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1 Key Features

- Standard DIN Rail Mounting.
- Selectable modes of control: Phase Angle or Burst Fire (Single-Cycle/Dual-Cycle & 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.
- Soft Start.
- Auto Phase-Rotation detection.

2 Introduction

The DMFC36 driver module has been designed to offer both phase angle & 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. The DMFC36 software also includes auto phase rotation.

Designed to be used in conjunction with a thyristor assembly or supplied on one of our complete thyristor controllers, the DMFC36 offers a highly versatile and cost-effective solution in a wide variety of applications.

The DMFC36 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 DMFC36, 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 Specifications

Standard Supply voltage	420/460 VAC selectable via LINK J1 (other supply voltages available)
Supply Frequency	50/60 Hz
Auxiliary Supply Voltage	24V AC/DC (500mA minimum)
Power Consumption	7VA
Internal Fusing	1 Amp 32mm fuse
Protection Rating	IP20
Operation Temperature Range	0-65°C
Input Signal Options	0-5VDC, 0-10VDC, 1-5VDC, 2-10VDC, 0-20mA, 4-20mA, Manual Potentiometer
Output Specification	Pulse transformer picket-fence 25kHz pulse output. Initial pulse 500mA & Sustaining pulses of 250mA
Output Isolation	3.5KV
Soft Start (Ramp Speed)	0-30 Seconds (adjustable)
STD Burst-Fire Cycle Time	Minimum 1s to Maximum 30s variable. Selectable via switch SW1
Rapid Burst-Fire Cycle Time	Single-Cycle/Dual-Cycle variable time base, selectable via switch SW1
Green LED Indicator	Power ON, indicating when 5 VDC is present
Red LED Indicator	LED ON continuously indicates phase loss between K2 phase 1 & 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
Yellow LED Indicator	Burst-Rate indicator, mimics the output burst-rate
Safety Standards	Complies with European Low Voltage Directive & major international standards

4 Terminals & Connections

Terminal	Function	Notes
9-way terminal block reading left - right		
1	5V DC output (50mA max)	This supply is used to feed 5VDC to the clockwise end of the manual control potentiometer or auxiliary circuit
2	+VE voltage control signal input	+VE control signal input from the temperature controller or connect to the counter-clockwise end of the manual control potentiometer
3	Ground/0V (-VE) voltage control signal input	-VE control signal input from temperature controller or connect to the counter-clockwise end of the 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)
6,7	INHIBIT	CLOSE contacts to DISABLE (shut down) the controller OPEN contacts to ENABLE the controller
8	Common 0V line	External -VE 24VDC supply (only required if supply to L1 and L2 are not being used)
9	+24V AC or DC input	External +VE 24VDC supply (only required if supply to L1 and L2 are not being used)
Additional Connections		
HI/LO	High/Low Jumper Link	Select High or Low supply voltage range
L1 & L2	AC Supply input (use any two phases or phase and neutral)	AC supply only required if 24VDC supply to terminals 8 & 9 are not being used
G1 & K1 G2 & K2	Output connections to thyristors	Timing reference inputs from K1 of phase 1 and K1 of phase 2 are taken from here

