

***OZtherm***<sup>TM</sup>

*Digital Power Controller*

**F-410**

**SINGLE PHASE S.C.R. CONTROLLER**

\*

**FEATURING  
FASTCYCLEBURSTSWITCHING  
FORCONTROL OFACOUTPUT**

\*

DESIGNED  
and  
MANUFACTURED  
by

***Fastron***  
TECHNOLOGIES PTY. LTD.

**Fastron** first released their " X " Series of S.C.R. Power Controllers in 1980, progressively developing over 20 different models and selling over 1000 controllers worldwide.

These controllers were primarily designed as custom built, open frame, OEM assemblies sold directly to equipment manufacturers.

The **OZtherm™** range of controllers capitalize on our experience in this field to provide a reliable and robust design housed in a series of standard assemblies and enclosures.

- F100 SERIES** ..... Contactors utilizing CRYDOM solid state relays mounted on a Heat Sink Assembly with fuses and transient suppressors.
- F200 SERIES** ..... Solid State Contactors utilizing S.C.R.'s and control card mounted in standard enclosures.
- F300 SERIES** ..... Phase Angle Controllers utilizing S.C.R.'s and control card mounted in standard enclosure`s
- F400 SERIES** ..... Burst Controllers, similar to F300 in construction, featuring fast cycle, zero cross switching.

## BENEFITS OF THE **OZtherm™** F410 BURST CONTROLLER

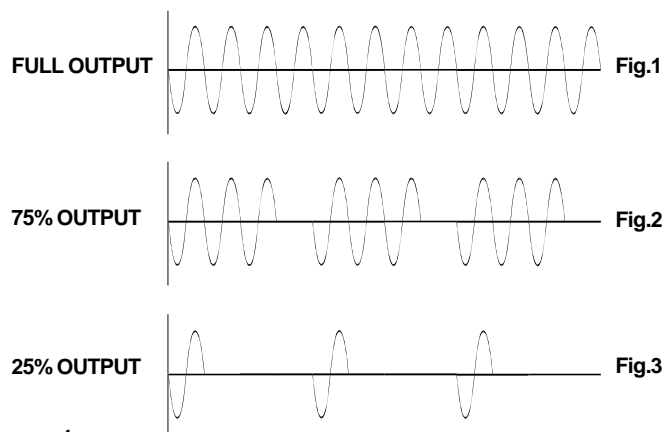
- Continuously variable control, 0 - 100%
- Digital Control and zero cross switching eliminates line harmonics and DC components
- Wide range of standard options to suit many applications
- Unity power factor from zero cross switching
- Proudly Australian Designed and Manufactured in our Melbourne factory enabling us to provide complete local support for customer applications, engineering and service.

## FAST CYCLE BURST SWITCHING

Fast Cycle Burst Control provides continuously variable power to the load by switching groups of 16 whole cycles in a minimum submultiple consistent with the required duty cycle.

The firing of the thyristors is determined by the controller circuitry which causes the thyristors to conduct for whole A.C cycles. **Fig.2** shows the voltage waveform at 75% (3 cycles on, 1 cycle off) and **Fig.3** 25% (1 cycle on, 3 cycles off) for A.C loads.

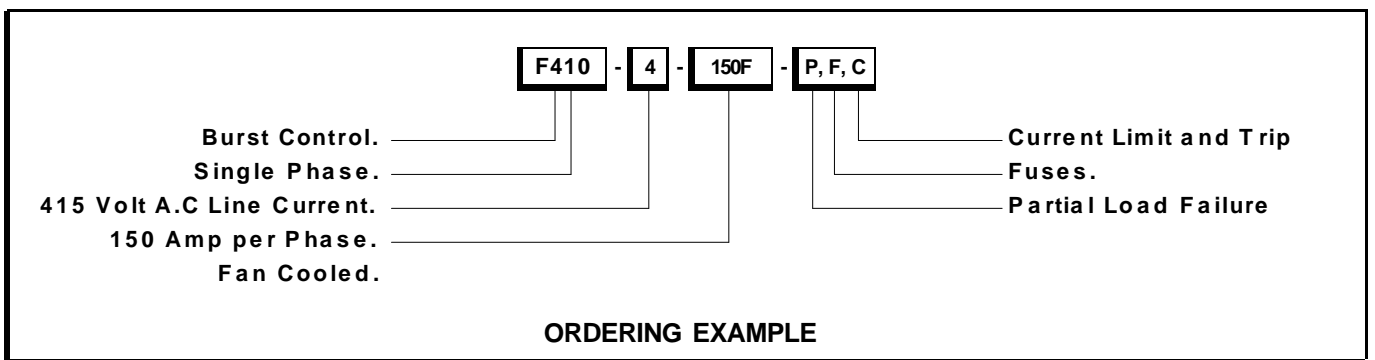
The more power that is required, the more the duty cycle is increased until 100% power when all cycles are conducting. **Fig.1**



