STAFFORD INSTRUMENTS

ST31XB Series

Installation Instructions

ST31XB Series
(ST312B, ST315B & ST316B)
Temperature Programmers

Supplied by:-

www.staffordinstruments.co.uk

See separate handbook for User Instructions

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Installation

Safety Warnings

ISOLATE BEFORE REMOVING COVER

WARNING

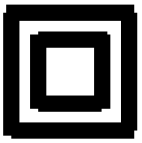
ISOLATE KILN & PROGRAMMER FROM ELECTRICAL SUPPLY BEFORE OPENING THIS INSTRUMENT FOR INSTALLATION, CONFIGURATION OR REPAIR PURPOSES

Installer Information

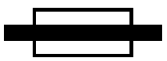
Installation Category: II
Pollution Class: 2

230V ~ 50HZ 1.0A

Fuse: 3.15A 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.

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 ñholsteròstyle 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-SSR)

For directly driving the elements of small kilns of up to 6kW with an internal SSR (Solid State Relay) please contact the factory.

Option Codes

A option code box is provided on the yellow warning label attached to the top surface of the base box shows any special options:-

	Standard configuration - for contactor driving. Internal link is fitted between terminals ñFLòand ñCOò See diagram on pages 5 & 6.
P-SSR	SSR Option - for direct driving of kiln elements.

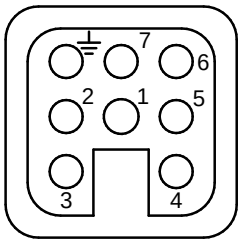
Non-standard instruments will have other option codes.

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.

