

## Contents

1	Key Features .....	2
2	Introduction .....	2
3	Technical Specification.....	2
4	Terminals & Connections .....	3
5	Switch Settings.....	3
6	Wiring (Thyristor Connections) .....	4
7	Application Circuits .....	5
8	Terminal Connections .....	5
9	Phase Reference .....	5
10	Dimensions.....	6
11	Fixing .....	6
12	Weight.....	6
13	Waveforms (Typical for single-cycle & dual-cycle switching) .....	7
13.1	EMC Standards .....	7
14	Order Codes .....	8
15	Recommendation & Safety Requirements .....	8
16	Product Application.....	8

## 1 Key Features

- Standard DIN Rail Mounting
- Selectable Single-Cycle/Dual-Cycle or adjustable Std Burst Firing
- On Board Indication of Power, Burst-Rates & Fault conditions
- Inhibit input
- Wide Range of Control Options (0-5V, 0-10V, 1-5V, 2-10V, 0-20mA, 4-20mA, Manual Potentiometer)
- On board protection fuse
- Isolated Pulse Transformer outputs

## 2 Introduction

The BM2R & BM3R driver modules have been designed to offer burst fire control of thyristor controllers driving Resistive loads. The Single-Cycle & Dual-Cycle options offer the fastest burst rates possible, providing very accurate control and minimising Harmonic distortion & Flicker within the system. In addition, the standard variable burst rate, adjustable from 1 to 30 seconds, is also available.

Designed to be used in conjunction with a thyristor assembly or supplied on one of our complete thyristor controllers, the BM2R & BM3R offer a highly versatile and cost-effective solution in a wide variety of applications.

The BM3R is commonly used in three phase applications with both 3-Wire and 4-Wire load configurations (including Closed-Delta, Floating-Star & Star to Neutral), where all three limbs are controlled (fully controlled circuit).

The BM2R, operating in Burst-Fire mode, is also commonly used in three phase, 3-Wire load configurations (including Closed-Delta & Floating-Star), where only two limbs are controlled (2/3rds controlled circuit).

For ease of mounting & for protection purposes, the controller comes in a DIN Rail Enclosure.

## 3 Technical Specification

<b>Standard Supply Voltage</b>	420/690V AC Selectable via LINK J1 (other supply voltages available)
<b>Supply Frequency</b>	50/60 Hz
<b>Auxiliary Supply Voltage</b>	24V AC/DC (500mA minimum)
<b>Power Consumption</b>	7VA
<b>Internal Fusing</b>	1A 32mm Fuse
<b>Protection Rating</b>	IP20
<b>Operating Temp. Range</b>	0 – 65°C
<b>Input Signal Options</b>	0-5VDC, 0-10VDC, 1-5VDC, 2-10VDC, 0-20mA, 4-20mA, Manual Potentiometer
<b>Output Specification</b>	Pulse transformer picket-fence 25kHz pulse output Initial pulse 500mA & Sustaining pulses of 250mA
<b>Output Isolation</b>	3.5kV
<b>Standard Burst-Fire Cycle Time</b>	Minimum 1s to Maximum 30s variable. Selectable via switch SW1
<b>Rapid Burst-Fire Cycle Time</b>	Single-Cycle/Dual-Cycle variable time base, selectable via switch SW1 (See waveforms)
<b>Yellow LED Indicator</b>	RS-485 comms indicator option (when fitted)
<b>Green LED Indicator</b>	Power ON, indicating when 5V DC is present
<b>Red LED Indicator</b>	LED ON continuously indicates phase loss between K2 phase 1 and K2 phase 2 LED slow flashing indicates no current control signal (4-20mA) LED fast flashing indicates incompatible 2-Leg control & 4-wire load selected
<b>Orange LED Indicator</b>	Burst-Rate indicator, mimics the output burst rate
<b>Safety Standards</b>	Complies with European Low Voltage Directive & major international standards

