

# X10594 – PR3-E Series 86/105kW HVAC Range

## 3-Phase Burst Fire Power Controller Installation Instructions

### Issue 8



## 1 Introduction

The PR3 range of thyristor stacks provides full seamless control of three phase resistive loads, using two thirds control technique. Signal control is by a dc signal or manual control is via a 5kΩ potentiometer. These burst firing control stacks use fast pulse zero volts switching technology, to minimise flicker and eliminate RFI problems. They also incorporate an automatic resetting temperature trip, integral semiconductor fuses and heatsink. The two builds in this range are the 86kW and 105kW models which have the same profile. All have easy access to signal & power terminals for simple installation.

## 2 Applications

Suitable for 3-wire, 3-phase floating-star or closed-delta configured resistive loads. This includes the Heating, Ventilating and Air Conditioning (HVAC) market for air curtain applications, but also for furnaces, ovens, dryers, and hot plates.

## 3 Functions

### Alarm relay functions (3-way terminal – V/free alarm “NO\_NC\_C”)

The alarm circuit has ‘voltage free’ relay contacts and are rated up to 2A @ 125V ac (RMS) load. Connection is via the PCB terminal.

For alarm relay status options see SPECIFICATIONS.

Note: The internal supply to the relay is obtained from the transformer via two 20mm 1A fuses. These are connected to the Black (L2) and Grey (L3) phases and therefore the relay and LED can only energise when there is an over-temperature condition, a sensor fault, or a phase loss on L1 phase. See Remote Supply option section.

### Over temperature protection

When a heatsink temperature of above 90°C is detected by the sensor, the alarms relay changes state and the status LED indicator flashes continuous rapid pulsing. The power to the load will be disconnected and will not return until the temperature drops to 85°C.

### Temperature sensor loss

The Status LED indicator changes to continuous equal ON/OFF pulsing if the sensor fails.

### Phase loss with auxiliary supply

When any one of the three phase inputs are missing, the relay changes state and the LED flashes with ON/OFF bursts of 1.5 seconds. This is only functional with a remote supply (see below).

### Fault condition

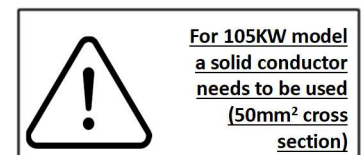
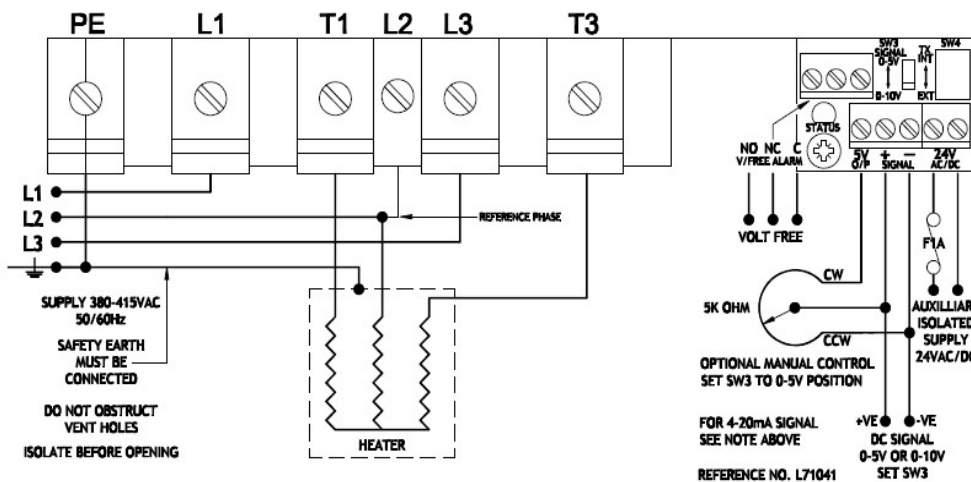
The default setting of DIL switch (SW1) is in the ON position, the alarm relay will be energised under a fault condition. Changing SW1 to the off position will energise the alarm relay continuously until a fault condition occurs.

