

# Characteristics

## Electrical

### Power supply

Voltage range: 216.2 - 253V  
 Frequency: 50Hz (nom)  
 Phases: 1  
 Power: Controller 3VA (max)  
 Switched output(s) 75VA  
 Fuse: 1.0A slow-blow

### Control Relay(s)

Contact type: SPST NO  
 Switched Live -  
 nominal 230VAC output  
 @300mA max.

### Thermocouple

Types: R type standard  
 (K,N & S type also available)

### Connectors

2-part connectors  
 Max. wire size 2.5mm<sup>2</sup>

### Error Handling

Thermocouple failure detection  
 Thermocouple reversal detection  
 Heater failure detection  
 Over-temperature detection

**CE** This instrument complies with Council Directive 89/336/EEC (electromagnetic compatibility) & Council Directive 73/23/EEC (low voltage safety)

## Temperature

### Temperature Setting (t1 & t2)

Range: 0 to 1320°C  
 Resolution: 1°C

### Control Accuracy

P.I.D. Control  
 Reading accuracy: ±0.25% FSD ±1 digit

## Time

Start delay range 00:00 to 19hr 59min  
 Soak time range 00:00 to 19hr 59min  
 Resolution: 1 min

## Program

1 program with 2 ramps & 1 soak  
 1st ramp rate: 10 to 399°C/hour or full power  
 2nd ramp rate: full power

## Environmental

Operating temperature range: 0 to +40°C  
 Storage temperature range: -10° to +55°C

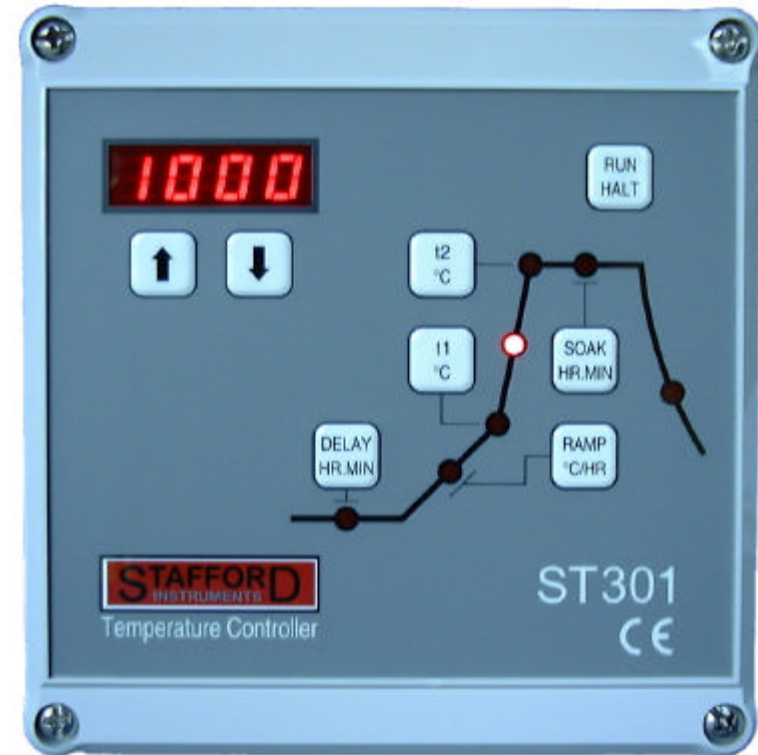
## Enclosure

Sealing: IP65  
 Material: ABS  
 Colour: Light Grey RAL 7035  
 Size: 120x122x58mm  
 Fixings: 90x110mm (4 off)



# ST301

## User Handbook



# ST301 Temperature Controller

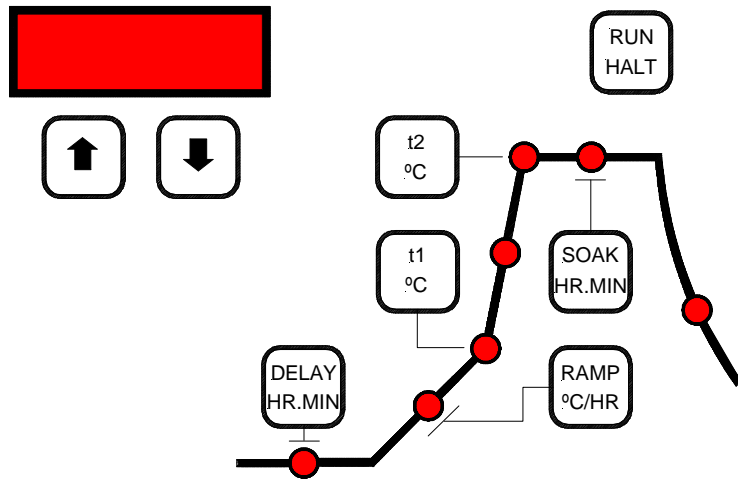
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Issue: 1.0A  
 Date: 15 Oct 1999

