



Innovative Heat Treatment

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SIMPLE1 PROGRAMMER & CONTROLLERS OPERATING MANUAL



“The
Heat Is
On”



TABLE OF CONTENTS

1. SPECIFICATIONS

2. SETTINGS- DIGITAL DISPLAY

3. DEFINITIONS

4. INSTRUCTIONS

5. OPERATING MODES

1.0 SPECIFICATIONS

Power input: -

- 110/115 VAC @ 50/60 Hz.
- 230/240 VAC @ 50/60 Hz

Relay Output (PI control loop):-

- Input Feed; max 240 VAC @ 50/60 Hz
- Output: max 3 Amp rating
(Contacts suppressed internally)

Thermocouple Input:-

- Type K (NiCr/NiAl) to BS4937-30: 1993
- Range: 0 to 1200° C (0 to 2200° F)
- Measurement Accuracy = 0.3° C (0.6° F)
- Linearity: Better than +/- 0.5° C (1° F) at any point

Calibration Accuracy

(Span/Zero adjust to display):-

- +/- 1 display digit

(Uncertainty: 1 display digit)

Proportional-Band Settings:-

- +/- 5° C (10° F), +/- 10° C (20° F), +/- 20° C (40° F) and +/- 40° C (80° F)

Hold-Back Settings:-

- 10° C (20° F), 20° C (40° F), 40° C (80° F) and 60° C (120° F)

Display:-

- Digital

The following values can be Programmed:-

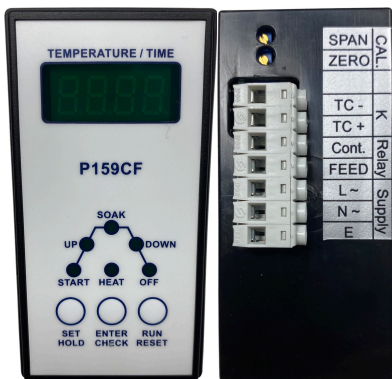
- Start temperature
- Rate of rise
- Soak temperature
- Soak time
- Rate of fall
- Off temperature

Environmental/Safety:-

- Operating Temperature: 0 to 55° C (Storage: -20 to 80° C)
- Ambient humidity: 10 to 90% rel. hum.
- CE compliance (EMC: EN 61326: 1998, LVD: EN 61010-1: 2001)
- WEEE compliant

Dimensions:-

- Case style: - DIN 43700 (96 x 48)
- Front frame: - 52mm x 100mm, 11mm high.
- Installation depth: - 120mm.
- Approx. weight: - 0.375 kg.
- Enclosure:- Front IP 64
- Rear:- IP 20
- Panel Cut-out:- 45mm (+0.6) x 92mm (+0.8)



FRONT

BACK

2.0 DIGITAL DISPLAY



P159 programmer will carry an UP-SOAK-DOWN temperature cycle following settings.

- A. START TEMPERATURE
- B. UP RATE
- C. SOAK TEMPERATURE
- D. DOWN RATE
- E. OFF TEMPERATURE



3.0 DEFINITIONS

A. START TEMPERATURE

Push the SET button. The START LED will come on and the display will flash, showing the previously entered start temperature. If this is the required value it is the only necessary to push the ENTER button. If a different value is needed, push the SET button. The thousands digit will flash and the SET button can be used to set this digit to the required value. Push the ENTER button. The hundreds digit will now flash and again use the SET button to get the required value. It is worth noting that if the SET switch is held down then the digit will continuously go from 0 to 9 and it can be released when the required number is shown. It is preferable not to make the switch operations too rapidly. The tens and units are set in the same manner.

After the units digit has been entered all four digits will flash. Check that this value is correct and push ENTER. However if the value is incorrect push RESET and the display will show all zeroes with the thousands digit flashing and the start temperature can be corrected. Do not enter a temperature greater than 1250°C.

B. UP RATE

When the correct value for the start temperature has been entered the UP LED will come on the display will flash showing the previously entered value for the up rate in degrees/hour. The SET and ENTER buttons are used in the same way as above to give the required value, but in this case the entry is limited to 3 digits with a maximum setting of 999°C/hour.

3.0 DEFINITIONS

C. SOAK TEMPERATURE

After the up rate has been entered, the SOAK LED will come on and the soak temperature is entered in exactly the same way as described above for the start temperature.

Soak time

When the soak temperature has been entered the SOAK LED remains on and the soak time can be entered. The entry is in hours and minutes with a decimal point separating the two.

D. DOWN RATE

When the DOWN LED is on entry is made in the same way as for the up rate.

E. OFF TEMPERATURE

When the OFF LED is on the entry is made in the same way as for the start temperature.

4.0 INSTRUCTIONS

Running the program

After the off temperature has been entered the display will show 'run'. Pushing the RUN button starts the program.

When the program is started the load will rise uncontrolled to the start temperature. The up ramp will not start until the load temperature gets within 15°C of the start temperature. During this phase the up LED will be on and the display will flash between 'Hold' and the load temperature. When the load gets within 15°C of the start temperature it will ramp up at the set rate. The 'Hold' feature also applies during the up ramp, so that if the setpoint exceeds the load temperature by 15°C or more the up ramp will hold.

When the soak temperature is reached it will remain there for the set time. During the soak time the display will flash between the load temperature and the elapsed time. When the elapsed time is shown a decimal point separates the hours and minutes. It will then ramp down at the set rate until the off temperature setting is reached when it switches off, which is shown by all LEDs being off.

