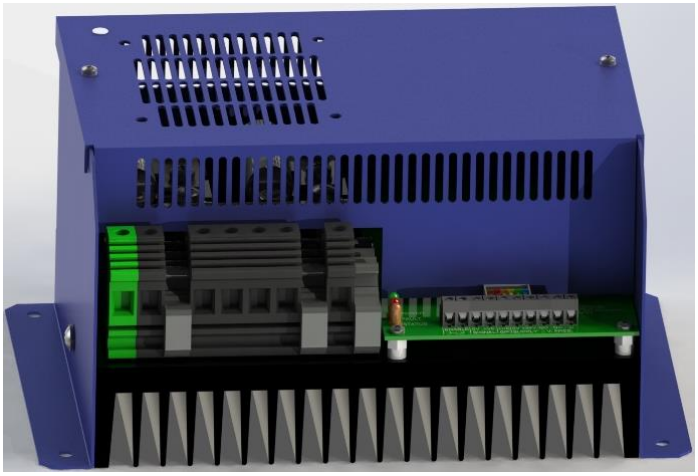
27kW and 36kW HVAC RANGE
3-PHASE BURST FIRE POWER CONTROLLER

PFC2 SERIES

X20109

Sample Photo – PR3-E-27kW



INTRODUCTION

The PR3-E S/SP/SPM range of thyristor stacks provide full, seamless control, of three phase, resistive loads using a two thirds control technique. Control of the power level is either by a dc signal or by manual control using a 5kΩ potentiometer. The PR3-E burst firing control stacks use fast pulse, zero volts switching technology, to minimise flicker and eliminate RFI problems. The controllers also incorporate an automatically resetting temperature trip, integral semiconductor fuses, and an integral volt free trip/enable input for wiring of an external thermal trip. The range contains two power ratings: 27kW and 36kW. For each power rating, three versions are available: S(standard – without high speed (HS) fuses and without internal power supply), SP (Standard Plus - including HS fuses and internal power supply) and SPM (Standard Plus Monitoring) version - including HS fuses, internal power supply and SCR/HS Fuse monitoring). All have easy access to signal & power terminals for simple installation.

RoHS Compliant

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.

FUNCTION

Trip/Enable Input

This input should be driven by a volt free contact. When the contact is closed the unit is enabled to supply power to the load. When the contact is open this disables the power to the load. If this input is not used a wire link must be fitted to enable the unit.

Alarm Relay Output (3-way terminal – Volt Free Contacts, Normally Open (NO), Normally Closed (NC), Common (COM).

The alarm circuit has voltage free relay contacts which have a 2A@125 V AC RMS rating. The alarm conditions which are detected are phase loss (L1, L2, L3), fuse failure (L1, L3), device failure (L1, L3), over temperature and temperature sensor error. The power to drive the alarm relay coil is obtained from the board power supply, which can be either internal or external. L2 & L3 are used to power the internal, transformer based power supply, therefore when internally powered the loss of phase L2 and L3 condition cannot be indicated as this results in a loss of power to the controller card.

Over Temperature Protection

When a heatsink temperature of above 90ºC is detected by the sensor, the alarms relay changes state and the Fault LED pulses rapidly. The power to the load will be disconnected and will not be re-enabled until the temperature drops to 85ºC.

Temperature Sensor Loss

If the temperature sensor fails or becomes disconnected, the Fault LED changes to ON/OFF (fast pulsing) and the alarm relay state changes.

Phase Loss with Auxiliary Supply

When any one of the three phase inputs is not present, the relay changes state and the Fault LED flashes with ON/OFF bursts of 1.5 seconds. This is only functional with a remote supply (see below).

SCR/Fuse Monitoring (SPM model only)

Fault and Status LED flash alternately and the alarm relay will change state. This condition indicates that either a HS fuse has failed or a SCR open or short circuit failure has been detected.

NOTE: The fuse or device fault indication can also be caused by an open circuit load on Phase 1 or Phase 3.

Alarm Relay Fault Indication

If DIL switch SW1-4 is in the OFF position, the alarm relay will be energised with no fault present and hence the NO contact will be closed and connected to the COM terminal. If DIL switch SW1-4 is in the ON position, the alarm relay will be de-energised when no fault is present and hence the NO contact will be disconnected from the COM terminal. For either state of SW1-4, the relay state toggles when an alarm condition is detected.

Remote Supply

If there is a requirement for the alarm relay and Fault LED to energise when a phase fault condition occurs, the SPM model must be specified and an external 24V dc supply should be used.