5 6-way DIP Switch Settings

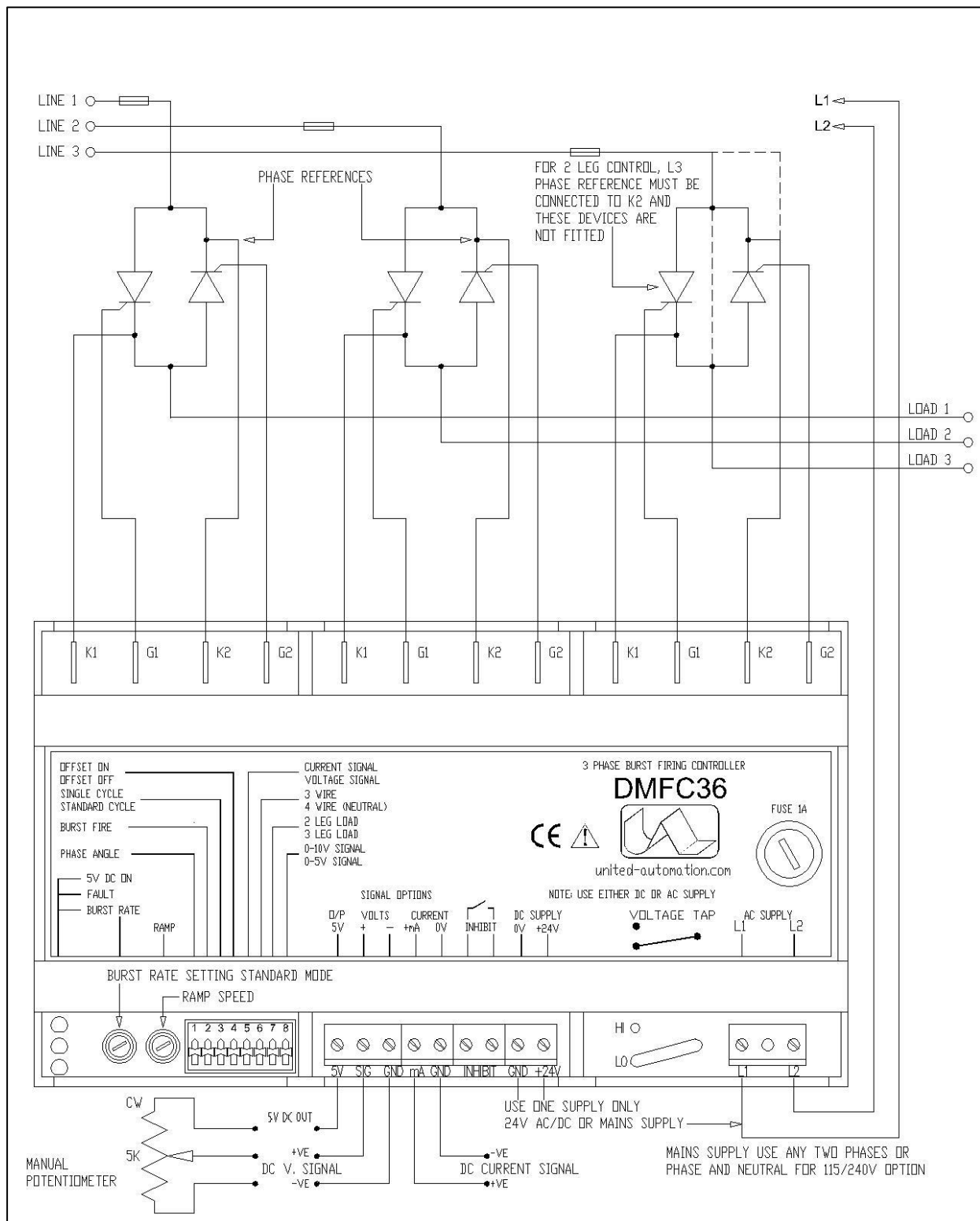
Switch	Position	Function/Action
Brown	ON – 1	Phase Angle Enabled
	OFF – 0	Phase Angle Disabled
Red	ON – 1	Burst Fire Enabled
	OFF – 0	Burst Fire Disabled
Orange	ON – 1	VR1 clockwise → Dual Cycle VR1 Anticlockwise → Single Cycle
	OFF – 0	Variable burst rate set by VR1 (time base 1 to 30 seconds)
Yellow	ON – 1	Sets an offset of 20% (used for control signals which do not start from 0, e.g., 1-5V, 2-10V & 4-20mA)
	OFF – 0	No offset applied (used for control signals which start from 0 e.g., 0-5V, 0-10V & 0-20mA)
Green	ON – 1	Current control signal enabled
	OFF – 0	Voltage control signal enabled
Blue	ON – 1	Setting for a 3-wire configured load (closed-delta or floating star), where there is no neutral connection
	OFF – 0	Setting for a 4-wire configured load (star to neutral), where there is a neutral connection to the star point. Note: green switch must be in the OFF position for this function
Purple	ON – 1	Setting to control 2 limbs (L1 & L2) and L3 is connected directly to the load Note: neutral must not be connected in this configuration
	OFF – 0	Setting to control all 3 limbs of a three-phase load. The star point may be either floating or connected to neutral
Grey	ON – 1	Setting for 0-10VDC control signals
	OFF – 0	Setting for 0-5VDC control signals (& manual control – using a 5K potentiometer)

X20092 – DFMC36 Driver Module

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6 Wiring Diagram (Thyristor Connections)



Note: For 2-leg (2/3rd) control, L3 phase reference must be connected to Phase-3, K2.

