the UP or DOWN buttons. Then press STEP when the correct value is shown, which will store the new value and then display the next program value in the sequence. To omit a program segment (i.e. delay, 1st. ramp, 2nd. ramp or soak period) set the time or setpoint temperature to zero.

The user may store 5 separate programs, each of which may be used according to the type of firing required.

LINKED PROGRAM OPTION

This option enables groups of 2 or more adjacent programs to be linked together, to form complex programs.

After programming the SOAK TIME on any program, the next press of the STEP button displays the linking value L0 through to L5. These are changed by using the UP/DOWN buttons.

L0 means that linking is off, i.e. the current program will finish after the soak time has completed. For L values between 1-5, this means that the selected program will jump to the L program number when the soak time has completed. The delay period for that program will be ignored.

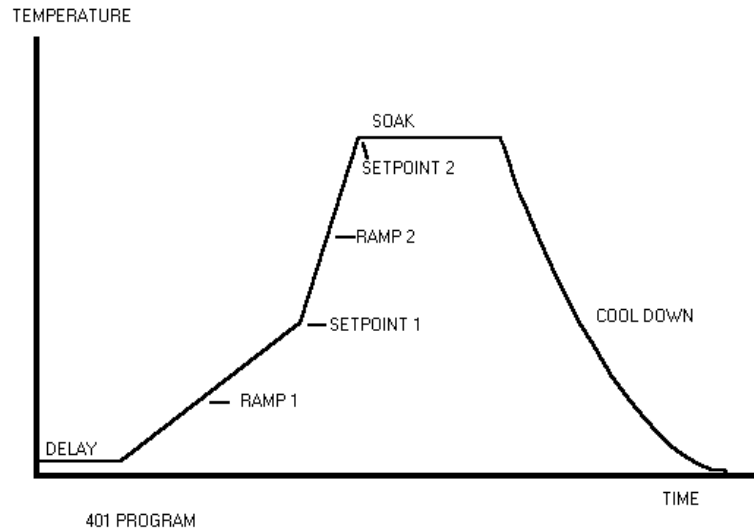
Programs are linked in an ascending adjacent sequence, but the last one selected must terminate in L0. For example, 2 linked program groups could consist of P1 + P2, and P3 + P4 + P5.

The entire linked program sequence may be examined by pressing STEP.

5 RUNNING A PROGRAM

Program operation is shown by green lights on the mimic diagram display. No green lights showing means that the program is not operating, and the kiln is not firing.

A single green light shows that the program is operating (in the segment displayed). All 4 green lights showing indicates that the program has completed, and the kiln is switched off.



To stop or cancel a program, press RUN. This will turn off all the green lights and set the programmer ready for program operation.

To start a program, press the RUN button. One green light will show which of the program segments (i.e. delay, 1st. ramp, 2nd. ramp or soak) is in operation. The green light will move along the mimic diagram as the program progresses to the next segment.

When the program has completed, all the green lights will show together.

Note that the program number (P1-P5) can be changed only if no green lights are showing.

If the instrument has the linking option fitted, the first program of the current linked sequence is automatically selected when the RUN button is pressed.

6 NOTES

When a program is running, and the number display is showing kiln temperature, the UP and DOWN buttons have extra functions.

Pressing (and keeping down) the DOWN button causes the display to show the program value currently in operation, i.e. either the remaining delay or soak time, or the temperature at which the kiln should be according to the program. When the



DOWN button is released the display reverts to showing kiln temperature.

Pressing the UP button forces the program to advance to the next segment. Each time the UP button is pressed the green light will move along the mimic diagram.

The entire program values may be checked at any time by using the STEP button. The display will change back to kiln temperature automatically 15 seconds after the STEP button was pressed if values have not been altered.

Note that when the kiln is firing, the extreme right-hand decimal point on the numeric display will light when the kiln contactor switches on. This is simply an indication of "power-on" to the kiln.

If the display is flashing on and off, this means that the program contains an out of range value. Press the STEP button until the display shows ----, which is the out of range value. Then re-enter the correct value, using the UP/DOWN buttons, and press STEP to enter. The display should stop flashing. If it continues to flash, another program value is affected, continue with this procedure until clear.