<http://www.stafford-inst.co.uk/docs/st301/user301.pdf>

# Setting

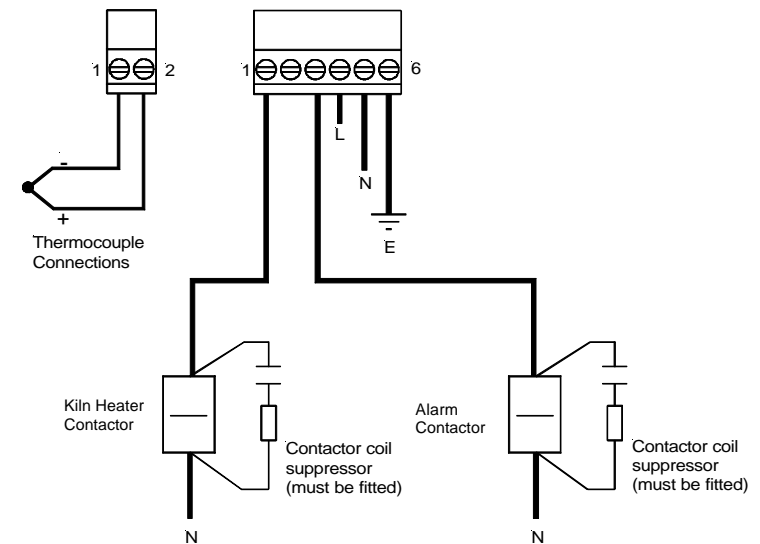
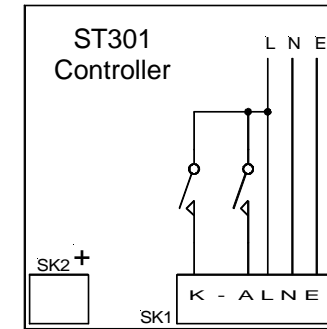


When the controller is halted no lamps on the firing mimic curve are illuminated and the display shows the kiln temperature. The controller settings can be changed, if necessary, by pressing the appropriate key. The corresponding lamp on the mimic curve will flash and the currently-stored value will be displayed. This can be altered using the  $\uparrow$  &  $\downarrow$  keys. Holding these keys down allows rapid change in the displayed value. If no keys are pressed for 5 seconds the display will revert to showing kiln temperature. All settings are remembered when the controller is turned

- DELAY HR.MIN** This allows the start of a firing to be delayed in the range 00.00 to 19.59 hours.mins.
- RAMP °C/HR** This sets the initial ramp rate in the range 10 to 399°C per hour or to FULL power. This is the rate of rise to temperature t1.
- t1 °C** This can be set in the range 0 to 1320°C and is the target temperature for the initial ramp.
- t2 °C** This can be set in the range 0 to 1320°C and is the final or soak temperature. The ramp rate from t1 to t2 is FULL power.
- SOAK HR.MIN** This can be set in the range 00.00 to 19.59 hours.mins. and is the time the controller dwells or soaks at temperature t2.

# Wiring In

If a pre-wired cable & plug is not fitted then the instrument can be wired to the kiln as shown below. The instrument is fitted with 2-part connectors to facilitate wiring. The maximum wire size is 2.5mm<sup>2</sup>.



### Note

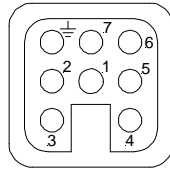
The (optional) alarm relay contacts close at the start of firing and open when firing is complete. The contacts also open if the kiln temperature exceeds the required temperature by 20°C for more than 15 minutes. This relay can be used to drive a secondary contactor to isolate kiln

## Wiring

### Connector

If the instrument has been pre-wired with a cable & plug ensure that the plug is compatible with the connector fitted to the kiln. The standard connector is Harting type HAN 7D or

