OZtherm™

Power Controller

F-310

SINGLE PHASE S.C.R. CONTROLLER

*

FEATURING
PHASE ANGLE SWITCHING
FOR CONTROL OF
AC OR DC
OUTPUT

*

DESIGNED
and
MANUFACTURED
by

Fastron
TECHNOLOGIES PTY. LTD.

OZtherm™ Range of Power Controllers

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™ F310 PHASE ANGLE CONTROLLER

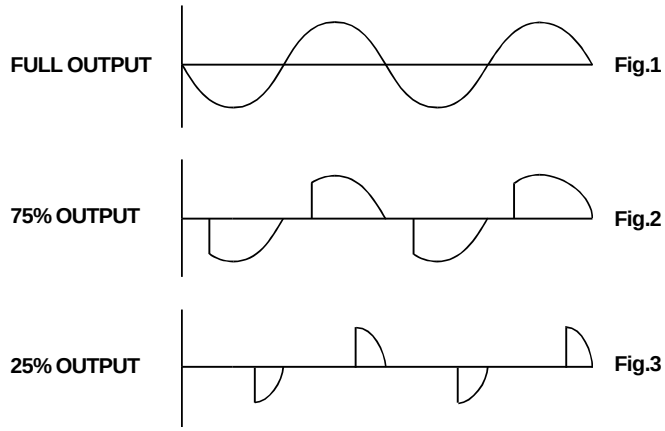
- Continuously variable control, 2 - 98%
- Wide range of standard options to suit many applications
- Proudly Australian Designed and Manufactured in our Melbourne factory enabling us to provide complete local support for customer applications, engineering and service.

PHASE ANGLE SWITCHING

Phase Angle Control provides continuously variable power to the load.

The firing of the thyristors is determined by the controller circuitry which causes the thyristors to conduct for part of the A.C supply cycle. **Fig.2** shows the voltage waveform at 75% and **Fig.3** 25% for A.C loads.

The more power that is required, the more the conduction angle is increased until 100% power when the full cycle is conducting. **Fig.1**



MODEL DESIGNATION / ORDER CODE

F310 -		-		-	DESCRIPTION	Fuse Rating	Case Size	Weight KG	Cable Termination mm^2	Dissipation Watts	I^2t 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.		**20**			20 amperes A.C line current	25AF	fig.4	5	2.5 - 6.	40	610
		40			40 amperes A.C line current	45AF	fig.4	5	2.5 - 6.	68	1,060
		50			50 amperes A.C line current	55AF	fig.4	5	6 - 10.	72	2,300
		65			65 amperes A.C line current	75AF	fig.4	5	6 - 10.	88	5,000
		75			75 amperes A.C line current	90AF	fig.4	5	6 - 10.	94	9,100

Options.	**C**	Current limit	A.C. current measurement.
	F	High speed fuses.	
	VP	Potentiometer control	
	VI	0 to 10 V control	
	V5	0 to 5 V control	
	VC	Volt free contact control	
	VCL	Zero offset adjustment for option VC	
	P	Preheat	
	T	Thermal cutout.	

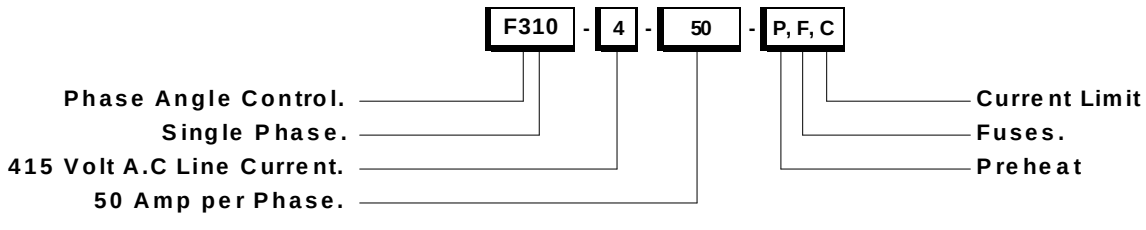
DESCRIPTION OF OPTIONS (Table 1)

OPTION	DESCRIPTION	APPLICATION
C	Maintains current output to a predetermined level for A.C systems. Current limit is set by internal or external potentiometer. LED indicates current limit operation. (A.C. Current transformer supplied loose.)	Typically used with constant resistance loads. Reduces output to match and protect lower rated loads. (Control input controls output voltage)
F	Supplied loose with isolated stand-offs for external mounting.	
VP	Potentiometer control	Manual control
V1	0 to 10 V DC control signal	
V5	0 to 5 V DC control signal	
VC	Volt free contact control	Soft start, on / off control
VCL	Zero offset adjustment for option VC	
P	A reduced voltage "preheat" with a timer for reduced power initial startup of systems. Preheat is active from initial power up and the unit will revert to normal operation after time out.	Suitable for drying out ceramic elements from cold before full power is applied and for slow initial startup of systems.
T	Thermal switch is mounted on the heatsink to ensure the unit is shut off, and automatically resets when an over temperature condition is reached within the unit. Reset is automatic when Unit temperature falls below the trip level.	

