Characteristics

Electrical

Power supply
Voltage range: 216.2 - 253V
Frequency: 50Hz (nom)
Phases: 1
Power: Programmer: 3VA (max)

Fuse: 1.0A slow-blow HRC
20mm x 5mm ceramic

Control Relays
Contact type: SPST NO volt-free
nominal 230VAC switching
@300mA max (contactor driving)
@24A max (direct switching)

Thermocouple
R,S,K & N type.

Power Connector (ST030B)
24A Terminal block (7.62mm pitch)
"Rising clamp" type

Power Connectors (ST036A)
Pluggable Terminal blocks (5mm pitch)
"Rising clamp" type

Thermocouple Connector
Pluggable terminal block (3.5mm pitch)
"Rising clamp" type

Jumper Wire (ST030B only)
90mm long 2.5mm^2

Error Handling

Thermocouple failure detection
Thermocouple reversal detection
Heater failure detection
Kiln over-temperature detection
Room over-temperature detection
Firing run time hours limiter
Alarm buzzer

Other

Keyboard lock facility + indicator
Kiln heating indicator
Program running indicator

Weight

Instrument + wall bracket: 0.710kg
Shipping weight: 1.180kg

Temperature

Temperature setting
Range: 0 to 1320ºC (R/S) 0 to 1200°C (K/N)
Resolution: 1ºC

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

Time

Start delay range: 00:00 to 99hr 59min
Soak time range: 00:00 to 99hr 59min
Resolution: 1 min

Ramps

Ramp rate: 1 to 999°C/hour or full power
Ramps can be heating or cooling

Environmental

Operating temperature range: -10°C to +55°C
Storage temperature range: -10ºC to +55ºC
RH: Maximum relative humidity 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 55°C.

Enclosure

Material: ABS
Sealing: IP65
Colour: Light Grey (RAL 7035)

Size: 120x122x58mm
Fixings: 90x110mm (4 off)

Holster style wall mounting bracket

CE This instrument complies with Council Directive 89/336/EC (EMC) & Council Directive 2006/95/EC (safety)

Council Directives 2002/96/EC & 2003/108/EC

The crossed out bin symbol, placed on this product, reminds you of the need to dispose of the product properly at the end of its life. Electrical & Electronic Equipment should never be disposed of with general waste but must be separately collected for proper treatment. In this way you will assist in the recovery, recycling & reuse of many of the materials used in this product.

Further copies of this document can be found at www.staffordinstruments.co.uk/docs/st31xa/install31xa.pdf

STAFFORD INSTRUMENTS

ST31XA Series

Installation Instructions

ST31XA Series
(ST312A, ST314A, ST315A & ST316A)
Temperature Programmers

Stafford Instruments Ltd.
Tel: +44(0)1785 255588
Fax: +44(0)1785 255589

www.staffordinstruments.co.uk
email: support@stafford-inst.co.uk

CE

See separate handbook for User Instructions

Issue: 4.00
Date: 27 Jan 2011

Installation

Safety Warnings

ISOLATE BEFORE REMOVING COVER

WARNING

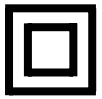
ISOLATE KILN & PROGRAMMER FROM ELECTRICAL SUPPLY BEFORE OPENING THIS INSTRUMENT FOR INSTALLATION, CONFIGURATION OR REPAIR PURPOSES

Installer Information

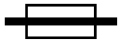
Installation Category: II
Pollution Class: 2

230V ~ 50HZ 1.0A

Fuse: 1.0A Anti-surge
20mm ceramic HRC



IP65



CE

EMC

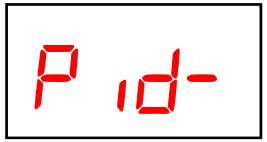
To meet Electromagnetic Compatibility requirements both the thermocouple lead and the power leads should not exceed 3.0m in length.

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.

IMPORTANT

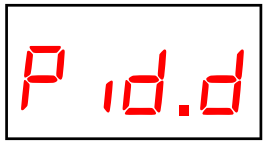
Error messages are provided to detect kiln faults and so offer some protection to the kiln. For increased protection the use of a heat fuse or other independent over-temperature trip (such as the Stafford Instruments ST121) is recommended. For maximum protection an independent thermocouple, trip & heater contactor circuit should be used.

