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CAMBRIDGE PROCESS CONTROLS

201 PROGRAMMER/CONTROLLER

OPERATING INSTRUCTIONS

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DESCRIPTION

The 201 Controller is a combined Programmer and Temperature Controller, designed specifically for use with small pottery kilns. The system is microprocessor based and contains all solid state circuitry, and a range of extra facilities provides the user with a versatile, easy to use instrument. Control of the entire firing cycle is fully automatic, giving accurate and repeatable firings.

Installation, and connection to existing wiring of the kiln is easily carried out by referring to the installation section of this book.

The user may store up to 10 complete firing programs which are may be recalled for use or modification before a firing commences.

Program values are stored in non-volatile memory, i.e. values programmed by the user are retained even when the unit is switched off.

A complete program will follow all, or part of this sequence:

A delayed start if required, to obtain the benefits of cheaper night time power.

A controlled heating ramp (linear in degrees per hour) up to the first set-point temperature.

Full-power heating up to the second set-point temperature.

A soak period, with the temperature maintained at the second set-point temperature.

A controlled cooling ramp (linear in degrees per hour) down to the third set-point temperature.

When the kiln has cooled to this temperature, power to the kiln is switched off and the kiln will continue to cool at its normal free rate. The 'End-of-program' display is shown on the unit.

The internal operating system of the unit gives the user a wide range of program options, depending on requirements. These are:

1. 'Full' program.

2. Each program 'segment' may be omitted if required. By setting delay/soak times or segment set-points to zero, the relevant program segments can be bypassed to provide programs such as one heating ramp up to top temperature, or full power to top temperature with optional soak period and cooling ramp.

The auxiliary relay in the unit may be connected to external apparatus, such as a damper control motor, fan or alarm. This relay is designed to energise at a programmed temperature during the 'heating' part of the program, and de-energise at another programmed temperature during the 'cooling' segments. Alternatively it can be set to energise during the entire heating part of the program.



Please refer to the section on 'OPERATING NOTES' for a more detailed description of these features.

SPECIFICATION

Digital temperature display 1600°C span
Delayed start facility, 0 to 99 hours 59 minutes.
1-heating ramp, 1 to 1000°C per hour, to first setpoint.
Full power to second setpoint.
3-Set Points, 0 to 1350°C.
1-Soak Period, 00.00 to 99hr.59mins.
1-Cooling ramp, 1 to 1000°C per hour, to last setpoint.
Automatic switch-off at the end of each program.
2-Term control, fixed P & I terms suitable for all kilns.
10-Stored programs.
Auxiliary relay for control of dampers or other apparatus.
Front panel 'mimic' display shows program sequence and operation.

These values are programmed using a simple keypad on the front panel. All programmed values are shown on the digital display.

Other features include:

Keyswitch to prevent unauthorised operation or program changes.
Setpoint limit at 1350°C.
Non volatile program memory.
Available for use with types R,K,S thermocouples.
Thermocouple cold junction compensation.
Digital thermocouple linearisation.
Solid state relay for contactor control.
All program values may be changed during RUN.
Automatic restart of program if the power supply fails during a firing.
Broken thermocouple protection (program cut off for 1999 temperature display).
Reverse thermocouple protection (program cut off for 0° temp).
Wall mounting case.
Sealed membrane front panel.
Available with cable & plug for direct connection to kiln.
220/240v 50/60Hz AC input.



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

Digital temperature display 1300°C span
3-Setpoints, 0 to 1200°C.
Setpoint limit at 1200°C.

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 is intended to be fixed to a wall, adjacent to the kiln.

Fix a no.8 or no.10 woodscrew to the wall, at least two feet from the kiln (so that the unit is not damaged by heat radiating from the kiln).

Hang the unit on this screw by placing it over the 'keyhole' cut-out at the rear of the unit.

Remove the two screws holding the terminal cover, at the bottom of the unit. Secure the unit to the wall by two more screws, using the slots provided.

Connect up the wiring as shown below.

It is essential that the EARTH wire is connected, for both safety and operational reasons.

Note that if the auxiliary relay is to be connected, an extra cable gland should be fitted.

Replace the terminal cover before switching on, and remember to ALWAYS disconnect the AC supply to the unit, and to the kiln, before subsequently removing this cover.

CONNECTION DATA

T/C- Thermocouple negative

T/C+ Thermocouple positive

COM Aux. relay common contact

N/O Aux. relay normally open contact

N/C Aux. relay normally closed contact

A Output relay ,connect to contactor coil.



(Other side of coil to AC neutral)

B Output relay , connect to AC live

E Earth connection

N AC neutral supply

L AC live supply

Note that the A and B terminals are on/off relay contacts.

PROGRAMMING

Switch on the unit. The display will show the kiln temperature.

Turn the keyswitch to the 'Normal' position, which allows program values to be entered.

If any green LED lights are lit, press the 'RUN' button once to extinguish them.