#### 4 Terminals & Connections

Terminal	Function	Notes
<b>9-way terminal block reading from Left-Right</b>		
1	5V DC output (50mA max.)	This supply is used to feed 5V DC to the clockwise end of the manual control potentiometer or auxiliary circuit
2	+VE voltage control signal input	+VE control signal input from Temperature Controller or connect to wiper of a manual control potentiometer
3	Ground / 0V / -VE voltage control signal input	-VE control signal input from Temperature Controller or connect to wiper of a manual control potentiometer
4	+VE Current signal input	+VE Current signal input, 0-20mA or 4-20mA
5	Ground / 0V	-VE Current signal input, 0-20mA or 4-20mA
6	INHIBIT	CLOSE contacts to DISABLE (shut down) controller
7		OPEN contacts to ENABLE the controller
8	(Common 0V Line)	
9	+24V AC or DC input	
<b>Additional Connections</b>		
HI/LO	High / Low Jumper Link	
L1 & L2	AC Supply input use any 2 phases or phase and neutral	
G1 & K1	Output connections to thyristors	Timing reference inputs from K2 of phase 1 and K2 of phase 2 are taken from here
G2 & K2		

#### 5 Switch Settings





SW1 Settings ON=1 (UP), OFF=0 (DOWN)

<b>SW1 6-way DIP switch</b>			
Colour	State	Notes	
Brown	ON	VR1 Clockwise – Dual Cycle	VR1 Anti-clockwise – Single Cycle
	OFF	Variable Burst Rate set by VR1 TIME BASE – 1 - 30 seconds	
Red	ON	Adds an offset of 20%, this mode is used for control signals which do not start from 0, such as 1-5V, 2-10V and 4-20mA	
	OFF	No offset added, this mode is used for control signals starting from 0, such as 0-5V, 0-10V and 0-20mA	
Orange	ON	The controller reads a current control signal at the terminal marked +mA, this mode is used for control signals such as 0-20mA and 4-20mA	
	OFF	The controller reads a voltage signal at the terminal marked +SIG, this mode is used for voltage control signals, such as 0-5V and 0-10V and the manual potentiometer	
Yellow	ON	Sets the controller for a floating star load, no neutral (3 wire) or closed delta configuration	
	OFF	Sets the controller for a star load with a neutral connected (4 wire). Note in this position, the GREEN switch must be switched OFF	
Green	ON	Sets the controller up to control 2 limbs L1 and L2 of a three-phase load. L3 is connected directly to the load, Neutral must not be connected in this configuration	
	OFF	Sets the controller up to control all 3 limbs of a three-phase load. The star point may be floating or connected to neutral	
Blue	ON	Sets the controller for 0-10V DC control signals	
	OFF	Sets the controller for 0-5V DC control signals and manual control with a 5kΩ potentiometer	

