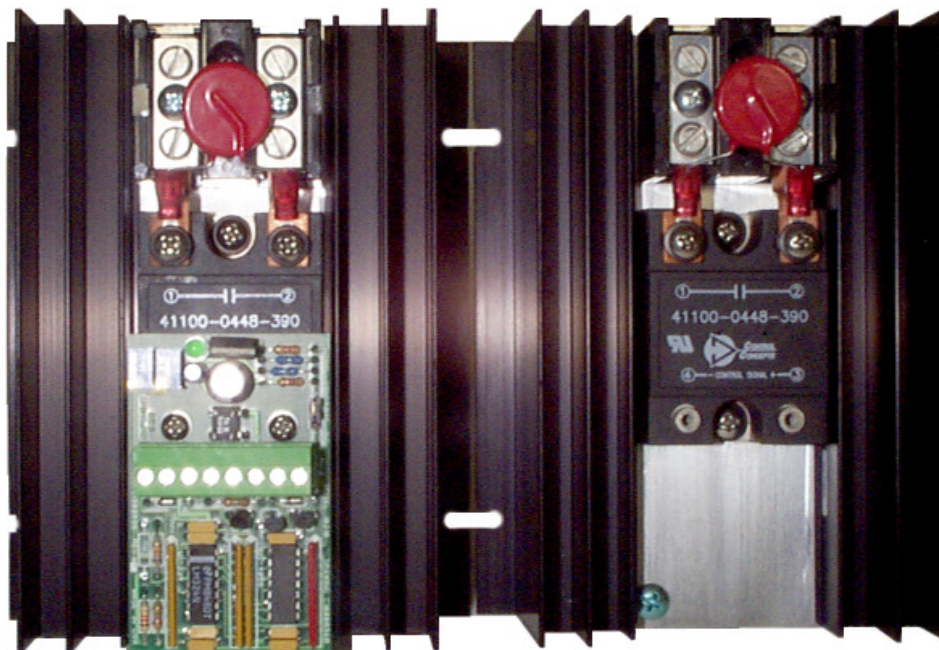




CONTROL CONCEPTS

3021B

**Three Phase,
2-Leg Zero-Cross
with Sync-Guard**



Description

The model 3021B is a two-leg zero-cross SCR power controller that linearly controls, proportional to a command signal, the power applied to a 3 phase electrical load. Command signals may be 0-5Vdc or 0-10Vdc or a potentiometer. The controller is available with current ratings of 10, 20, 30, 40 or 70 Amps and voltage ratings of 120, 240, 480 or 575 Vac, 50/60hz.

The controller consists of a master and a slave assembly. Each assembly consists of a heatsink and an SCR (Silicon Controlled Rectifier) module containing two SCRs configured to operate as a zero-cross AC switch. The SCR module also provides electrical isolation between the line and load voltage and the heatsink and the input command to the SCR module.

An electronic circuit on the master assembly controls the ON/OFF switching of the SCR modules causing the load power to be directly proportional to the command signal. The fast ON/OFF zero-cross switching improves heater life and provides superior performance over that achieved by relays, contactors or other solid state time proportional controls.

The 3021B features Sync-guard™ which reduces synchronous operation of multiple SCR controllers. Up to 10 of these controllers may be wired together to reduce voltage variations caused by multiple controllers cycling on and off at the same time.

Applications

- Electric Ovens, Furnaces and Kilns
- Three-Phase Resistive Loads
- Environmental Chambers
- Contactor Replacement
- Platen heaters
- Extruders