## MODEL DESIGNATION / ORDER CODE

F410 - [ ] - [ ] - [ ] -		DESCRIPTION	Fuse Rating	Case Size	Weight KG	Cable Termination mm <sup>2</sup>	Dissipation Watts	I <sup>2</sup> t Thyristor Rating
Line Voltage	1	110 volt A.C line input						
	2	240 volt A.C line input						
	4	415 volt A.C line input						
Rated Current at 50 deg. Celcius.	25	25 amperes A.C line current	25	fig.4	5	2.5 - 6.	48	610
	40	40 amperes A.C line current	45	fig.4	5	10 - 16.	68	1,060
	50	50 amperes A.C line current	55	fig.4	5	10 - 16.	72	2,300
	65	65 amperes A.C line current	75	fig.4	5	10 - 25.	88	5,000
	75	75 amperes A.C line current	90	fig.4	5	10 - 25.	94	9,100
	100	100 amperes A.C line current	125	fig.4	5	10 - 25.	111	16,200
	110	110 amperes A.C line current	125	fig.4	5	M10 bolt	122	27,600
	125	125 amperes A.C line current	150	fig.4	5	M10 bolt	124	97,000
	150F	150 amperes A.C line current - fan	150	fig.5	6	M10 bolt	176	16,200
	180F	180 amperes A.C line current - fan	225	fig.5	6	M10 bolt	194	84,000
	200F	200 amperes A.C line current - fan	225	fig.5	6	M10 bolt	204	97,000
	250	250 amperes A.C line current	300	fig.6	26	M10 bolt	345	90,600
	300	300 amperes A.C line current	400	fig.6	26	M10 bolt	423	106,000
	350	350 amperes A.C line current	400	fig.6	26	M10 bolt	458	238,000
	400F	400 amperes A.C line current - fan	400	fig.6	26	M10 bolt	533	106,000
	500F	500 amperes A.C line current - fan	500	fig.6	26	M10 bolt	593	238,000
	650F	650 amperes A.C line current - fan	350x2	fig.6	26	M10 bolt	795	781,000
750F	750 amperes A.C line current - fan	400x2	fig.6	26	M10 bolt	826	2x10 <sup>6</sup>	
900F	900 amperes A.C line current - fan	500x2	fig.7	40	M10 bolt	1174	781,000	
1100F	1100 amperes A.C line current - fan	600x2	fig.7	40	M10 bolt	1270	2x10 <sup>6</sup>	

Options.		
C	Current limit and trip.	A.C. current measurement.
F	High speed fuses.	
PLF	Partial load failure	Requires C option.
T	Thermal cutout.	Standard on fan models.



**PLEASE NOTE;-** If your application requires the Power Controller to function differently to our standard specifications or you are uncertain about the choice of options please contact the factory.

## DESCRIPTION OF OPTIONS ( Table 1 )



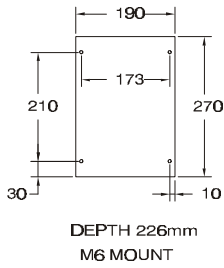
OPTION	DESCRIPTION	APPLICATION
C	Maintains average current output to a predetermined level for A.C. systems. Current limit can be set by internal or external potentiometer. LED indicates current limit operation. Current trip is adjustable " on board " and volt free output contact is provided for external indication. The trip function inhibits operation until manually reset. ( A.C. Current transformer supplied loose. )	Typically used with constant resistance and transformer loads. ( Control input controls output voltage )
F	Supplied loose with isolated stand-offs for external mounting.	
PLF	A reduction in output current from normal levels is sensed and signalled by and LED and by a volt free output contact for external indication.	Designed for sensing open or faulty load elements
T	Thermal switch is mounted on the heatsink to ensure the controller is shut off, and automatically resets when an over temperature condition is reached within the unit. This option is standard on fan cooled units. It automatically resets when temperature falls below the trip level.	