Error messages should normally be left enabled. Error messages should only be disabled as a short term measure—to diagnose kiln problems for example. Power fail recovery may need to be disabled if un-attended firing is not allowed.



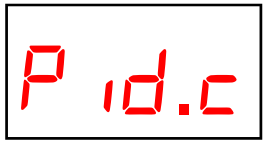
The PID menu is now displayed. To review or change PID settings press the ⬆ or ⬇ keys. ***Only enter the PID menu if you know what you are doing!*** To skip PID setting press the START/STOP key.

Pressing the START/STOP key causes the instrument to store the configuration data and then leave configuration mode by resetting itself without changing PID values.



If the START/STOP key is pressed when this menu is shown then the factory default values for PID will be reloaded. The default values are P: 55°C, I: 200 seconds, D: 10 seconds.

Pressing the START/STOP key causes the instrument to reload the factory default values for PID, store the configuration data and then leave configuration mode by resetting itself.



If the START/STOP key is pressed when this menu is shown then the menu for re-viewing or changing P (the proportional band) is shown:-

To change the proportional band use the ⬆ or ⬇ keys. The factory default value for the proportional band is 55°C. It can be changed in the range 1°C to 999°C. To change I (the integral time) press the START/STOP key:-

To change the integral time use the ⬆ or ⬇ keys. The factory default value for the integral time is 200 seconds. It can be changed in the range 10 seconds to 999 seconds. To disable the integral term press the ⬇ key when I=10 to select I=0. To change D (the derivative time) press the START/STOP key:-

To change the derivative time use the ⬆ or ⬇ keys. The factory default value for the derivative time is 10 seconds. It can be changed in the range 0 seconds (disabled) to 999 seconds. To exit the configuration setting press the START/STOP key.

The instrument will now store the new PID data, store the configuration data and then leave configuration mode by resetting itself.

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.

Wall Mounting Bracket

This is a single part “holster” style metal bracket. The instrument can be removed from this bracket for in-hand programming if required.

Direct Wall Mounting

If direct wall mounting is required screw the instrument back box to the wall using the 4 moulded holes on 90mm x 110mm centres.

Note: these holes are sealed from the interior of the instrument. It is not good practice to drill further holes in the base of the instrument because this will compromise both the IP65 sealing and the double insulation.

Configurations

Kiln Contactor Driving

For operating kilns with contactors fitted please refer to the wiring diagrams on pages 4,5 & 6.

Direct Kiln Driving (option P)

For directly driving the elements of small kilns without contactors please refer to the wiring diagram on page 7.

Options

A “P” option code written on the yellow warning label attached to the top surface of the base box shows the type of factory set base wiring:-

☐☐☐ Standard configuration - for contactor driving.
Internal link is fitted between terminals “FL” and “CO”.
See diagram on pages 5 & 6.

P☐☐ Power configuration - for direct driving of kiln elements.
Internal link is fitted between terminals “”L” and “K2”.
See diagram on page 7.

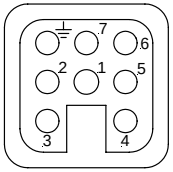
Non-standard instruments will have additional option codes.

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 similar.

