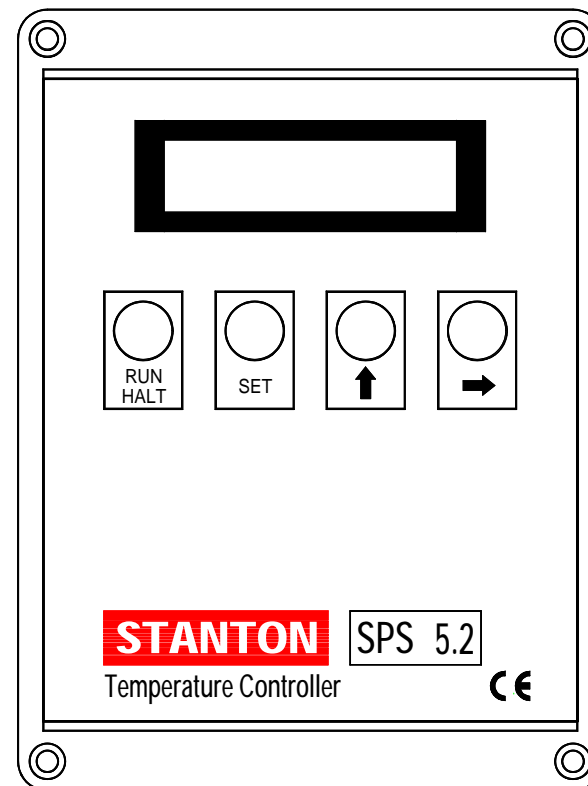


Notes

# USER HANDBOOK

## FOR

### SPS5.2 TEMPERATURE CONTROLLER



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Issue: 5.2E01  
Date: 10 July 98  
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Manufactured in Staffordshire, U.K.

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## 5.0 Characteristics

### Electrical

#### **Power supply**

Voltage range: 216.2 - 253V

(Euronorm)

Frequency: 50Hz (nom)

Phases: 1

Power: Controller 3VA (max)

Switched output 75VA

Fuse: 1.0A anti-surge

#### **Control Relay**

Contact type: SPST NO

Switched Live -

nominal 230VAC output

@300mA max.

#### **Thermocouple**

Types: K,N,R & S

(User Selectable)

#### **Connectors**

Max. wire size 1.5mm<sup>2</sup>

### Temperature

#### **t2 setting**

Trim Range:  $\pm 100^{\circ}\text{C}$

Resolution:  $1^{\circ}\text{C}$

#### **START DELAY setting**

Range: 00:00 to 99hr 59min

Resolution: 1 min

#### **Control Accuracy**

P.I.D. Control

Reading accuracy:  $\pm 0.25\%$  FSD  $\pm 1$  digit

### Environmental

Operating temperature range: 0 to  $+40^{\circ}\text{C}$

Storage temperature range:  $-10^{\circ}$  to  $+55^{\circ}\text{C}$

Enclosure sealing: IP65

Enclosure material: ABS or Polycarbonate

Enclosure colour: Light Grey RAL 7035

### EMC (Electromagnetic Compatibility)

This instrument is designed for use mainly in Domestic & Light Industrial environments where electro-magnetic interference may cause a loss of accuracy of the displayed temperature reading of up to  $3^{\circ}\text{C}$ . Specified accuracy will be restored when the interference is removed.

The design of this instrument has been assessed and tested assuming maximum connecting lead lengths of 3.0 metres.

## 4.0 Error Displays

Thermocouple burn-out is indicated by this display. This indicates that the thermocouple has become open circuit. The controller detects this condition while firing and when in **READY** mode. The controller will lock up in this condition with the heater power off. The only way to reset the controller from this condition is to turn off the power, clear the fault and then turn the power to the instrument back on.

**THERMOCOUPLE  
OPEN CIRCUIT!**

To clear the fault the thermocouple and associated wiring should be tested for open circuits. If the thermocouple is open circuit it will need to be replaced.

Heater failure or thermocouple short circuit is indicated by this display. The instrument detects this condition only in RUN mode when heating power has been applied continuously for 15 minutes but the temperature has increased by less than 2°C. This indicates either that the wiring to the thermocouple is short circuited or (more likely) that one or more of the heater elements has failed and the heater is incapable of reaching the required temperature. The only way to reset the controller from this condition is to turn off the power, clear the fault and then turn the power to the instrument back on.

**THERMOCOUPLE  
SHORT CIRCUIT!**

The controller performs continuous checks of its circuitry and embedded software to check for potential error conditions. If such an error is detected the control relay is switched off and an error message is displayed for one minute. After this period the controller resets itself and restarts as if a power failure had occurred. If the potential error has cleared the instrument will proceed as normal. If the error condition persists the instrument will repeat the error display cycle.