## STANDARD SPECIFICATIONS ( Table 2 )

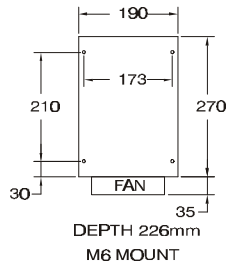
Control Mode	Fast Cycle Burst
Control Range	0 - 100%
Maximum Current	25 - 1100 amperes ( higher currents available on request )
Power Supply	110/240/415 volts A.C . 50 HZ. +/- 10% (60 HZ. and other voltages available on request )
Transient Protection	Internal R.C snubber 68 ohms / .1 micro-farad
Control Input	4 - 20 milliamps ( receiving impedance 100 ohms ) 0 - 10 volts ( receiving impedance 10K ohms ) 10K ohms potentiometer
Adjustments	Ramp ( soft start time ) 1-20 seconds Zero ( - 20% to +20% ) ; span ( 0 - full scale )
Ambient Temperture	0 - 50 degrees Celsius ( Maximum temperture of cooling air )
Ambient Humidity	0 - 85% relative humidity
Power Factor	Unity

## DIMENSIONS / MOUNTING DETAILS

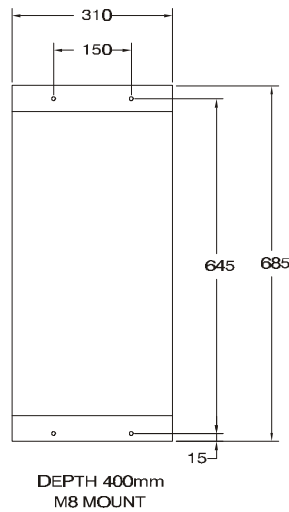
Shown mounted vertically in cabinet



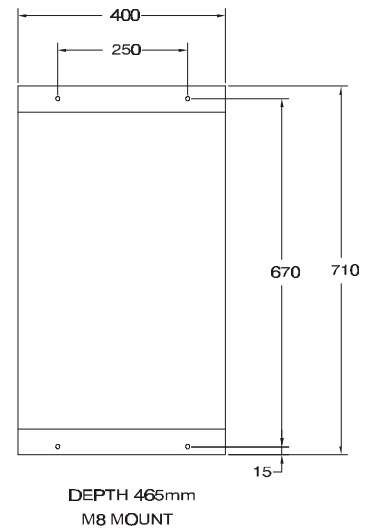
**Fig.4**



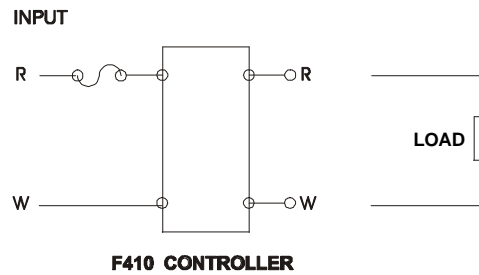
**Fig.5**



**Fig.6**



**Fig.7**



## APPLICATION LOAD / OPTION SELECTION

( Table 3 )

Series Name	Primary Control of Transformer	Number	Applicable Load	Option Selection
F410	NO	1	Load where resistance does not change. ( Nichrome, Iron-chrome, Kanthal, etc. )	Standard type C option
		2	Load which has peak in rush current. ( Tungsten Halogen Lamp, Far infrared lamp etc. )	C option



## OZTHERM POWER PRODUCTS

Thyristor based power controllers offer numerous benefits.

They are a reliable replacement for electromechanical contactors , being virtually maintenance free.

Thyristor based power controllers are ideal for controlling complex loads , such as heating elements that change resistance over time or temperature , transformer coupled loads , plating rectifiers and fast systems.

### PRINCIPLE OF OPERATION

Oztherm power controllers consist of two main parts , the control electronics and the power switching electronics.

Thyristors , also known as SCRs , are used as the power switching devices.

A thyristor functions like a diode that can be “turned on” by a momentary pulse to its gate. When a thyristor has been turned on via its gate and its anode is positive relative to its cathode it will conduct.

The thyristor turns itself off when there is near zero current through it.

To control full wave AC over the positive and negative half cycle two thyristors arranged in inverse parallel are required.

The control electronics provide the firing impulses for the thyristor gates. The control input signal is measured and the timing of the gate firing impulses are varied in response to it.

Three types of firing mode are available on Oztherm power controllers.

Phase angle control works by varying the conduction angle of the AC sine wave.