CONTROL OPTIONS GUIDE

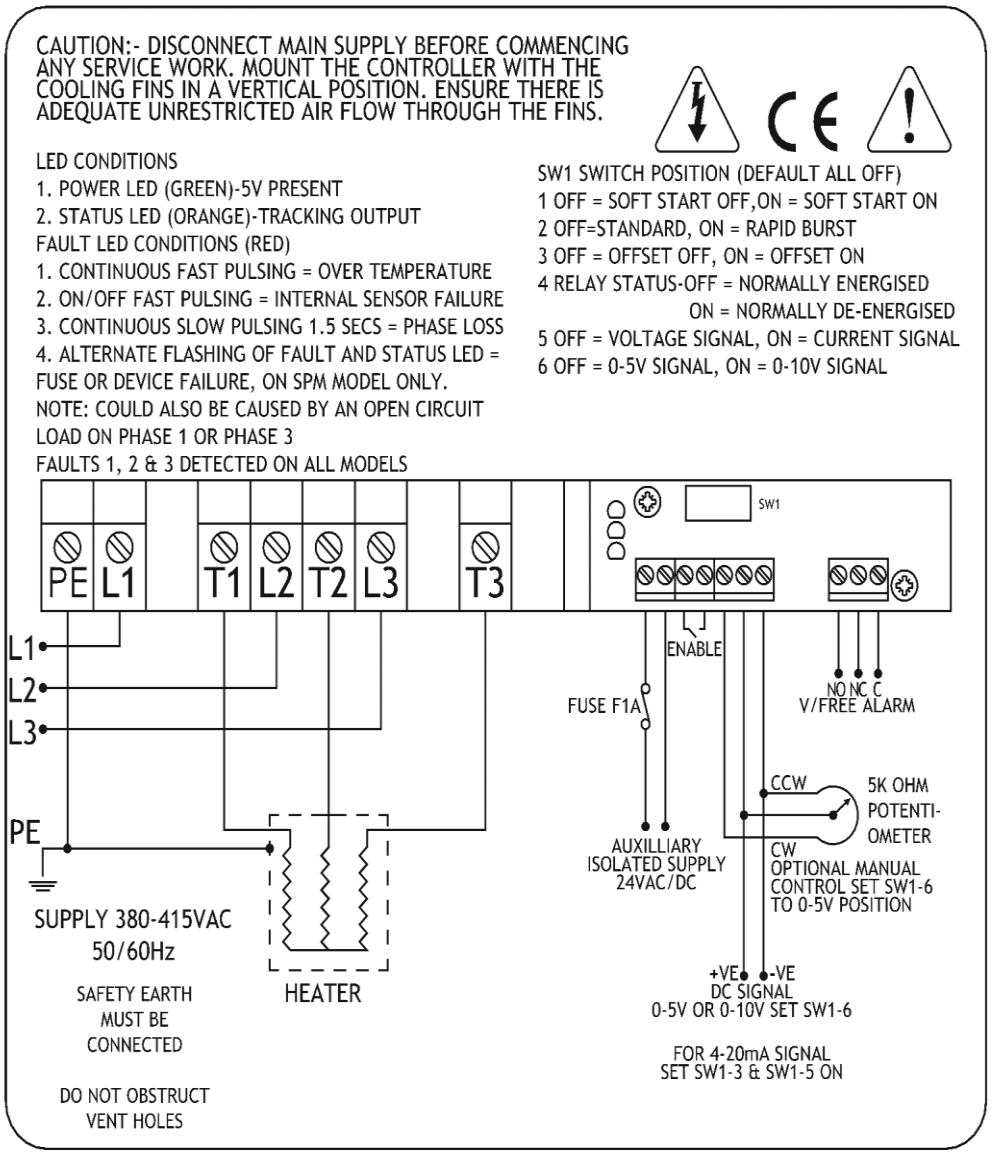
Soft Start Option (SW1-1):
When this switch is ON, the output ramps up to required power level using phase angle and then switches to burst fire mode.

Rapid Burst Fire (SW1-2):
When switch SW1-2 is in the OFF position, standard burst fire is used. When in standard burst fire mode, the Burst Rate trimmer (VR1) is used to set the time bae. The time base is the ON/OFF cycle time, this is variable from 1-30 seconds. When switch SW1-2 is in the ON position, rapid burst fire mode is selected. Two types of rapid burst fire are supported, single and dual cycle. Single cycle is selected when Burst Rate trimmer (VR1) is fully anticlockwise. Dual cycle is selected when Burst Rate trimmer (VR1) is fully clockwise.

Offset Option (SW1-3):
When SW1-3 is in the off position no offset is selected for the voltage and current input control signals. When SW1-3 is in the ON position an offset is introduced, this option is selected for 1-5V, 2-10V and 4-20mA control signals.

Voltage or Current Option (SW1-5):
When switch SW1-5 is in the OFF position this selects a voltage control input signal (0-5V, 1-5V, 0-10V, 2-10V). When switch SW1-5 is in the ON position this selects a current control signal (0-20mA, 4-20mA).

10V Signal Option (SW1-6):
When switch SW1-6 is in the OFF position the control voltage is selected to be 0-5V or 1-5V, depending on the Offset Option switch (SW1-3).When switch SW1-6 is in the ON position the control voltage range is selected to be 0-10V or 2-10V depending on the Offset Option switch SW1-3.



INSTALLATION

This robust stack assembly will operate in an ambient temperature of up to 45°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.

Load considerations

The PR3E series of power controllers are designed for 3-wire, 3-phase floating-star or closed delta, resistive loads. The PR3-E series are 2-leg thyristor controllers and therefore do not support 3-phase, 4-wire star, star point to neutral loads. For further information on configured loads, see the 'Application Circuits' section of our supporting datasheet – APC (ref. X10322).