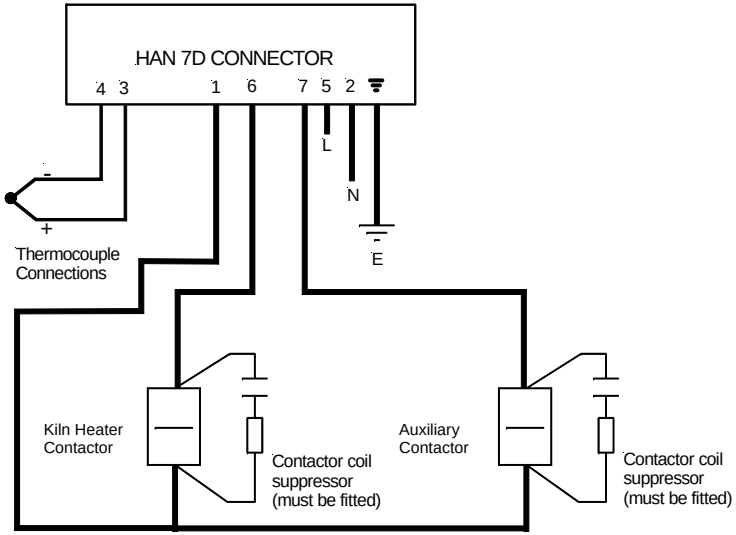
HAN 7D Pinout



View on pins

Kiln Connections

Compatible kiln connector wiring is shown below:-

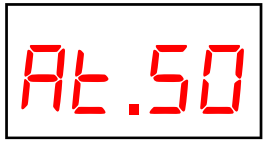


Connector Pin List

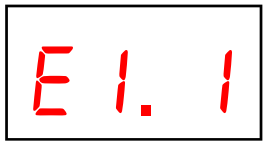
1	Neutral to contactors	5	Mains Live supply
2	Mains Neutral supply	6	Kiln Power contactor Live
3	Thermocouple +	7	Auxiliary contactor Live
4	Thermocouple -	Earth	Earth

Contact Suppression

The coil of each contactor ***should be suppressed*** with an RC suppressor. The RC suppressor must be connected directly across the coil terminals on the contactor. Suitable proprietary RC suppressors are often available from contactor manufacturers as add-on blocks. A suitable RC suppressor with insulated wire leads is available from Farnell Electronic Components as part number: 1187659 - these ***are also available from Stafford Instruments Ltd.***

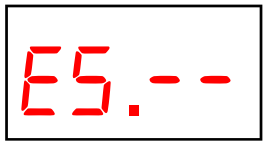


The ambient temperature trip level is now displayed. This can be altered with the ⬆ & ⬇ keys in the range 30°C to 70°C or disabled (At.--). If this temperature is exceeded the controller will show Err7. Press the START/STOP key.

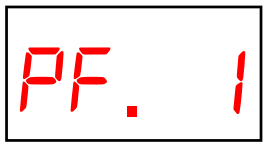


Error 1 (heating failure) message status is now displayed. This can be altered with the ⬆ & ⬇ keys. E1. 1 indicates that error 1 is enabled. E1. 0 indicates that error 1 is disabled.
Press the START/STOP key.

Error 4 (contactor welded) message status is now displayed. This can be altered with the ⬆ & ⬇ keys. E4. 1 indicates that error 4 is enabled. E4. 0 indicates that error 4 is disabled.
Press the START/STOP key.

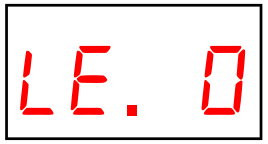


Error 5 (overshoot limit exceeded) message status is now displayed. This can be altered with the ⬆ & ⬇ keys to E5.10 (10° C), E5.20 (20°C), E5.30 (30°C), E5.40 (40° C), E5.50 (50°C) or E5.-- (disabled).
Press the START/STOP key.



Power failure handling status is now displayed. This can be altered with the ⬆ & ⬇ keys. PF. 1 indicates that power failure recovery is enabled. PF. 0 indicates that power failure recovery is disabled.
Press the START/STOP key.

The lock-up on error facility described below is used to prevent the clearing of errors by cycling the power to the instrument - to force an engineer call-out. Errors are cleared by entering this configuration mode.



Lock-up on error status is now displayed. This can be altered with the ⬆ & ⬇ keys. LE. 1 indicates that lock-up on error is enabled. LE. 0 indicates that lock-up on error is disabled.
Press the START/STOP key.

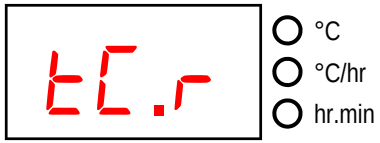
Configuring

The following installation parameters of the instrument can be configured:-

- Thermocouple type — default: R type
- Maximum allowed kiln temperature — default: 1320°C (R/S), 1200°C (K/N)
- Kiln power rating — default: 0.0kW
- Maximum firing time hours limit — default: disabled
- Ambient (room) temperature trip: — default: 50°C
- Error 1 enabled/disabled — default: enabled
- Error 4 enabled/disabled — default: enabled
- Error 5 temperature overshoot limit: — default: disabled
- Power fail recovery enabled/disabled — default: enabled
- Lock-up on error enabled/disabled — default: disabled

To enter configuration mode power down the instrument. Press and hold down the START/STOP key while powering up the instrument. Release the START/STOP key when the thermocouple type is displayed.