**ERROR 7!**

In the event of an error contact the supplier quoting the error number.

## 1.0 Features

- Simple to use
- Large clear illuminated alphabetic display
- 10 Pre-set programmes
- User adjustable soak temperature ( $\pm 100^\circ\text{C}$ )
- Start delay (0-99hr 59min)
- User settings stored in non-volatile memory
- Intelligent power fail recovery
- Thermocouple failure detection
- Heater element failure detection
- R, K, N & S type thermocouple selection

## 2.0 Operating Instructions

### 2.1 Power On

When power is applied to the controller the display will illuminate & show the model number, version number & the thermocouple type in use. **READY** will normally<sup>1</sup> be displayed. The heating power is off and the controller is ready to accept keyboard commands.

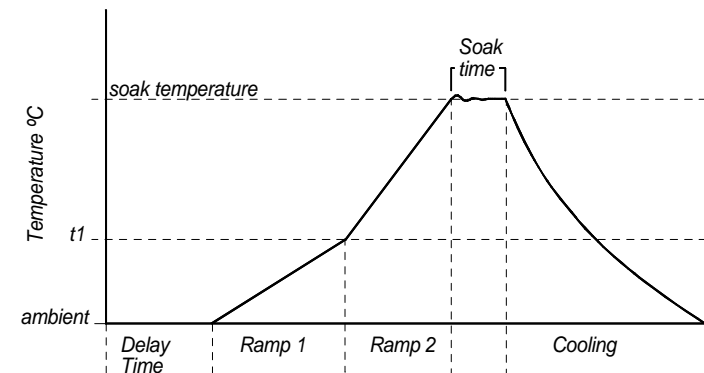
<sup>1</sup>If the display does not show **READY** then the instrument is in **RUN** mode because the previous firing sequence was interrupted by a power failure - the controller is now trying to complete this interrupted firing sequence. To return to **READY** mode, if required, press the RUN/HALT key.

### 2.2 Instrument Capabilities

#### General

The instrument contains 10 pre-set firing programmes to allow the user to carry out the vast majority of firings used in ceramics.

Each programme consists of two controlled ramps and a soak period (which may be zero) with a user adjustable ( $\pm 100^\circ\text{C}$ ) top (soak) temperature. A typical firing sequence is illustrated below:-



### Delay Time

This is a user-settable start delay time in the range 0 to 99 hours 59 mins. This feature can be used to delay firing - enabling firing during the night, possibly on low-tariff electricity.

### Ramp 1

Heating is performed to increase the temperature of the load from ambient to temperature t1. The value of t1 and the rate of increase of temperature depend on the programme selected (see below).

### Ramp 2

Heating is performed to increase the temperature of the load from temperature t1 to the soak temperature. The soak temperature and the rate of increase of temperature depend on the programme selected (see below). The soak temperature is user adjustable in the range  $\pm 100^{\circ}\text{C}$ .

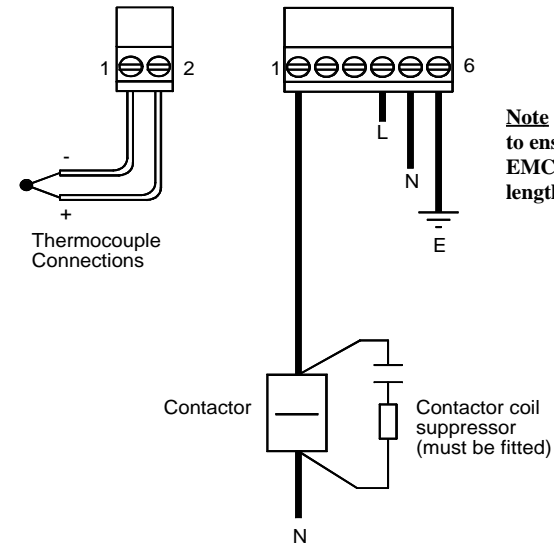
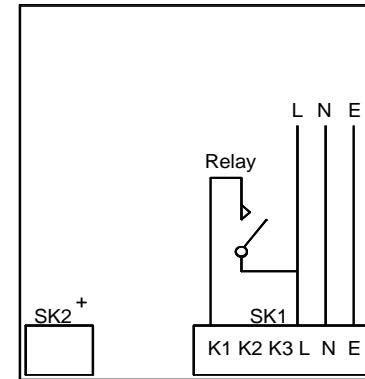
### Soak Time

This is the time that the controller dwells at the soak temperature. The soak time depends on the programme selected (see below). After soaking the controller cuts off heating power and the load is allowed to cool naturally.