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, it is recommended to enable the soft start feature when driving these types of load.

Connections

This unit has simple clamp type connectors for all auxiliary-wiring requirements.

Power Supply

Three way internal jumper JP2 selects the internal power supply input voltage to either 420v or 460v ac rms, phase to phase. If the jumper link is fitted across HI-COM, 460v is selected with the jumper link fitted across COM-LO, 420v is selected. The jumper header is labelled as shown below:

For SP & SPM variants, with internal power supply, the units are factory set for 420v rms (COM-LO) supply. For operation with an external power supply the jumper link should be removed from JP2.

Fusing

It is recommended that high speed semiconductor type fuses (as supplied on SP and SPM models) be used for protection. See SRA Data sheet X10255 for further information. Other external supplies should be fused accordingly.

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.

SPECIFICATIONS

Power (Current) ratings:	27kW (38A); 36kW (50A); @ a typical supply of 415V RMS
Input voltage:	400V RMS +/- 10%
Frequency:	50/60Hz
Control Signal Input Options:	0 to 5V or Manual using 5K Potentiometer: SW1-3:OFF, SW1-5:OFF, SW1-6:OFF. 1 to 5V: SW1-3:ON, SW1-5:OFF, SW1-6:OFF. 0 to 10V: SW1-3:OFF, SW1-5:OFF,SW1-6:ON 2 to 10V: SW1-3:ON, SW1-5:OFF, SW1-6:ON 0-20mA: SW1-3:OFF, SW1-5:ON, SW1-6:OFF. 4-20mA: SW1-3:ON, SW1-5:ON, SW1-6:OFF.
Alarms Relay Contact Rating:	2A @ 125V ac Max.
Power Indicator:	Power LED
Status Indicator:	Status LED indicator changes intensity during phase angle soft start or flashes in synchronisation with bursts.
Over Temperature:	Temperature trip activates @ 90ºC, +/- 1ºC. Fault LED indicator flashes, continuous fast pulsing. Temperature trip de-activates @ 85ºC, +/- 1ºC
Alarm Relay Default State	SW1-4**:**OFF Relay is energised in no fault state, NO contact is closed (connected to COM). SW1-4**:**ON Relay is de-energised in no fault state, NO contact is open (disconnected from COM).
Phase loss Detection	Fault LED indicator 'flashes' continuous slow pulsing.
Sensor Loss Detection:	Fault LED indicator 'flashes' fast pulsing.
SCR/Fuse Fault:	Fault LED and Status LED alternately flash (SPM model only).
Cable Terminations:	Phase Power 10mm² rising clamp terminal block Earth 10mm² rising clamp terminal block Remote Supply, Alarm Relay, Enable, Control Signal 2.5mm² rising clamp terminal block
Terminal Torque Settings:	1.2Nm (10mm²) Power terminals only.
Fusing 27kW:	45ET (45A) High-Speed Semiconductor type fuse, or equivalent. (SP & SPM models only) 36kW: 63ET (63A) High-Speed Semiconductor type fuse, or equivalent. (SP & SPM models only)
Ambient Temperature:	45°C without de-rating
Dimensions:	152mm (D) x 241mm (W) x 115mm (H)
Fixing Centres:	4 x 5.5mm ø holes on centres 220mm (W) x 130mm (D)
Weight:	2.6kg Maximum (all models)

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 contact breaker is installed in the supply.** The supply to the contactor coil should be interrupted by an over-temperature thermostat located in the heater battery and also by detection of airflow loss.

RECOMMENDATIONS

Additional supporting documents, which may be appropriate for your application, are available on request (see X10593).

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.

© *These products are protected by unregistered design with United Automation Limited, Southport, UK*

ORDER DETAILS

When ordering directly, please use the following stock codes:-

Manufacturer stock code	Product Description	Rating
A437418-HV	PR3-E-27kW-S	3-phase, 27kW, 38A@415V, 2/3rds control
A437419-HV	PR3-E-27kW-SP	3-phase, 27kW, 38A@415V, 2/3rds control
A437420-HV	PR3-E-27kW-SPM	3-phase, 27kW, 38A@415V, 2/3rds control
A437481-HV	PR3-E-36kW-S	3-phase, 36kW, 50A@415V, 2/3rds control
A437482-HV	PR3-E-36kW-SP	3-phase, 36kW, 50A@415V, 2/3rds control
A437483-HV	PR3-E-36kW-SPM	3-phase, 36kW, 50A@415V, 2/3rds control
A403011	5kΩ, 1W Potentiometer with 0.5m long leads for manual control option	
Available on request	Spare HS fuses: 45ET (45A) or 63ET (63A) SCR-type	

UNITED AUTOMATION LIMITED

Southport Business Park
Wight Moss Way
Southport, PR8 4HQ
ENGLAND

Tel: 0044 (0) 1704 – 516500
Fax: 0044 (0) 1704 – 516501
enquiries@united-automation.com
www.united-automation.com

Issue 4 Date 08/08/2016

nqa. ISO 9001 Registered
UKAS QUALITY MANAGEMENT 015