### Remote supply

The unit will be factory set for an internal supply (SW4 in the “INT” position). If there is a requirement for the signal relay and LED to energise when a phase fault condition occurs, then there is provision for an external 24V ac or dc supply (SW4 in the EXT” position).

NOTE – If the remote supply is utilised, the main (L1, L2 and L3) supply must come on before this supply is switched on.

## 4 Connections



### CONTROL OPTIONS GUIDE

#### Burst fire control options (SW2)

There are two methods which can be selected to suit specific applications. With the SW2 DIL switch in the “ON” position it gives fast burst control which is the ‘inhibited flicker’ mode. With the SW2 DIL switch in the “OFF” position it gives slow burst control, which is basic burst firing mode.

### Control input options (SW3 & SW“1/V”)

These are connected via the terminals 5V o/p and “+” and “-” signal. Ensure correct polarity, as shown in CONNECTIONS section.

[SW3] For input voltage signals of 0-5V or 0-10V dc, use the “+” and “-” SIGNAL terminals.

[SW3] For manual control using a 5kΩ, 1W potentiometer, use all 3 terminals 5V-O/P, and “+” and “-” SIGNAL terminals.

[SW “1/V”] For input current signal of 4-20mA, set DIL switch SW-1/V to “ON”, fit a 270Ω, 0.25W resistor across the “+” and “-” SIGNAL terminals and set SW3 to 0-5V. SW-1/V is internal and the cover must be removed to set, only after the power has been disconnected.

Note: For 4-20mA signal, a 270Ω resistor is supplied. Factory-set ‘default’ setting is 0-10V. (See CONNECTIONS and SPECIFICATIONS sections)

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## 5 Installation

### 5.1 Cooling requirements

This robust stack assembly has an operational temperature of 65°C when naturally cooled and has a built in 90°C over temperature trip on the heatsink as a safety feature. The unit should be mounted vertically, with heatsink fins top to bottom, and with sufficient surrounding air space to maximise natural convection cooling. If the unit is mounted in an enclosure or cabinet, adequate ventilation and/or forced air-cooling should be fitted.

### 5.2 Load considerations

The PR3 series of power controllers are designed for 3-wire, 3-phase floating-star or closed delta configured resistive loads. The PR3 series are 2-leg thyristor controllers and therefore unsuitable for 4-wire, 3-phase with star point to neutral configured loads. For further information on configured loads, see the 'Application circuits' section of our supporting datasheet – APC (ref. X10322). Unusual heating loads such as Molybdenum, Platinum or Tungsten have a typical 10:1 hot to cold resistance ratio and therefore, when cold, draw larger currents than normal.

### 5.3 Connections

This unit has Power terminals and simple clamp type terminal connectors for all auxiliary wiring requirements (see SPECIFICATIONS below).

NOTE: It is factory set for an internal power supply. For alternative 'voltage free' alarm supply details see Functions section. Please contact our Technical support for further details.

### 5.4 Fusing & over temperature

It is recommended that fast acting semiconductor type fuses (as supplied) be used for protection. See SRA Data sheet X10255 for further information. It is recommended that a load break switch and a contact breaker is installed in the load supply. The supply to the contactor coil should be interrupted by an over-temperature thermostat located in the heater battery and also upon detection of airflow loss.

### 5.5 CE Marking

This family carries a "CE" marking. These burst fire controllers do not normally require a remote filter. For more information contact our sales desk. A Declaration of Conformity is available on request.