STANDARD SPECIFICATIONS (Table 4)

OZtherm™

Control Mode	Phase angle. (soft start provided as standard)
Control Range	2 - 98%
Maximum Current	20 - 75 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 or 0 - 5 volts (receiving impedance 10K ohms) 10K ohms potentiometer Volt free contact (receiving impedance 10K ohms)
Adjustments	Ramp (soft start time) 1-20 seconds Span (0 - full scale)
Ambient Temperture	0 - 50 degrees Celsius (Maximum temperture of cooling air)
Ambient Humidity	0 - 85% relative humidity
Power Factor	Unity



ORDERING EXAMPLE

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.**

DIMENSIONS / MOUNTING DETAILS

Shown mounted vertically in cabinet

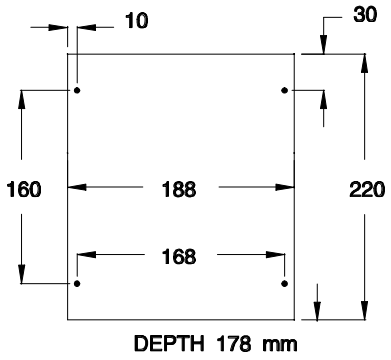
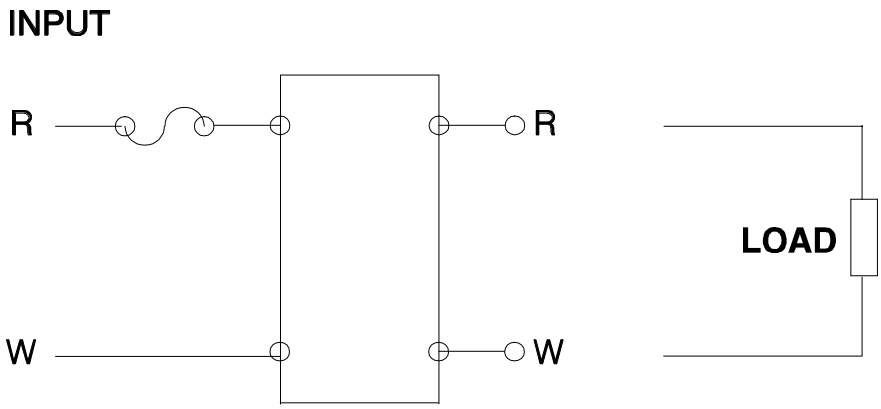


Fig.4

CIRCUIT CONFIGURATIONS



F310 CONTROLLER

APPLICATION LOAD / OPTION SELECTION (Table 3)

Series Name	Primary Control of Transformer	Number	Applicable Load	Option Selection
F310	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
		3	Battery Chargers and D.C supplies.	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

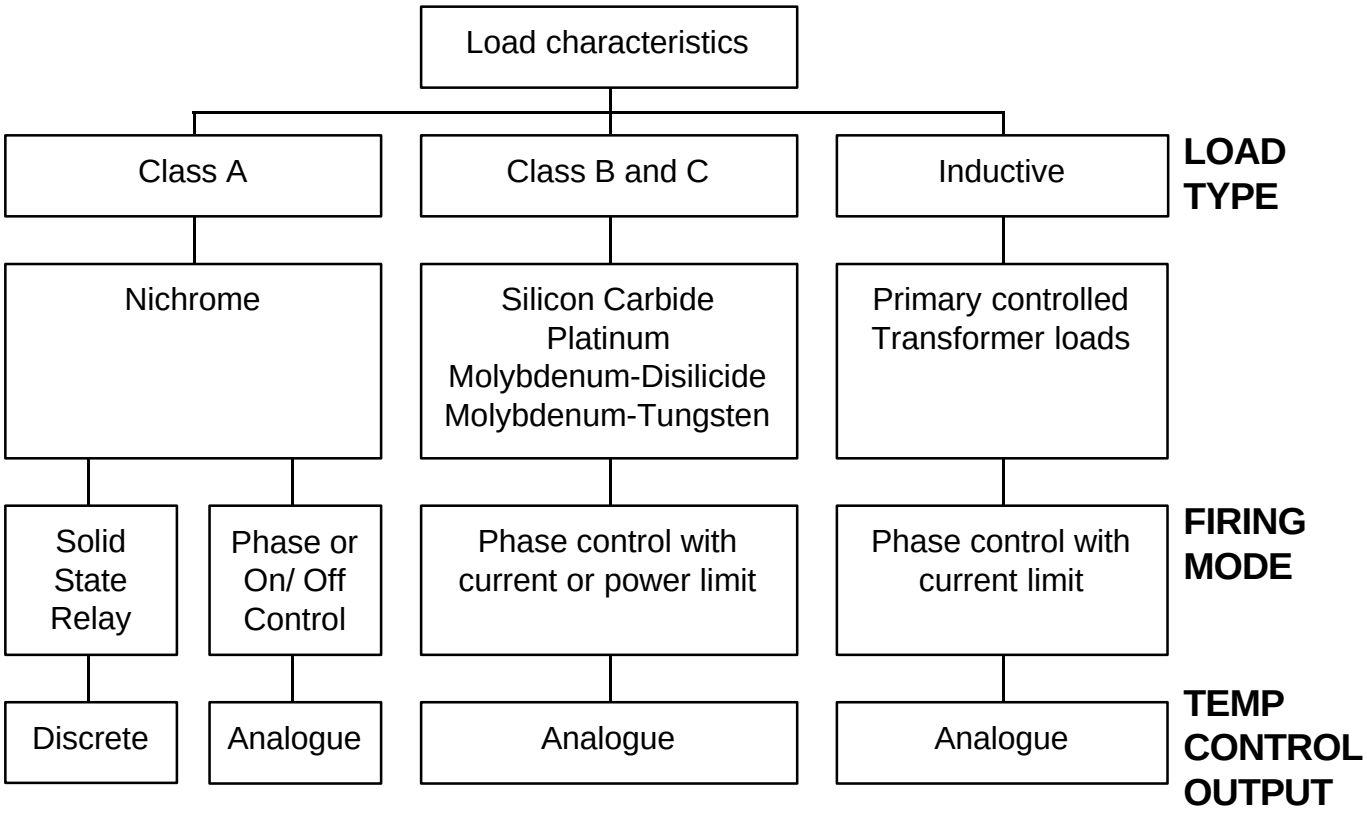
These elements have a low cold temperature resistance that increases greatly at operating temperature. Examples include: Molybdenum Disilicide, Platinum and Molybdenum Tungsten