Press the STEP button. The display will show the current program number selected (P1- P10). To change, press either UP or DOWN. When the required number is displayed, press STEP again and the display will show DELAY time, in an hours and minutes format. The 'mimic' display will show that the displayed value relates to DELAY.

To set the DELAY time required (which is the time delay to the start of the firing, from the moment the RUN button is pressed), press the UP or DOWN buttons. A single press will change the displayed time by 1 minute. If the button is held down, after the initial 1 digit change the display will start to increase or decrease, initially at a slow rate and the speeding up in order to set large values quickly. When the approximate delay time is displayed, release the button. Final small adjustments can then be made by single presses of the appropriate 'UP' or 'DOWN' button.

Note that this technique applies to all program parameter entries.

When the required DELAY time is displayed, press the 'STEP' button. The mimic diagram will change to show that the first ramp value is now displayed.

Note that the ramp value is in degrees per hour. To enter the required value, press the 'UP' or 'DOWN' buttons as previously described.

Press 'STEP' when the required value is correctly shown on the display.

The next program value to be shown is the first SET POINT, in degrees centigrade. This is the temperature which the kiln will rise to at the previously entered ramp rate. This value is limited to 1350 degrees.

Continue pressing the 'STEP' button, and 'UP/DOWN' as required in order to set the remaining program values. The mimic diagram, or right hand LED column will show



which program parameter is currently being displayed.

At the end of the program entry sequence, the display will revert to showing TEMPERATURE. All program values will then have been set, for the program number selected. If required the program may be checked for correct values by just pressing STEP, and reading each displayed value.

Note that new program values (i.e. which have been changed by using the 'UP/DOWN' buttons) will only be entered into memory when the 'STEP' button is pressed.

At any time, the display may be returned to TEMPERATURE by pressing the red DISPLAY button.

Note that to by-pass any program segment, set the set point temperature value to zero.

To load another program, change the 'PROGRAM NO.' selected, and repeat the entire sequence described above.

The third ramp is a "cooling" ramp, i.e. the final set point temperature must be lower than the top temperature set point

OPERATING NOTES

To run a program, carry out the following sequence of operations:

Turn the keyswitch to the 'NORMAL' position.

If any green LED's are lit, press the 'RUN' button to extinguish them.

Press 'STEP' to show the current program number selected. Change if required, and enter the new value by pressing 'STEP'. Note that the program number cannot be changed if the unit is in the 'RUN' mode (i.e. if any GREEN lights are showing)

Press the 'RUN' button. The program will now start, and the green mimic display LED's will show the part of the program in operation. The power contactor in the kiln will switch on and off to maintain the correct rate of temperature rise in the kiln.

To prevent the program being accidentally (or deliberately !) changed, turn the keyswitch to the 'LOCK PROGRAM' position, and remove the key. The program may now only be examined (by pressing 'STEP') but cannot be changed.

If the display is showing kiln temperature, pressing and holding down the DISPLAY button will change the display to show the program value currently in operation, i.e. either the remaining delay or soak time, or the temperature value at which the kiln



should be according to the program. Releasing the button returns the display to kiln temperature. As the temperature rises and the program goes through its sequence, the green LED's will change to show the program segment currently in operation.

When the program has completed, all the 5 green LED's will light to show the END of PROGRAM condition.

To re-set the program, press the 'RUN' button once. This will re-load all the original program values, and extinguish all the green LED's. To re-start the same program, press the 'RUN' button again. The entire sequence will then repeat. Alternatively change the program number, and then press RUN.

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.

The program may be "skipped" to the next segment, by pressing the UP button when the display is showing kiln temperature. This facility allows programs to be started at any required point, without changing the complete program.

AUXILIARY RELAY operation.

The 'RELAY ON TEMP' and 'RELAY OFF TEMP' displays show the temperature values at which the relay will energise and de-energise respectively. The RELAY ON function will only operate (at the programmed temperature) during the two heating ramps. Similarly, the RELAY OFF function operates only during the cooling part of the program, i.e. during ramp 3 or END.

The relay can be connected to damper systems if required (maximum for relay contacts is 1A 240v resistive load) or by setting the RELAY ON temperature to a value greater than the highest set point it can function as an alarm. The relay will the only energise if the kiln temperature equals or exceeds the ON setting.

If both the ON and OFF temperatures are set to zero, the relay will energise at the start of the first ramp, and de-energise when the END condition is reached.

DISPLAY

If the display is flashing on and off, this indicates that one or more of the program values is out of range, or has become corrupted, and represents an 'illegal' value for correct operation of the 201. The 'RUN' mode will be turned off (if it was on) and power to the kiln will be switched off. To correct the condition, press 'STEP' until the display shows ----. This indicates the program value which is out of range, or



corrupted.

Press UP or DOWN to display the required value, and then STEP to enter the value. The flashing display should then revert to normal, and the unit is ready to use. If the display continues to flash, this means that another programm value is also out of range. Continue to press 'STEP' and correct as before.

IMPORTANT SAFETY NOTICE

CPC strongly 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.