## UNITED AUTOMATION LTD

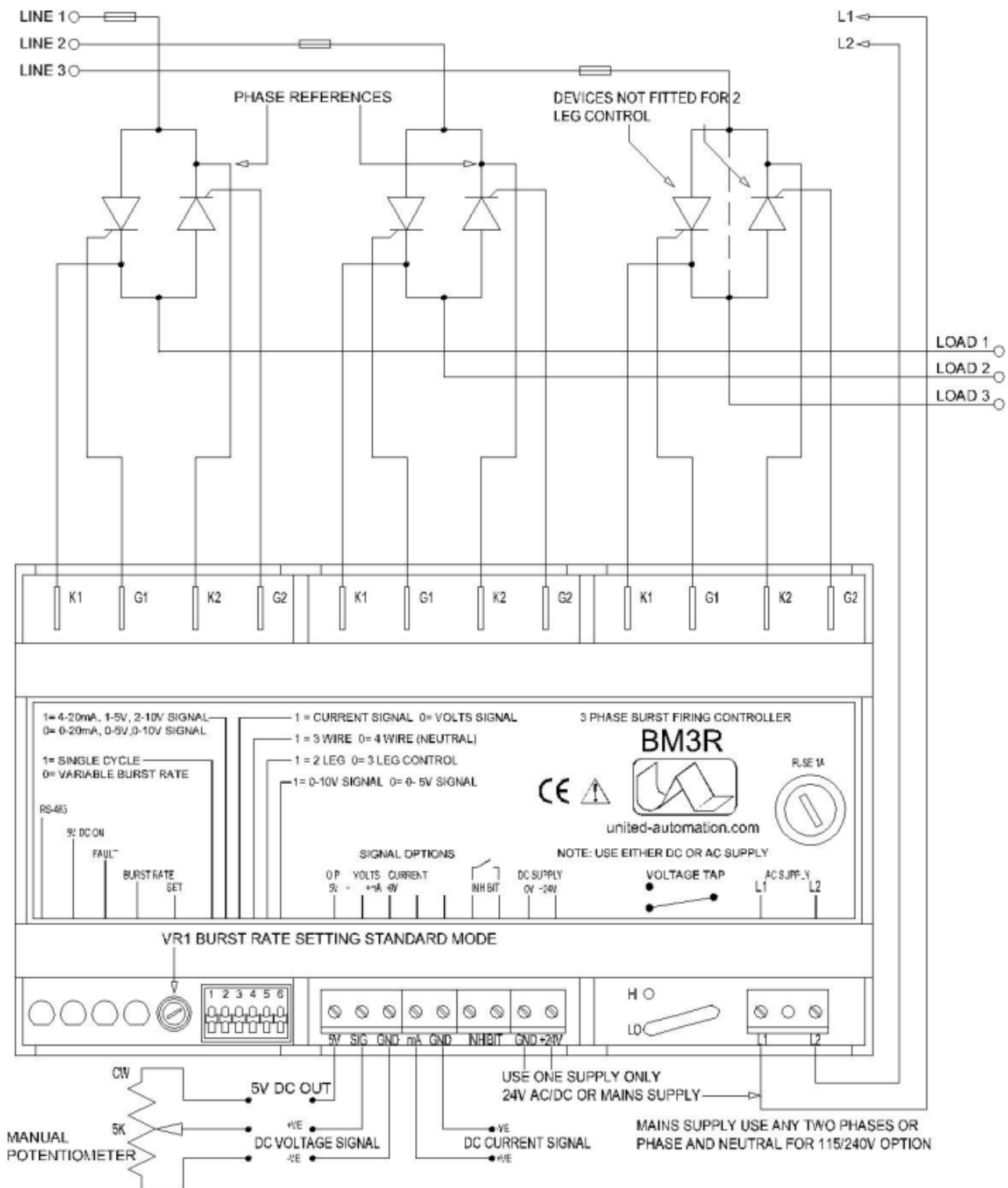
Southport Business Park  
Wight Moss Way  
Southport, PR8 4HQ  
ENGLAND