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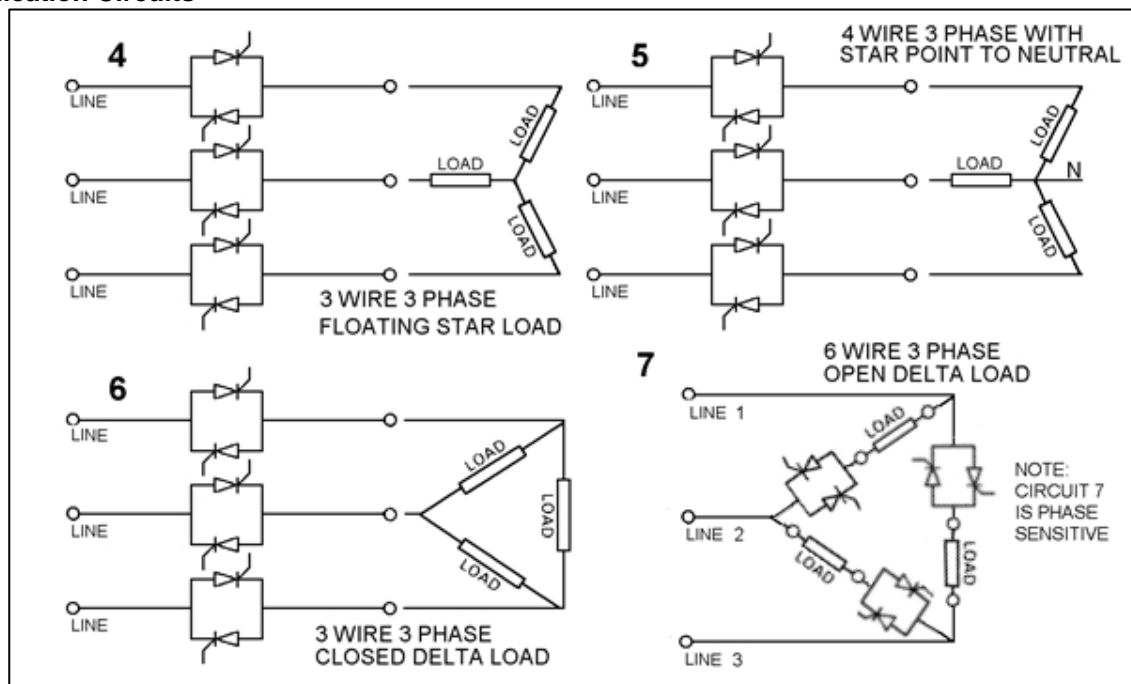


Figure 1: Typical 3-phase, 3-wire, 4-wire & 6-wire Load Configurations (All three phases switched)

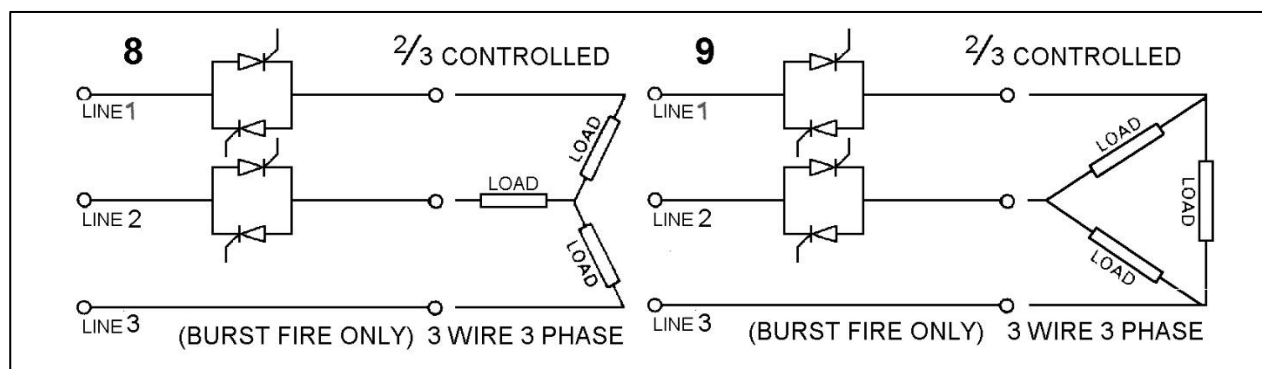


Figure 2: Typical 3-phase, 3-wire Load Configurations (only two of three phases switched) Burst-Fire mode only