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.

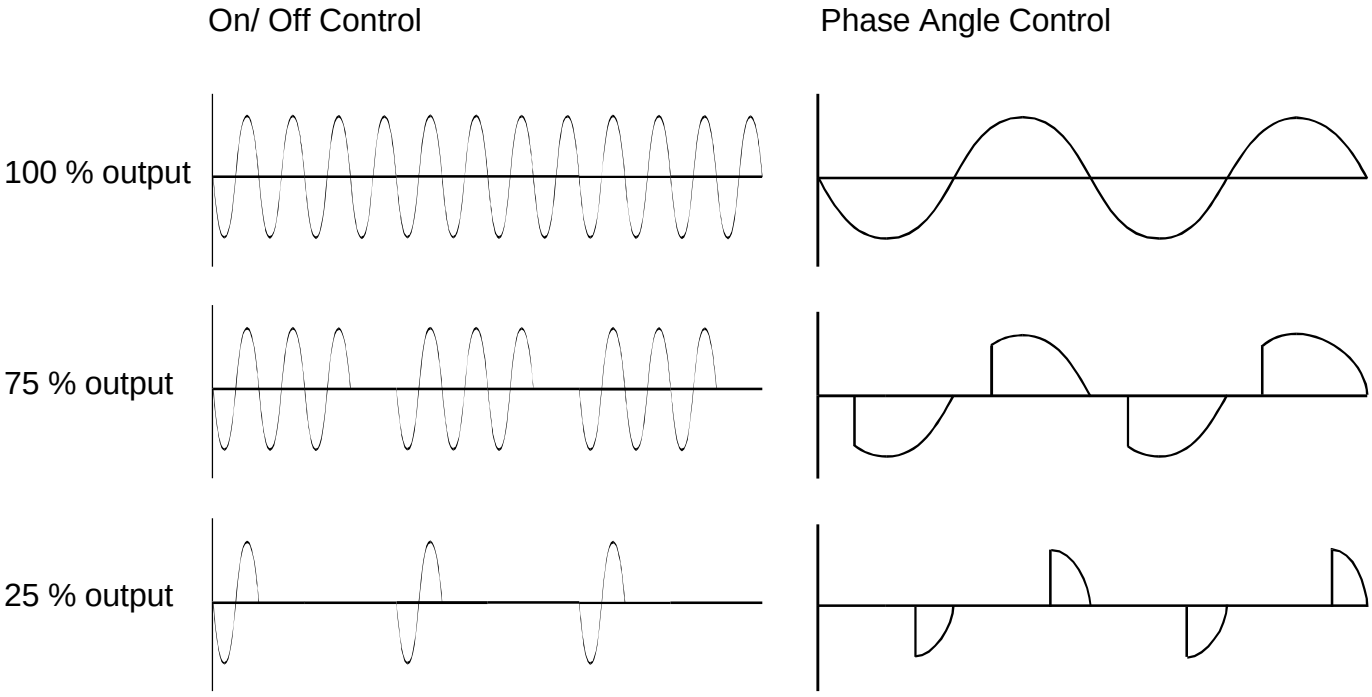
CLASS C

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



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