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




unitedautomationltd

UA\_Limited



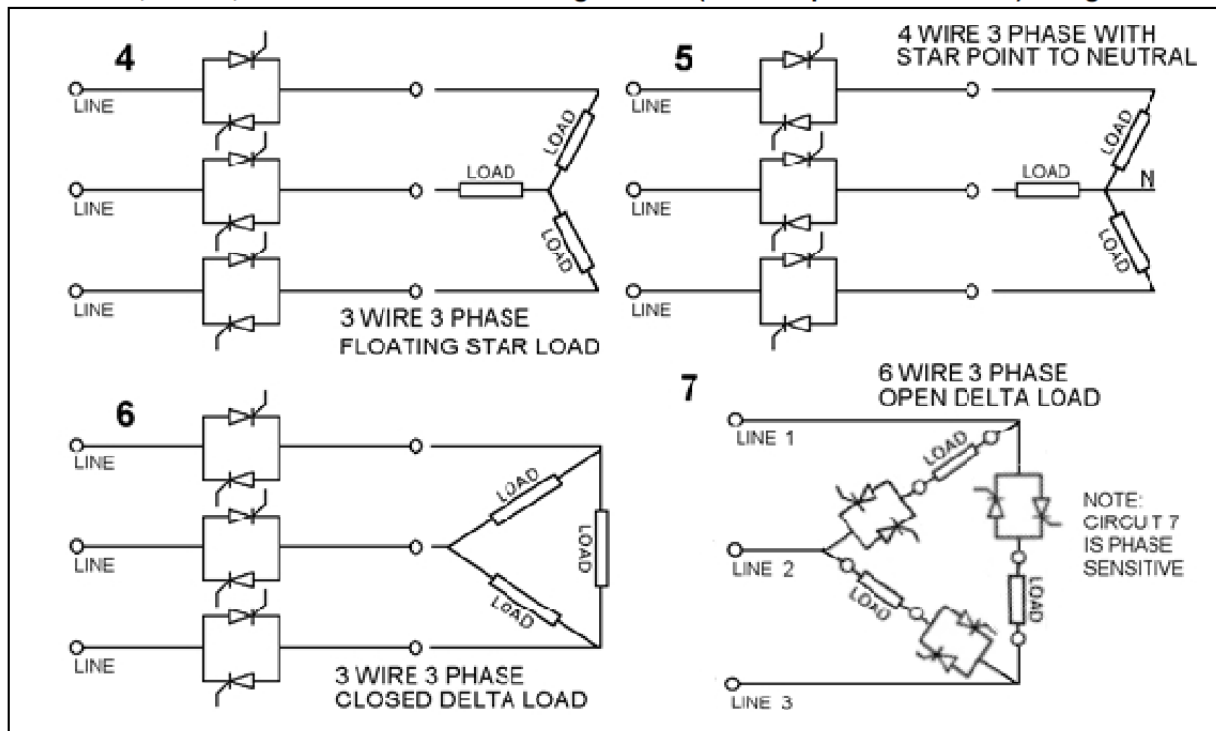
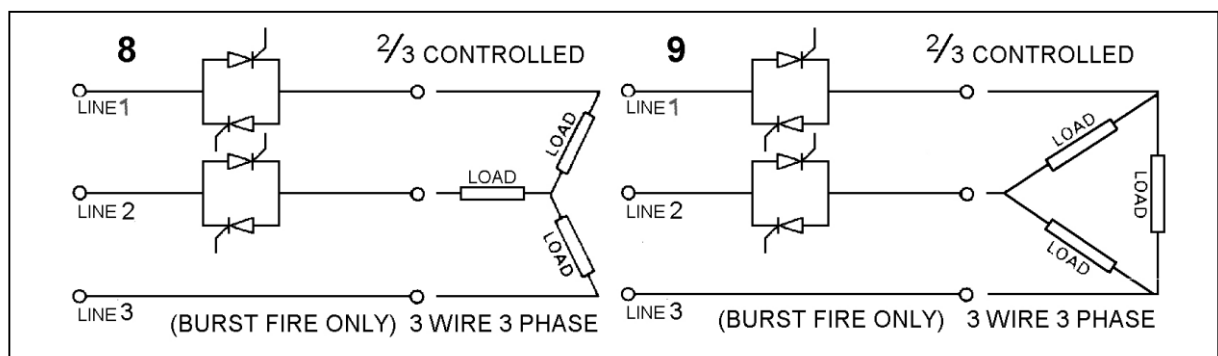
## 6 Wiring (Thyristor Connections)

**UNITED AUTOMATION LTD**

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

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

unitedautomationltd UA\_Limited

**Typical 3-Phase, 3-Wire, 4-Wire & 6-Wire Load configurations (all three phases switched) using BM3R**

**Typical 3-Phase, 3-Wire Load configurations (only two of three phases switched) using BM2R (or BM3R)**


## 8 Terminal Connections

Connections are made to the above terminals which will accept wires up to 1.5mm<sup>2</sup> cross section. The use of screened cable is not usually necessary for control signal wiring within a panel.

Normal precautions should be taken to keep signal wiring away from power cables, in particular avoid running signal cables parallel to power cables in the same trunking. See ITA datasheet for more information.