Showing the setpoint value

During the temperature cycle, pushing the SP button displays the setpoint temperature instead of the load temperature. Also the UP, SOAK or DOWN LEDs will show which segment of the cycle is being done. If it is required to terminate the program at any time, pushing the RESET button shows 'rst' in the display and the RESET button must be pushed again while this is being shown. The display will then show the load temperature and all LEDs will be off.

4.0 INSTRUCTIONS

Repeating a program

When a program has been run it is quite simple to run the same program again. Push the SET button and the start temperature will flash. Push the ENTER button, the up rate will flash, push the Enter button again until all settings have been re-entered and 'run' is displayed.

Open circuit and reserve thermocouple protection

If the temperature exceeds 1250°C the display will show 'HIGH' and the output will be off.

If the thermocouple is inadvertently reversed then as the load is heated the displayed temperature will go down. It will then display '-tc' to show that the thermocouple is reversed. When the temperature reaches a value of about 800°C the output is switched off and the display shows 'HIGH'.

Proportional band setting

The proportional band can be set to $\pm 10^{\circ}\text{C}$, $\pm 20^{\circ}\text{C}$ or $\pm 40^{\circ}\text{C}$. This can only be done when the instrument is in the off condition. Push the ENTER and RUN buttons together. On release the display will show Pb10, Pb20 or Pb40. Pushing the SET button will change the display between these three. Push ENTER when the required is shown. The best control is achieved by using the smallest value but if the controlled temperature tends to swing either side of the setpoint then a higher proportional band setting must be used.

Power fail operation

If the power fails during a program, then when the supply is restored the program will continue from the segment it was in when the power failed.

4.0 INSTRUCTIONS

Controller output

The output is visa relay contacts rated at 7A to 250VAC and the action is time proportional plus integral with an overall cycle time of about 25 seconds.

Dimensions

Height 96mm X Width 48mm X Depth including connector 127mm.

Panel cut out 92mm x 45mm.

Supply voltage

230VAC or 115 VAC internally set.

Thermocouple type

Type K (NiCr/Ni/Al) range 0 to 1250°C

5.0 OPERATING MODES

The P159CF has 3 modes of operation;

- OFF (Indicator only)
- PROGRAM
- ENERGY REGULATOR (Proportional relay output, TC input ignored)

OFF

Display shows thermocouple input temperature reading (°C/F). Heat output remains off (no control action) and no program segment LEDs are lit. In the event of an open-circuit thermocouple the display shows **HIGH**.

PROGRAM

Push **SET** in OFF mode and use **SET** button to toggle to **PROG**, push **ENTER** and **START** LED is lit with previous **START** temperature value flashing on display. To keep this value push **ENTER** or change this value by pushing **SET**. Value is changed one digit at a time using **SET** to increment a digit and **ENTER** to move to the next digit.

After entering the final digit the whole value flashes. The value can be set to **0000** by pushing **RESET** button, then setting a new value digit by digit. Once correct value is flashing push **ENTER** to store this setting.

Continue this procedure to enter new values for **UP** rate, **SOAK** temperature, **SOAK** time, **DOWN** rate and **OFF** temperature. Once **OFF** temperature is stored, the display shows **run**.

To commence the program cycle, push **RUN** button. Program now runs with the current programme segment LED lit and **HEAT** LED showing output relay condition. Display shows actual load temperature, but will flash **HELD** if the load temperature is lower than the set point by a value exceeding the stored **HOLD-BACK** value. When program cycle is completed, the unit returns to the OFF mode. To end program early push **RESET** button twice.

Viewing Set Point Value during program cycle

To show the set point while the program is running, push the **CHECK** button once.

The display flashes the set point value 5 times (alternating between **SP** and value).

Program/ Settings Check during program cycle

While viewing set point as above, further pushes of **CHECK** button will display each program segment value in turn; **START**, **UP**, **SOAK**, **TIME**, **DOWN** and **OFF** and then settings; **Units (C/F)**, **Pb** (Prop. Band) and **H** (Hold-back).

Program Hold

The program cycle can be paused at any time using **HOLD** function. This is set by keeping **HOLD** button pushed for 3 seconds (display shows ---) until display flashes **HOLD**. To end **HOLD** function push **HOLD** button once.

5.0 OPERATING MODES

Units (C/F), Prop-Band and Hold Back setting

With unit in OFF mode push ENTER and RUN switches together until display blanks.

Upon release, display shows previously set units C or F. Push SET to toggle value, then push ENTER to store.

Pb (Prop-band) setting is now displayed. Use SET button to select values; 5, 10, 20 or 40 C (10/20/40/80 F).

Pushing ENTER stores desired value. Display now shows Hb (Hold- Back) setting. Use SET button to select; 10, 20, 40 or 60 (20/40/60/120 F). Pushing ENTER stores desired value. Unit returns to OFF mode.

ENERGY REGULATOR

Push SET in OFF mode and use SET button to toggle to E.rEg, push ENTER and display shows P_00 ('P' flashes to highlight proportional percentage output operation). Use SET button to increment value; 00 to 100% in 5% steps.

Proportional cycle time is 20 seconds, i.e. - 50% (P_50 displayed) = 10 seconds ON/ 10 seconds OFF. To return to OFF mode push RESET twice.