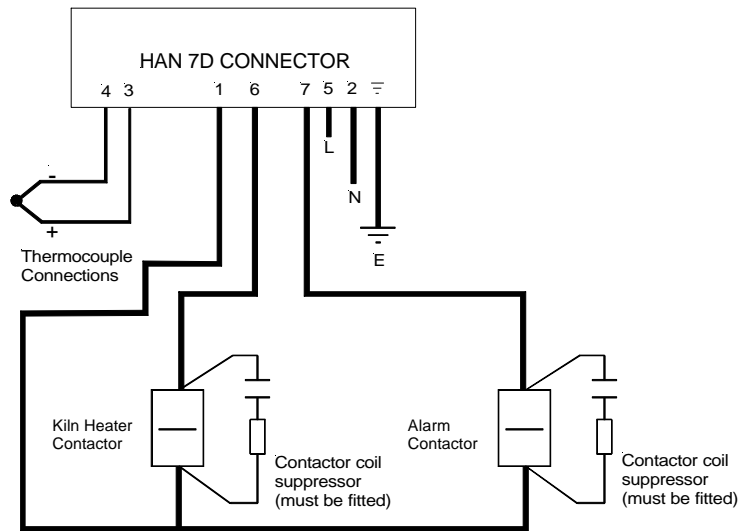
### HAN 7D Pinout



View on pins

### Kiln Connections

Compatible kiln connector wiring is shown below:-



### Connector Pin List

1	Neutral to contactors	5	Mains Live supply
2	Mains Neutral supply	6	Kiln Power contactor Live
3	Thermocouple +	7	Alarm contactor Live
4	Thermocouple -	Earth	Earth

## Firing

**RUN** Pressing this key will start a firing or abort a firing that is in progress. The status of the firing is shown on the firing mimic curve. If a start delay has been requested then the mimic **DELAY** lamp will light and the delay time remaining will be displayed.

On commencing a firing the kiln is heated from the starting temperature to temperature **t1** at a rate determined by the **RAMP** setting. Upon reaching **t1** the kiln will be heated at full power to temperature **t2**, the soak temperature. It will soak at this temperature for the **SOAK** period. It will then cool naturally with the lamp on the cooling section of the

During firing the kiln temperature is displayed. The value of any of the controller settings can also be displayed by pressing and holding down the appropriate key. During soaking the soak time *remaining* is

An indicator at the bottom right of the display lights when the kiln is being heated. Another indicator near the bottom left of the display lights when the keyboard is *locked* – this is an anti-tamper feature. To lock or unlock the keyboard press the **↑** & **↓** keys simultaneously.

## Errors

- Err1** The kiln temperature is not increasing as required. Possible causes are: kiln door or lid not closed properly, heater element failure, power phase failure or thermocouple short-circuit.
- Err2** Thermocouple or thermocouple wiring open circuit. Check wiring / replace thermocouple.
- Err3** Thermocouple reversed (temperature less than  $-50^{\circ}\text{C}$ ). Check wiring.
- Err4** Kiln temperature has exceeded required temperature by more than  $20^{\circ}\text{C}$  for 15 minutes. The alarm relay (if fitted) has been de-energised. This indicates a kiln contactor fault – check.

# Installation

## Safety Warnings



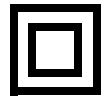
ISOLATE  
BEFORE  
REMOVING

### WARNING

ISOLATE KILN & CONTROLLER FROM ELECTRICAL  
SUPPLY BEFORE OPENING THIS INSTRUMENT FOR  
INSTALLATION, CONFIGURATION OR REPAIR PURPOSES

## Installer Information

Installation Category: II  
Pollution Class: 2



230V ~ 50HZ 1.0A

IP65

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



## EMC

To meet Electromagnetic Compatibility requirements both the thermocouple lead and the power leads should not exceed 3.0m in length.

This instrument is designed for use mainly in Domestic & Light Industrial environments where electromagnetic interference may cause a loss of accuracy of the displayed temperature reading of up to 3°C. Specified accuracy will be restored when the interference is removed.

## Contact Suppression

The coil of each 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 |

## Mounting

### Mounting Location

Mount the instrument on a suitable vertical surface which will not get hot. Choose a position where the instrument is not exposed to direct heat from the kiln - especially when the kiln door or lid is open.

The cable entry in the instrument base should normally be positioned downwards to guard against moisture ingress.

### Mounting Centres

The mounting centres are marked on the back of the instrument enclosure and are 90mm x 110mm.

To expose the mounting holes in the instrument base remove the instrument's front panel which is secured with cross-head screws.