Burst control modulates power by turning the thyristors on and off for AC cycles. The control electronics turn the thyristors on at a position determined by the control signal and off at zero current. The output is the ratio of OFF time to ON time.

On/ Off control is similar to burst control and is like an “electronic relay” in operation.

F100 and F200 series power controllers use the on/ off firing mode

F300 series power controllers use the phase angle firing mode.

F400 series power controllers use the burst firing mode.

### SELECTING THE CORRECT CONTROLLER FOR HEATING ELEMENT TYPES

Heating elements can be broadly divided into three categories:-

#### CLASS A

These elements have negligible resistance variation with either temperature or time. Examples include: Nickel/Chromium or similar alloys.

#### CLASS B

These elements have a low cold temperature resistance that increases greatly at operating temperature. Examples include: Molybdenum Disilicide, Platinum and Molybdenum Tungsten

Class B elements usually require current limit on start up, as their low cold resistance results in high currents at the operating supply voltage. These elements may also require a stepdown transformer to match the supply voltage to the rated element voltage.

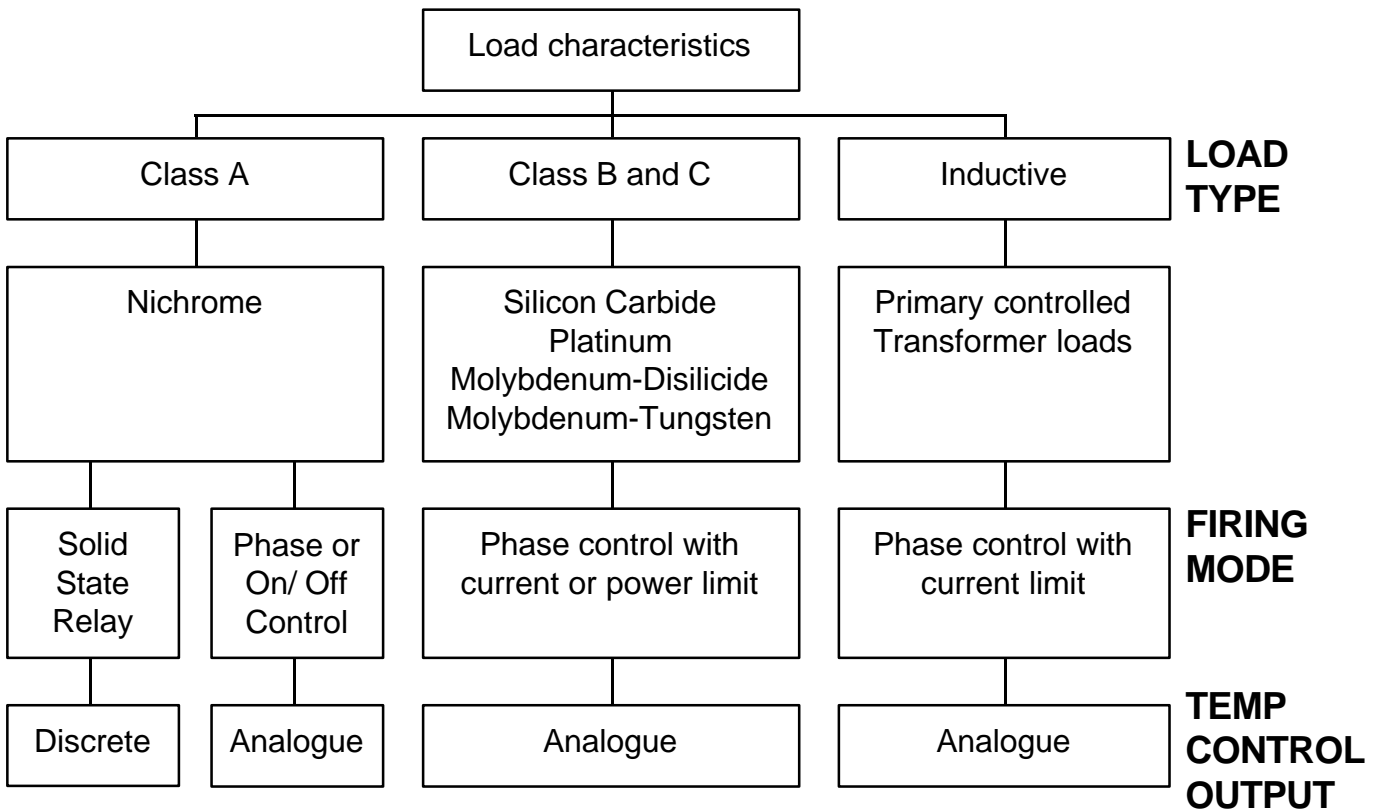
Because current limit is required, and the element voltage ratings are less than line voltage, phase angle control (F300 series controllers) is the recommended firing mode.