## 9 Phase Reference

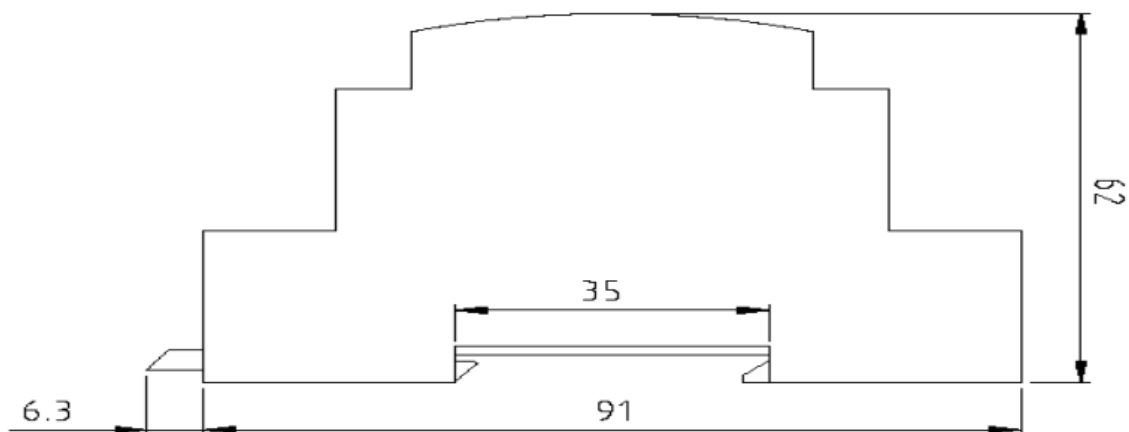
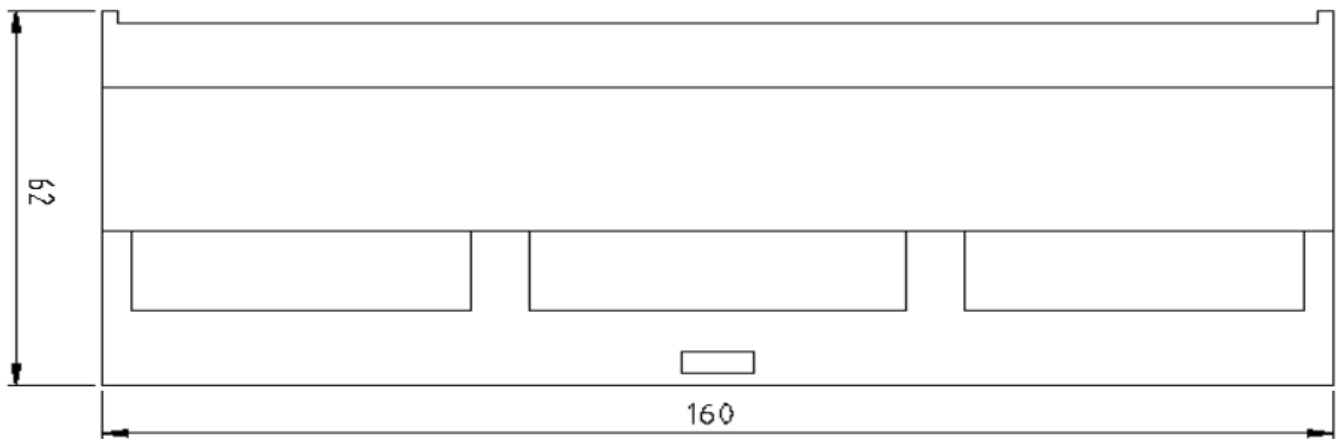
The phase references, for the zero-voltage detection circuit is taken from both of the K2 connections of PHASE 1 and PHASE 2, this phase reference is provided by the Cathode connections of the thyristor modules, so the correct orientation of the thyristor modules is required see the schematic diagram. If the line supply to either of these phases is not present the Red LED will be on continuously and the output drive will be inhibited until the supply to these phases is reinstated.

# UNITED AUTOMATION LTD

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

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




 unitedautomationltd
 
 UA\_Limited



## 11 Fixing

Unit should be installed on TS35 DIN Rail via DIN clip on base of control module

## 12 Weight

BM3R Module: <500g

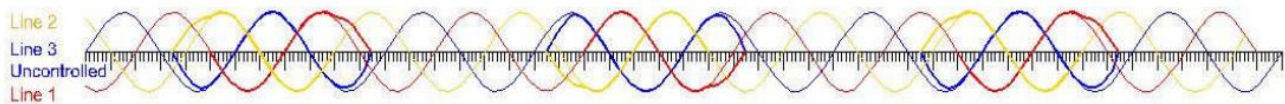


### 13 Waveforms (Typical for single-cycle & dual-cycle switching)

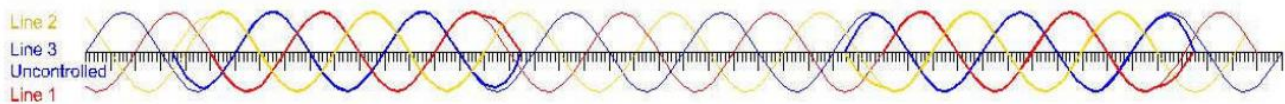
The following diagrams show representations of voltage waveforms for Burst-Fire (Single-Cycle & Dual-Cycle switching operation). The heavily outlined portion of the sinusoidal train indicates when the thyristors are switched on, and the lighter portion indicates when they are off. The waveforms show zero voltage (and thus current) switch on, and zero current switch off.