8 Terminal Connections

Connections are made to the above terminals which will accept wires up to 1.5mm² 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 K1 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.

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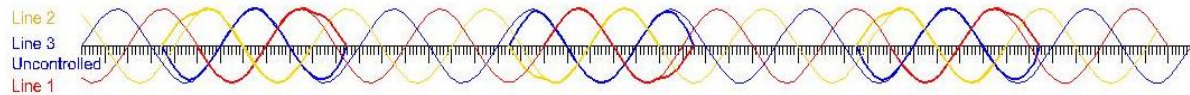
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10 Waveforms (Typical for single-cycle & Dual-cycle switching)

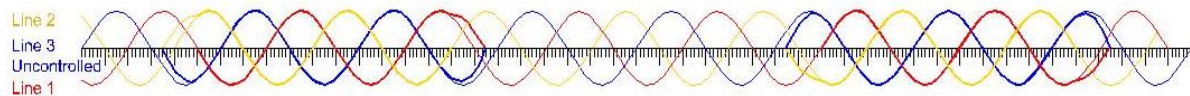
The following diagrams show representations of voltage waveforms for Burst-Fire (Single-Cycle & Dual-Cycle switching) operation. The heavily outlined portion of the sinusoidal train indicates when the thyristors are switched on, and the lighter portion indicates when they are off. The waveforms show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

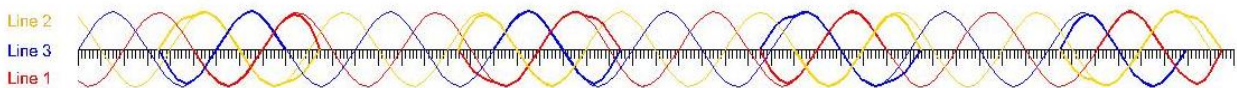
Single cycle fast burst 50% setting 2 leg control



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

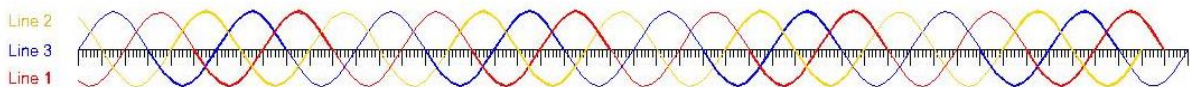


Figure 3: Voltage Waveforms

11 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

12 Recommendations & Safety Requirements

Below are some additional supporting documents which may be appropriate for your individual application – available upon request.

Ref. Code	Identity	Description
X10772	3-RFI	Filter recommendation – Addressing the EMC directive
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 & fusing recommendations
X10322	APC	Applications Circuits
X10789	WAV	Single or Dual cycle waveforms & harmonics data