Approvals



LISTED 3L32
INDUSTRIAL
CONTROL
EQUIPMENT
E136219



CERTIFIED
BY UL TO
CANADIAN
NATIONAL
STANDARDS

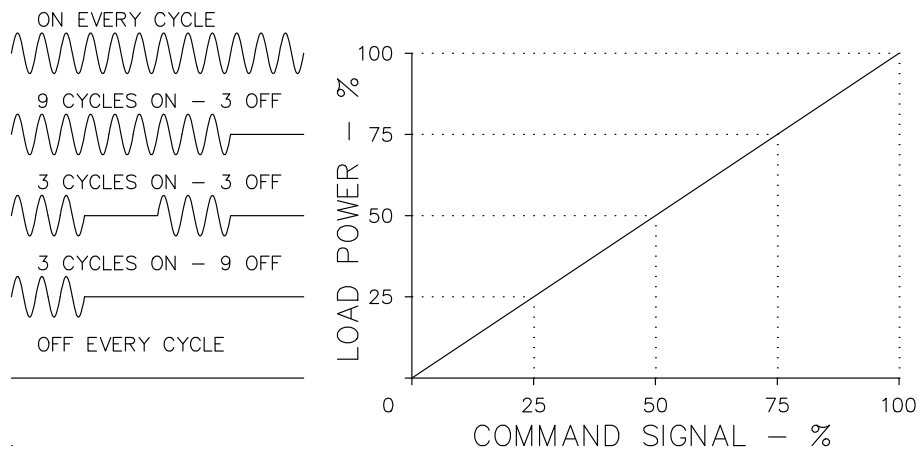
Features

Advantages

Benefits

Compact size	Size of enclosure and panel space are reduced.	Valuable space is saved, enclosure costs are reduced.
Electrical isolation of command signal from load and line voltages.	Eliminates potential ground loops. Provides safe operation with inexpensive, non-isolated process controllers.	A less costly, more reliable means to achieve good process control.
Controller accepts 0-5Vdc, 0-10Vdc or potentiometer commands.	Load power can be linearly controlled from 0 to 98% by either a potentiometer or by a process controller.	Provides flexibility and readily allows the use of auto/manual and run/idle control circuits.
Zero-Cross Operation	Power is switched ON or Off as voltage goes through zero. (See theory of operation, below)	Zero-Cross operation improves reliability and reduces RFI.
Diagnostic indicator	Light emitting diode (LED) provides visual indication of controller operation.	Provides an easily understood means to troubleshoot by inexperienced personnel.
Continuous operation at 55°C	No de-rating required below 55°C.	Improves reliability and provides long trouble-free life.
Distributive control	Provides highest cycle to cycle resolution of the power level required.	Infinite resolution of load power and fast response provides superior process control.
Line voltage compensation	Maintains the load power constant independent of line voltage changes.	Line voltage variations do not affect load power, provides better process control.
Sync-Guard™	Reduces synchronous operation of multiple SCR controllers to obtain a smoother power demand.	Cooler operation of supply transformers, circuit breakers, etc., greatly reduces the possibility of voltage variations resulting from multiple controllers cycling on and off at the same time.

Theory of Operation



The model 3021B is a zero-cross distributive controller. Zero-cross implies that load power can be turned ON or OFF only at the beginning or end of each electrical half cycle when the instantaneous value of the applied voltage is zero. Distributive control provides rapid ON-OFF cycling of the load power and combines various cycling rates to obtain the desired load power with infinite resolution. At 50% power the 3021B controller is ON for 3 electrical cycles and OFF for 3 electrical cycles. At lower power levels load power is applied for 3 cycles and the number of OFF cycles is increased.

At power levels above 50% power is removed for 3 cycles and the number of ON cycles is increased. For example, at 75% power the controller is on for 9 cycles and off for 3 cycles. At 60% power the controller is ON for 4 cycles, OFF for 3 cycles, then ON for 5 cycles followed by 3 OFF cycles, providing 9 ON cycles out of a total of 15 cycles. This rapid switching makes it possible to control relatively fast responding heaters and improves the life of heaters because the element temperature remains relatively constant.