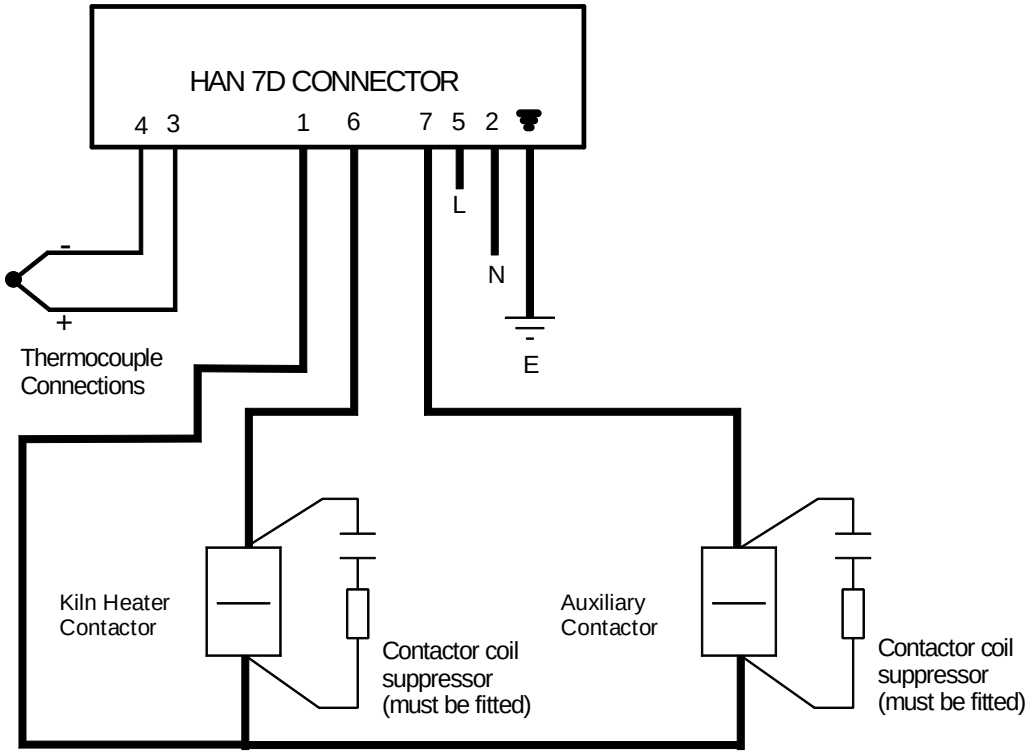
HAN 7D Pinout



View on pins

Kiln Connections

Compatible kiln connector wiring is shown below:-



Connector Pin List

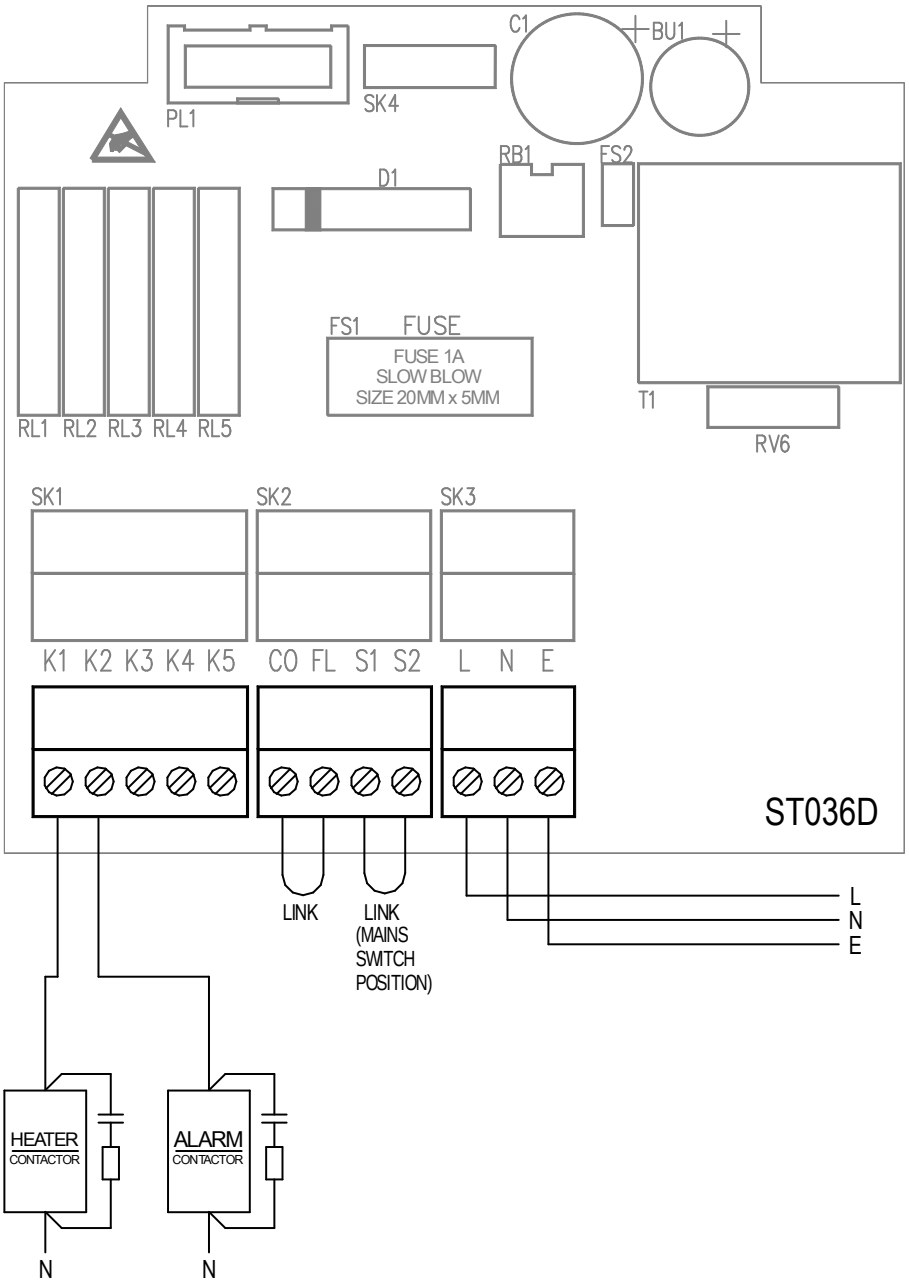
1	Neutral to contactors	5	Mains Live supply
2	Mains Neutral supply	6	Kiln Power contactor Live
3	Thermocouple +	7	Auxiliary contactor Live
4	Thermocouple -	Earth	Earth

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.***

Wiring In - ST036C/D PCB

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) & 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.