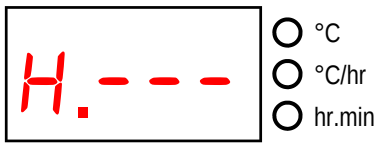
Note: in the sequence below if no key presses are detected within 15 seconds the instrument will exit configuration mode and configuration changes will not be saved.



The currently configured thermocouple type letter will flash. This can be altered with the ⬆ & ⬇ keys to R,S,K or N type (rSHn). Press the START/STOP key.

The maximum allowable kiln temperature is now displayed. This can be altered with the ⬆ & ⬇ keys. Press the START/STOP key.

The currently configured kiln power rating in kW is now displayed. This can be altered with the ⬆ & ⬇ keys. Press the START/STOP key.



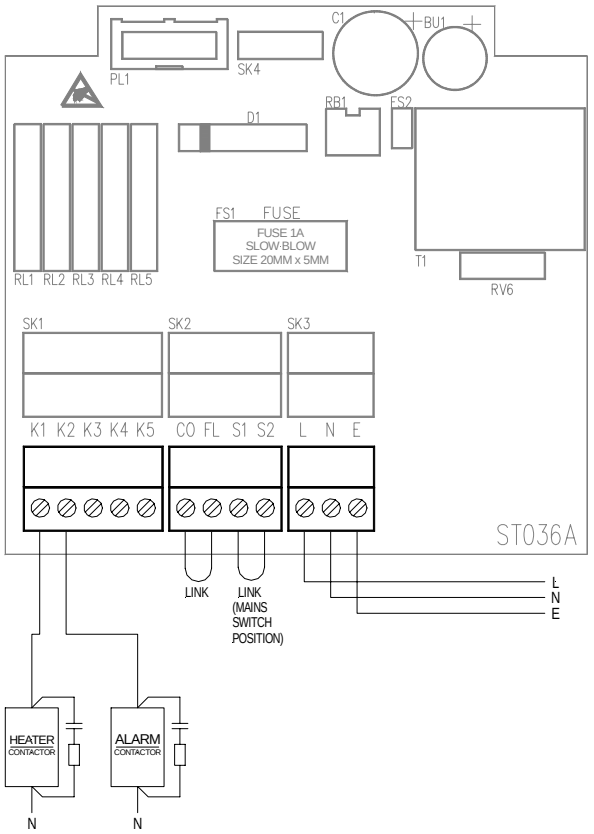
The maximum firing hours limit is now displayed. This can be altered with the ⬆ & ⬇ keys in the range 10 to 999 hours or disabled (---) . If this limit is exceeded the controller will show Err6. Press the START/STOP key.

Installation

Wiring In - ST31XA (ST036A PCB)

If a pre-wired cable & plug is not fitted then the instrument can be wired to the kiln as shown below.

Note: Identify the type of circuit board fitted before proceeding (ST036A or ST030B). Wiring details for ST030B board shown overleaf. Wiring in should only be performed by a qualified person - preferably an experienced kiln electrician.



Configuration

The relay contacts are volt-free. To power the contacts fit a jumper link between terminals FL (fused live) & CO (common) as shown above. A jumper link should also be fitted between terminals S1 & S2 (if a mains switch is not fitted).