#### CLASS C

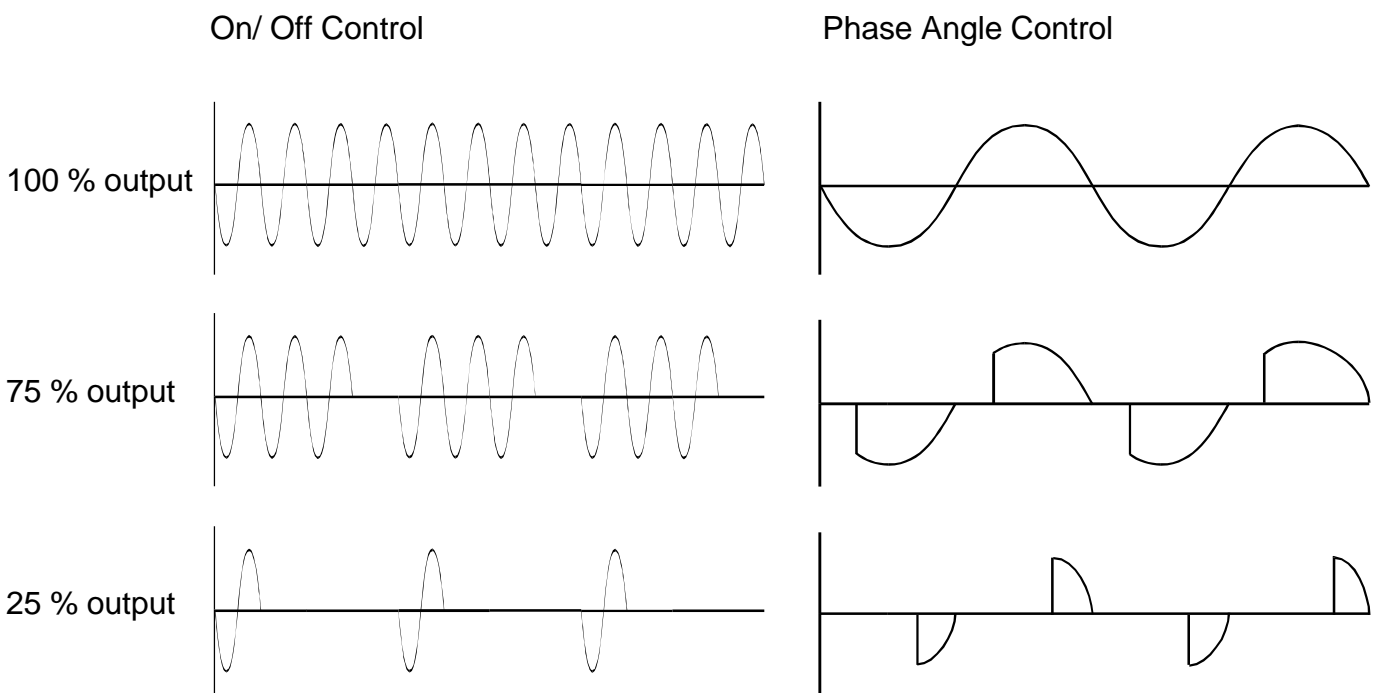
The resistance of these elements increases greatly with time in use (typically 2 to 4 times) and with temperature. Silicon carbide is a common example. The power controller must be sized so that it can deliver the higher currents required to maintain the desired power when the elements are new. If the elements are sized correctly the use of a stepdown transformer may be avoided.

The power limit (PW) option is recommended for this class of element as it compensates for element ageing and limits the maximum load power. Phase angle (F300 series controllers) is the recommended firing mode.

## CONTROLLER SELECTION AND ELEMENT TYPE



## VOLTAGE WAVEFORMS FOR ON/ OFF AND PHASE ANGLE CONTROL



***Fastron***  
TECHNOLOGIES PTY. LTD.

HEAD OFFICE  
25 Kingsley Close  
Rowville 3178  
Victoria Australia

Tel: 61- 3 9763 5155 Fax: 61-3 9763 5166  
Email;- fastron@ozemail.com.au