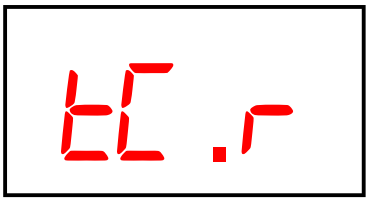
Configuring

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
♦ PID process cycle time	default: 30 seconds
♦ PID values	defaults: P=55, I=200, D=10

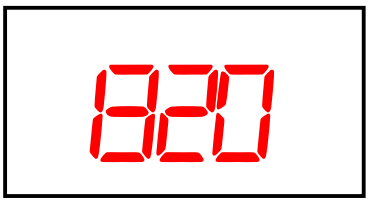
To enter configuration mode power down the instrument. Press and hold down the START/STOP key while powering up the instrument.
Release the START/STOP key when the thermocouple type is displayed.

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.



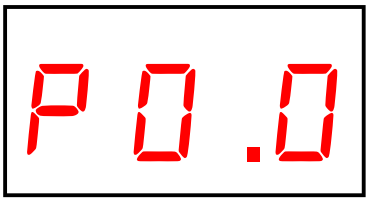
○ °C
○ °C/hr
○ hr.min

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.



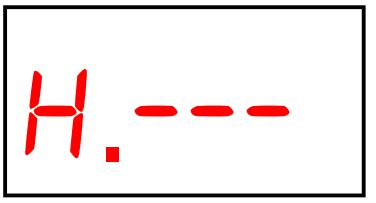
● °C
○ °C/hr
○ hr.min

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



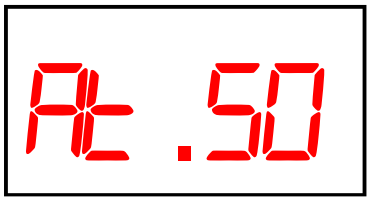
○ °C
○ °C/hr
○ hr.min

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

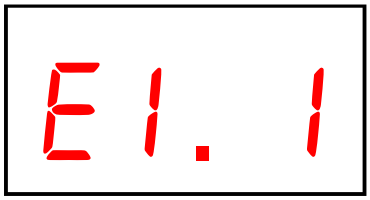


○ °C
○ °C/hr
○ hr.min

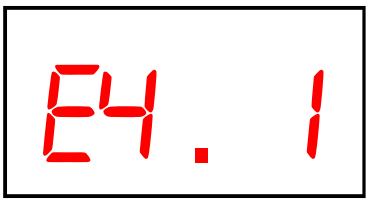
The maximum firing hours limit is now displayed. This can be altered with the ⬆ & ⬇ keys in the range 10 to 999 hours or disabled (---) . If this limit is exceeded the controller will show Err6 .
Press the START/STOP key.



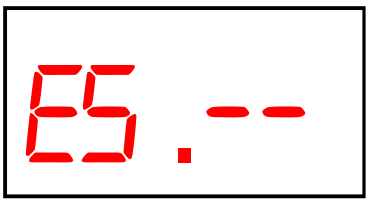
The ambient temperature trip level is now displayed. This can be altered with the ⬆ & ⬇ keys in the range 30°C to 70°C or disabled (At .--). If this temperature is exceeded the controller will show Err7 .
Press the START/STOP key.



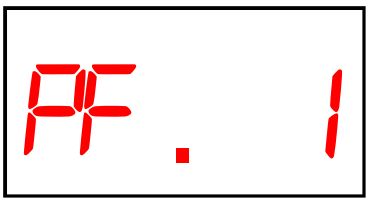
Error 1 (heating failure) message status is now displayed. This can be altered with the ⬆ & ⬇ keys. E1. 1 indicates that error 1 is enabled. E1. 0 indicates that error 1 is disabled.
Press the START/STOP key.



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.

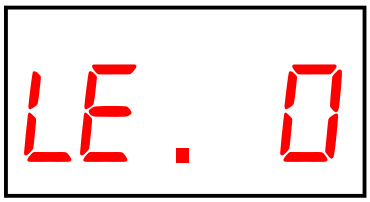


Error 5 (overshoot limit exceeded) message status is now displayed. This can be altered with the ⬆ & ⬇ keys to E5. 0 (10°C), E5.20 (20°C), E5.30 (30°C), E5.40 (40°C), E5.50 (50°C) or E5.-- (disabled).
Press the START/STOP key.