## 6 Technical Specifications

<b>Power/Current Rating</b>	86kW (120A); 105kW (146A) @ a typical supply of 415V RMS	
<b>Input Voltage</b>	400V RMS $\pm$ 10%	
<b>Frequency</b>	50/60Hz	
<b>Control Input Options</b>	<b>Signal (using SW3):</b> 0 to 10V DC (set as standard)/0 to 5V	
	<b>Manual:</b> using 5k $\Omega$ potentiometer	
	<b>For 4-20mA Signal:</b> set <b>S/W I/V</b> to "ON", fit 270 $\Omega$ (0.25W) across SIG $\pm$ and set <b>SW3</b> to 0-5V	
<b>Burst Fire Control Options</b>	<b>Slow Burst:</b> 1 second proportional time base	<b>Fast Burst:</b> variable and un-proportional time base
<b>Alarm Relay Functions</b>	The voltage free alarm circuit is rated for 125V AC @ 2A	
<b>Alarm Relay Status Options</b>	SW1 = "OFF" – Relay is continuously energised (normally closed); trips in fault condition	
	SW1 = "ON" – Relay is de-energised (normally open); closes in fault condition	
<b>Status Indicator</b>	(Tracking control signal) <b>status</b> LED indicator changes <b>intensity</b>	
<b>Cooling Fan</b>	None fitted	
<b>Over Temperature</b>	Trip in temperature @ 90°C $\pm$ 1°C (Status LED indicator 'flashes' with ON/OFF rapid pulsing)	
	Trip out temperature @ 85°C $\pm$ 1°C	
<b>Phase Loss Detection</b>	Status LED indicator 'flashes' ON/OFF continuously in slow 1.5 second intervals	
<b>Sensor Loss Detection</b>	Status LED indicator 'flashes' ON/OFF continuously in equal intervals	
<b>Cable Terminations</b>	<b>Phase Power &amp; Earth</b>	35mm <sup>2</sup> Rising Clamp Terminal Block
	<b>Reference Phase (L2)</b>	10mm <sup>2</sup> Rising Clamp Terminal Block
	<b>Remote supply Auxiliary alarm (relay)</b>	2.5mm <sup>2</sup> Rising Clamp Terminal Blocks
	<b>Control signal</b>	2.5mm <sup>2</sup> Rising Clamp Terminal Blocks
<b>Terminal Torque Specs</b>	3.2 to 3.7Nm – Power an Earth terminals. 2.0Nm-Reference (L2) Terminal.	
<b>Fusing</b>	<b>86kW</b>	160EET (160A) High-speed Semiconductor type fuse
	<b>105kW</b>	200EET (200A) High-speed Semiconductor type fuse
<b>Working Temperature</b>	65°C (maximum operational)	
<b>Dimensions</b>	272mm (D) x 250mm (W) x 130mm (H) 36kW – length is viewed with heatsink fins going top to bottom (see photo)	
<b>Fixing Centres</b>	4 x 6mm holes on centres 227mm (W) x 200mm (D)	
<b>Weight</b>	(all models) 5.2kg	

Note: SAFETY WARNING – Isolate supply before removing cover; Metal parts, in particular the heatsink, may get very hot when the unit is fully operational. DO NOT COVER enclosure ventilation slots.

It is essential that a load break switch and a contact breaker is installed in the load supply. The supply to the contactor coil should be interrupted by an over-temperature thermostat located in the heater battery and also upon detection of airflow loss.

## 7 Recommendations and Safety Requirements

Additional supporting documents, which may be appropriate for your application, are available on request. These include X10255: SRA – Safety Advise; X10213: ITA – Interaction (Causes & remedies for Burst fire & Phase Angle control), P01.1 – UAL Conditions of Sale.

NOTE: It is recommended that installation and maintenance of this equipment should be done with reference to the current edition of the I.E.T. (formally I.E.E.) regulations (BS7671) by suitably qualified/trained personnel. The regulations contain important requirements regarding installation and safety of electrical equipment. Specific installers should refer to local and national regulations.

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## 8 Order Details

When ordering directly, please use the following stock codes:

Manufacturer stock code	Product Description	Rating
A447412-HV-A	PR3-E-86kW	3-phase, 86kW, 120A@415V, 2/3rds control
A447432-HV-A	PR3-E-105kW	3-phase, 105kW, 146A@415V, 2/3rds control
T30201	Auxiliary transformer for Failsafe Alarm	0/240/415 10-0-10V 2VA
A403011	5k $\Omega$ , 1W Potentiometer with 0.5m long leads for manual control option	-
Available on request	Spare HS fuses: 160EET (160A) or 200EET (200A), SCR-type	-

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