## 2.3 Programmes

Prog No	Description	Ramp 1 (°C/hour)	t1 °C	Ramp 2 (°C/hour)	Soak Temp °C	Soak Time (mins)
0	Lustre	125	375	125	750	0
1	On Glaze Enamel	123	400	123	800	0
2	Slow Biscuit	30	210	113	1000	0
3	Normal Biscuit	40	200	114	1000	10
4	High Biscuit	40	200	120	1160	0
5	Earthenware Low Temperature Glaze	100	500	115	960	10
6	Earthenware Normal Temperature Glaze	120	500	120	1070	0
7	Earthenware High Temperature Glaze	112	560	112	1120	10
8	Stoneware	126	630	126	1260	10
9	Porcelain	100	200	210	1280	10

## 3.4 Wiring



**Note**  
to ensure compliance with the EMC & LVD Directives lead lengths should not exceed 3m.

### 3.4.1 Contactor Coil Suppression

The coil of the contactor **must be suppressed** with an RC filter network. The RC network must be connected directly across the coil terminals on the contactor.

Suitable proprietary RC filter networks fitted with insulated wire leads are:-

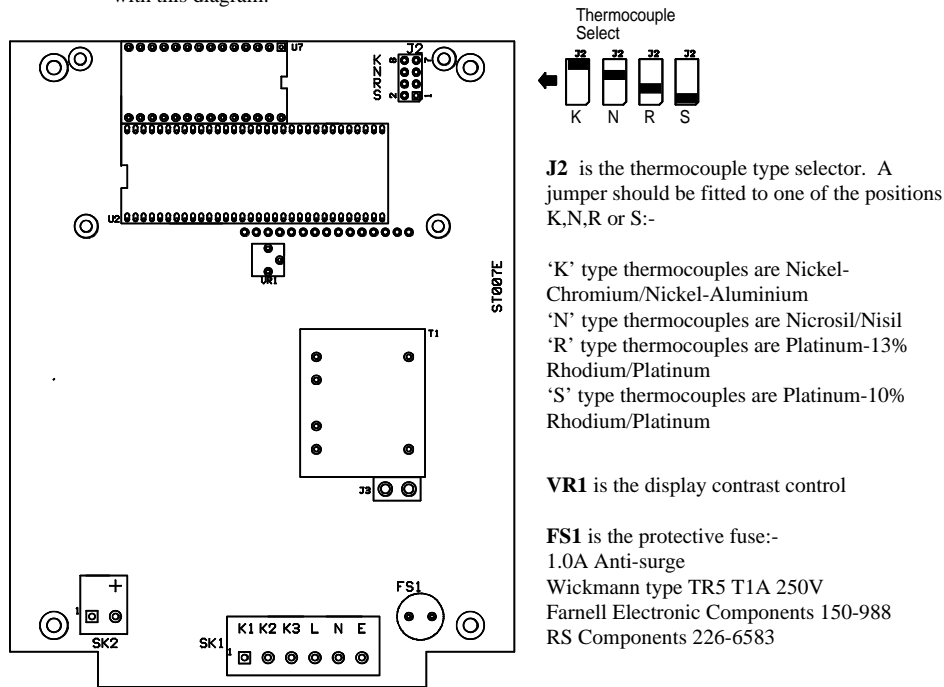
- |    |                               |                  |
|----|-------------------------------|------------------|
| 1. | RS Components                 | Part No. 210-364 |
| 2. | RS Components (tab fixing)    | Part No. 210-370 |
| 3. | Farnell Electronic Components | Part No. 218-893 |

### 3.2 Instrument Mounting

Mount the controller on a suitable vertical surface which will not get hot, using the 4 off 4mm diameter mounting holes. The mounting hole spacing is marked on the back of the controller and is 88mm x 148mm. The cable gland hole is 20mm diameter and should normally be at the bottom to guard against moisture ingress. The instrument should be mounted away from direct sources of heat.