A more comprehensive set of waveforms and Harmonics information is available in a separate appendix document Ref: X10789

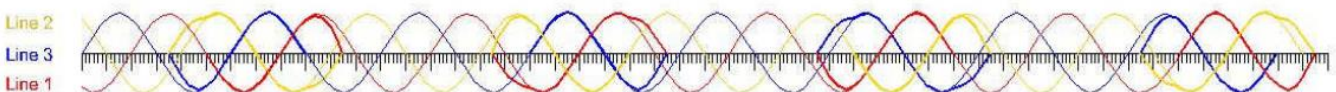
Single cycle fast burst 50% setting 2 leg control



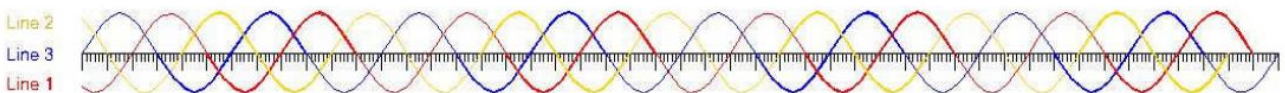
Dual cycle fast burst 50% setting 2 leg control



Single cycle fast burst 50% setting 3 leg control 3 wire load



Single cycle fast burst 50% setting 3 leg control 4 wire load



#### 13.1 EMC Standards

Complies with the European EMC Directive for operation in an industrial environment

The Following standards have been applied in whole or in part in the design of this controller:

EN61010-1

EN61000-6-2

EN 50 081 part 2





## UNITED AUTOMATION LTD

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

Tel: 0044 (0) 1704 – 516500

enquiries@united-automation.com

www.united-automation.com




unitedautomationltd

UA\_Limited



**14 Order Codes**

Basic Instrument	Supply	UAL Order Code
BM3R	420/460V AC 50Hz and 24V AC/DC	A32458
BM3R	480V AC 50Hz	A32462
BM3R	380/500V AC 24V AC/DC input	A32465
BM2R	420/460V AC 50Hz and 24V AC/DC	A32459
BM2R	480V AC 50Hz	A32464
BM2R	380/500V AC 24V AC/DC input	A32466

**15 Recommendation & Safety Requirements**

Other documents, which may be appropriate for your applications, are available on request:

Code	Identity	Description
X10213	ITA	Interaction: Uses for phase angle and for burst fire control
X10255	SRA	Safety requirements: Addressing the Low Voltage Directive (LVD) including, Thermal Data/Cooling, Live Parts Warning, Earthing Requirements and Fusing Recommendations
X10322	APC	Application Circuits
X10789	WAV	Single or Dual Cycle Waveforms & Harmonics Data

**Note:** It is recommended that installation and maintenance of this equipment should be carried out by suitably qualified personnel, with reference to the current edition of the I.E.E. Wiring Regulations BS7671. The regulations contain important requirements regarding the safety of electrical equipment.



**Not for general waste**





**16 Product Application**

The BM2R & BM3R offer Single-Cycle/Dual-Cycle (Rapid Burst Firing) control where minimum fluctuation in heater element temperature is required. This type of Rapid Burst Fire is useful if a system has a high impedance supply as a result of long power leads or if the system is powered by a generator set. Normally this can result in the supply being subject to mains dips, but this option minimises the 'Flicker' effect on the mains supply. Another benefit of using this type of control is that you avoid high 'Harmonic Distortion' normally associated with phase angle control, typically down to levels of below 4%.

**UNITED AUTOMATION LTD**

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

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




unitedautomationltd

UA\_Limited