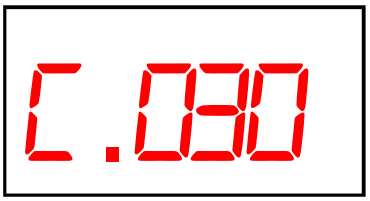


Power failure handling status is now displayed. This can be altered with the ⬆ & ⬇ keys. PF. 1 indicates that power failure recovery is enabled. PF. 0 indicates that power failure recovery is disabled.
Press the START/STOP key.

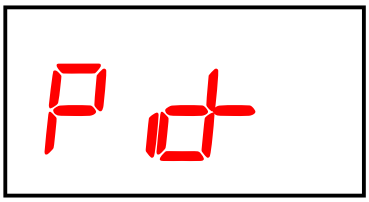
The lock-up on error facility described below is used to prevent the clearing of errors by cycling the power to the instrument - to force an engineer call-out. Errors are cleared by entering this configuration mode.



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.

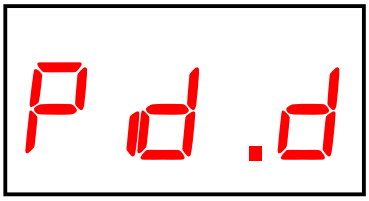


This parameter is the process cycle time in seconds for PID control and the hysteresis in °C for on/off control. This can be altered in the range 1 to 120 with the ⬆ & ⬇ keys. The factory set default value for PID control is 30 seconds. For on/off control the recommended value for hysteresis is 1°C. Press the START/STOP key.



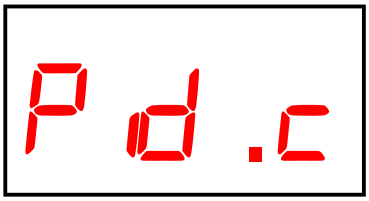
The PID menu is now displayed. To review or change PID settings press the ⬆ or ⬇ keys. ***Only enter the PID menu if you know what you are doing!*** To skip PID setting press the START/STOP key.

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.

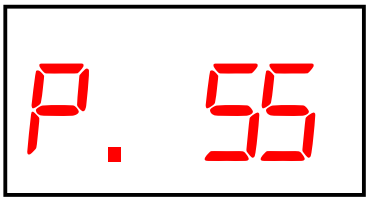


If the START/STOP key is pressed when this menu is shown then the factory default values for PID will be reloaded. The default values are P: 55°C, I: 200 seconds, D: 10 seconds.

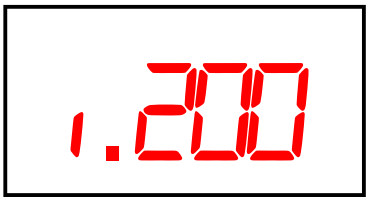
Pressing the START/STOP key causes the instrument to reload the factory default values for PID, store the configuration data and then leave configuration mode by resetting itself.



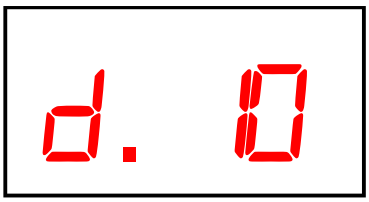
If the START/STOP key is pressed when this menu is shown then the menu for reviewing or changing P (the proportional band) is shown:-



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 0°C to 999°C. If 0°C is selected then PID control is disabled and on/off control enabled. The hysteresis for on/off control is set using the cycle time parameter and the recommended value for hysteresis is 1°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.

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.

Notes

Notes

Characteristics

Characteristics

Electrical

Power supply
Voltage range: 85 - 265VAC
Frequency: 50/60Hz
Phases: 1
Power: 4VA

Fuse: 3.15A slow-blow HRC
20mm x 5mm ceramic

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

Thermocouple
R,S,K & N type.

Connectors
Pluggable Terminal blocks (5mm pitch)
ñRising clampòtype

Thermocouple Connector
Pluggable terminal block (3.5mm pitch)
ñRising clampòtype

Temperature

Temperature setting
Range: 0 to 1400ºC (R/S) 0 to 1200°C (K/N)
Resolution: 1ºC

Control Accuracy
P.I.D. Control or on/off control (selectable)
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.

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

Further copies of this document can be found at www.staffordinstruments.co.uk/docs/st31xa/install31xb.pdf