### 3.3 Internal Component Identification

Remove the front of the instrument by unscrewing the 4 self-tapping screws. The required connectors and configuration jumpers can be identified on the lid mounted printed circuit board with this diagram:-



**J2** is the thermocouple type selector. A jumper should be fitted to one of the positions K,N,R or S:-

'K' type thermocouples are Nickel-Chromium/Nickel-Aluminium  
 'N' type thermocouples are Nicrosil/Nisil  
 'R' type thermocouples are Platinum-13% Rhodium/Platinum  
 'S' type thermocouples are Platinum-10% Rhodium/Platinum

**VR1** is the display contrast control

**FS1** is the protective fuse:-  
 1.0A Anti-surge  
 Wickmann type TR5 T1A 250V  
 Farnell Electronic Components 150-988  
 RS Components 226-6583

**SK2** is the thermocouple connector. The positive terminal is clearly marked.

**SK1** is the mains/control connector:-

- K1 is the switched Mains Live output to the heater contactor
- K2 & K3 are not used (not connected) on the SPS5.2
- K4 is Mains Live input
- K5 is Mains Neutral input
- K6 is Earth input (an Earth **must** be fitted to this controller)

### 2.4 Keys



Pressing this key when **READY** is displayed will start a firing using a programme which has been previously selected with the SET key. Pressing this key when a firing in progress will immediately abort the firing. Pressing this key directly after powering up the controller will put the user into SET mode - enabling a program to be selected.



Pressing this key when **READY** is displayed enables the user to select a firing program. Pressing this key during a firing has no effect.



This is used to increment user input when in SET mode. Pressing this key has no effect when **READY** is displayed or when a firing is in progress.



This is used for digit select when in SET mode. It is also used to review controller status during firing. Pressing this key when **READY** is displayed has no effect.

### 2.5 Setting

Pressing the SET key when **READY** is displayed causes the currently selected program details to be shown. This will be program 0 if this is the first time that SET has been pressed since power-up, else it will be the previously selected program. The program number, normal soak temperature & program name are displayed. To increment to the desired program press the key. If the program name is too long to fit in the display window it will scroll after a short delay.



Press the SET key to select the displayed program. The display will now show the programmed soak temperature. This can be adjusted by  $\pm 100^{\circ}\text{C}$  with the key. If the controller has remained powered since a previous firing and the program number has not been changed then the previously set up soak temperature will be displayed.



Press the SET key to select the displayed soak temperature. The display will now show the start delay. This can be set from 00:00 (zero) to 99:59 (99 hours 59 mins) with the & keys. Pressing the SET key again selects the displayed start delay and returns to the **READY** display. To start a firing press the RUN/HALT key.



## 2.6 Firing Displays

DELAYED START...  
TIME LEFT 04:32

This is shown when a delayed start is in progress. The display shows the hours:minutes remaining until firing commences.

SLOW HEATING...→  
KILN TEMP 23°C

This shows that the initial ramp, ramp 1 is being fired. For additional information press the → key. This additional information is also displayed once per minute.

FAST HEATING...→  
KILN TEMP 800°C

This shows that the final ramp, ramp 2 is being fired. Press the → key for additional information.

SOAKING...→  
KILN TEMP 1200°C

This shows that the controller is soaking. Press the → key for additional information including the time left in soak.

COOLING... HOT!  
KILN TEMP 1172°C

This shows that the soak period is complete and that the load is cooling naturally. **HOT!** is displayed flashing.

COOL  
KILN TEMP 96°C

This shows that the load has cooled to less than 100°C.

READY

This shows that the load has cooled to less than 40°C & firing is complete.

## 2.7 Power Fail Recovery

In the event of power failure followed by power restoration, the instrument attempts to take intelligent recovery actions to avoid a firing being aborted. The instrument has no direct knowledge of how long the power has been off so the recovery action taken depends on where the instrument had reached in the firing sequence prior to power failure as detailed below:-

Before Power Failure	After Power Failure
In <b>READY</b> mode	In <b>READY</b> mode
Timing delayed start	Immediate start as if the end of Delay Time reached
On Ramp 1 approaching t1	Immediate restart. Temperature will increase at ramp rate 1 of the current program starting at the present temperature
On Ramp 2 approaching t2	Immediate restart. If present temperature greater than t1 temperature will increase at ramp rate 2 of the current programme starting at the present temperature. If present temperature is less than t1 temperature will increase at ramp rate 1 of the current program starting at the present temperature
In Soak Period timing Soak Time	As above. The full soak period of the current program will be re-applied
Cooling after SOAK period	Cooling continued.

## 3.0 Installation Instructions


### 3.1 Safety



**ISOLATE  
BEFORE  
REMOVING  
COVER**

Installation Category: II  
Pollution Class: 2

230V ~ 50HZ 1.0A

 Fuse: 1.0A Anti-surge  
Wickmann type TR5 T1A 250V

### WARNING

**ISOLATE FROM ELECTRICAL SUPPLY BEFORE OPENING THIS INSTRUMENT FOR INSTALLATION, CONFIGURATION OR REPAIR PURPOSES**