13 Physical Dimensions

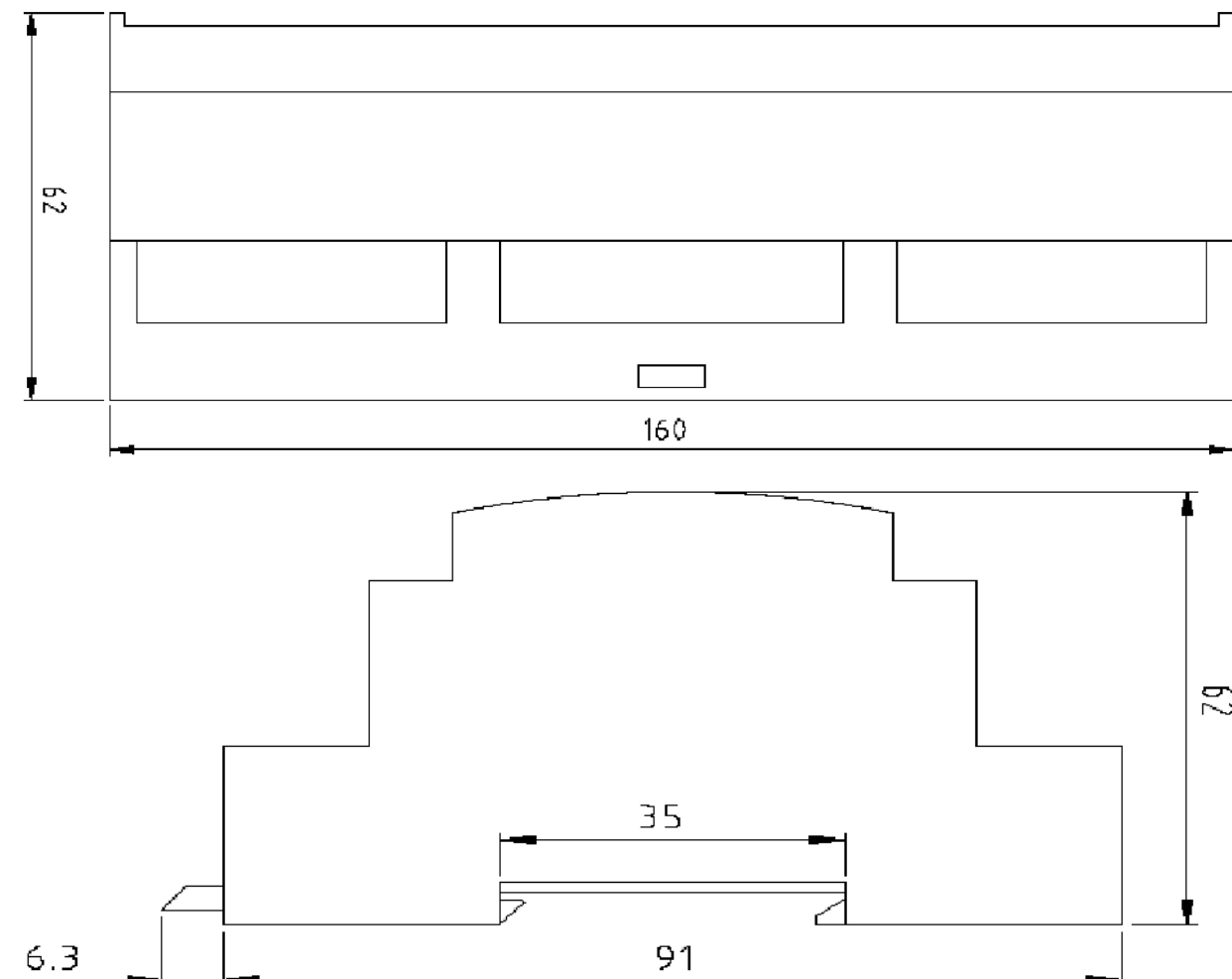






Figure 4: Overall Dimensions

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14 Order Codes

Product	Input Supply	UAL Order A-Code
DMFC36	420/460VAC 50Hz and 24VAC/DC	A35471
DMFC36	480VAC 50Hz	A34572
DMFC36	380/500VAC and 24VAC/DC	A34573

15 Product Function & Application

The DMFC36 offers Phase Angle, Burst-Fire or 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%.

The DMFC36 can be started in phase angle mode and switch to burst mode when the control signal ramps up to the set point. It will stay in the burst mode even if the signal drops below the set point. It will restart in phase angle mode when the unit is switched off or reset.

A typical application for this module would be for a three-phase thyristor controller for connection to a heater load to regulate its power.

16 Additional Notes**16.1 Mounting**

The unit should be installed on a TS35 DIN Rail via the DIN clip on the base of the control module

16.2 Weight

Complete unit weight – 500g approx.

16.3 Installation

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.T. Wiring Regulations BS7671. The regulations contain important requirements regarding the safe installation of electrical equipment.

Additional 'failsafe circuitry' e.g., line circuit breakers, high-speed SCR-type and/or general fusing and thermal trips, should be used as part of the main installation requirements.







Not for general waste

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