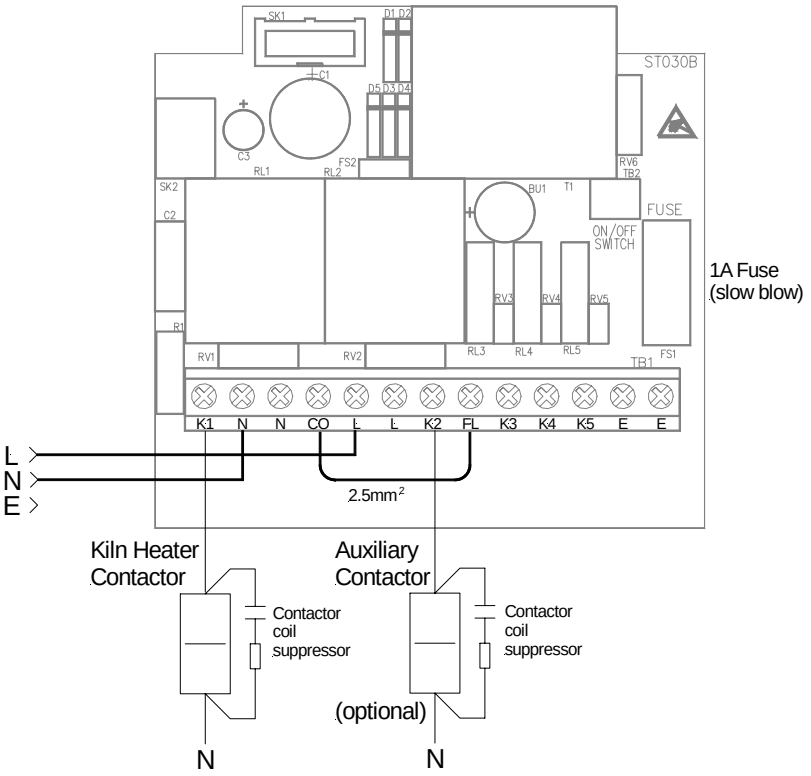
Note

The auxiliary / alarm relay (RL2) contacts close at the start of firing and open when firing is complete. The contacts also open if an error message is generated. This relay can be used to drive a secondary contactor to isolate kiln power.

Wiring In - ST31XA (ST030B PCB)

Wiring in should only be performed by a qualified person - preferably an experienced kiln electrician.

If a pre-wired cable & plug is not fitted then the instrument can be wired to the kiln as shown below.



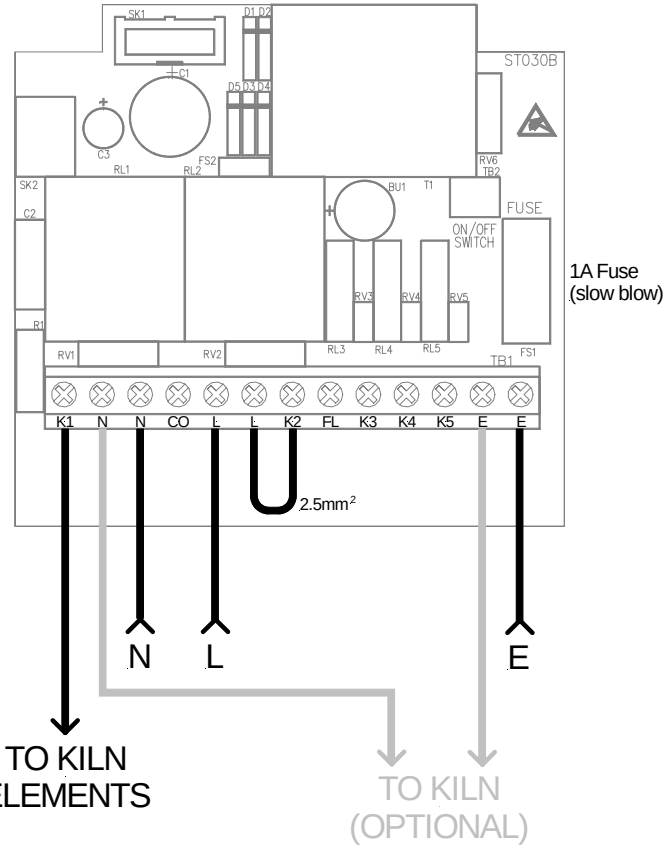
Configuration

The relay contacts are volt-free. To power the contacts fit a jumper link between terminals FL (fused live) and CO (common) as shown above. A suitable 90mm long jumper wire is provided (SI part no. 020011).

Note

The auxiliary / alarm relay (RL2) contacts close at the start of firing and open when firing is complete. The contacts also open if an error message is generated. This relay can be used to drive a secondary contactor to isolate kiln power.

Wiring In - ST31XPA (ST030B PCB)



Wiring of direct power switching controllers should only be performed by a kiln manufacturer or an experienced kiln electrician.

Configuration

The relay contacts are volt-free. To power the contacts fit a jumper link between terminals L (live) and K2 as shown above. A suitable 90mm long jumper wire is provided (SI part no. 020011).

Note

The auxiliary alarm / safety relay (RL2) contacts close at the start of firing and open when firing is complete. The contacts also open if an error message is generated.