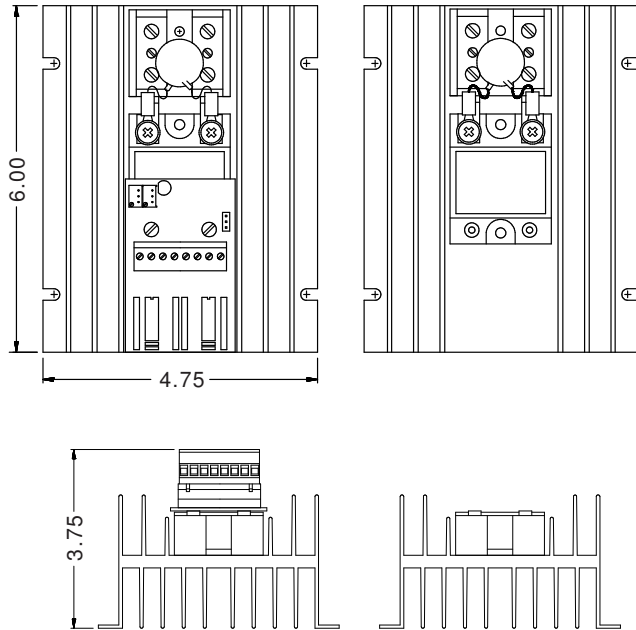
Specifications

Control Mode:	3-phase, 2-leg, zero-cross - distributive control Delta & 3 wire WYE loads.
Command Signal:	0-5 Volts DC, 0-10 Volts DC or potentiometer (1K to 20K.)
Input Impedance:	0-5Vdc input = 100K, 0-10Vdc input & potentiometer = 200K.
Control Range:	0 to 100% of line voltage.
Linearity:	Average load power is linear within 1% of the command signal.
Zero and Span Adjustment:	User adjustable over range of $\pm 20\%$ of span.
Isolation:	Dielectric strength input/line & load voltage/heatsink 4000V _{RMS} . Insulation resistance input/line & load voltage/heatsink 10 ¹⁰ ohms. Maximum capacitance input to output 8pf.
Cooling:	Convection.
Mounting:	Must be mounted on vertical surface with fins vertical. Units may be mounted adjacent to each other. (Heatsink is electrically isolated.)
Line Voltage:	120, 240, 480 or 575Vac +10%, -50% 50/60 Hertz.
Diagnostic Indicator:	An LED on the circuit board turns ON whenever the solid state relay is ON. Feature provides a quick and safe means to check controller operation.
Physical:	Weight; 10 thru 40 Amp 4lbs, 70 Amp 12 lbs. Dimensions: refer to drawings on pages 4 & 5.
Environment:	Operating: 0° to 55°C (32 to 131°F). Storage: -40° to 80°C (-40 to 176°F). Humidity: 0 to 100%, non-condensing.
dv/dt & Transient Voltage:	500 volts/usec minimum. A dv/dt snubber and a metal oxide varistor (MOV) are provided to protect against high frequency transients (dv/dt) and voltage spikes.
Dissipation:	1.5 watts per amp of controlled current.
Recommended Fusing:	Special semiconductor fuses are not required. It is recommended that the load and controller be protected with fast acting class "T" fuses such as Bussmann type JLN (300V) or JJS (600V) fuses. Control Concepts maintains an inventory of fuses and fuse holders for your convenience.

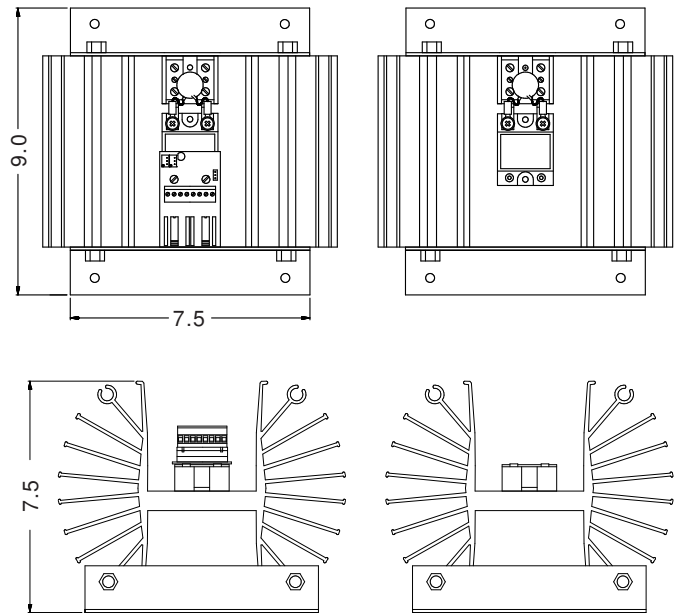
Current Capacity				KW			
Continuous RMS rating - Amps -	RMS 1 second	Peak 1 cycle (Non-Repetitive)	I ² t rating	120 Vac	240 Vac	480 Vac	575 Vac
10	22	140	81	2.08	4.16	8.31	9.96
20	40	250	260	4.16	8.31	16.63	19.92
30	80	625	1620	6.24	12.47	24.94	29.88
40	150	1000	4150	8.31	16.63	33.26	39.84
70	150	1000	4150	14.55	29.10	58.26	69.72

Dimensions

10 to 40 Amps



70 Amps



THE TRANSFORMER SUPPLIED WITH THE MODEL 3021B VARIES IN SIZE DEPENDING UPON THE LINE VOLTAGE.

Ordering Information

3021B - XX-XX - XXXX

Specify Voltage:

48 = 480
Other voltages may be Available

Specify Current:

20 Amps
Other Current ranges may be Available

Specify Command:

0/10V = 0 to 10 Volts DC Command
0/5V = 0 to 5 Volts DC Command
Pot = 1K to 20 K Potentiometer

Manufactured by



**CONTROL
CONCEPTS**

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Phone: 952.474.6200 Fax: 952.474.6070
7870 Park Drive, Chanhassen, MN 55317, U.S.A.

Please Note

The model **3021B** controls two of the three legs of a Wye or Delta load; the third leg is connected directly to the third phase line.

Control Concepts' model **3321B** controls all three legs of a Wye or Delta load.

If one of the SCR's in a three leg controller would short, control of power to the load would be maintained.

If one of the SCR's in a two-leg controller would short, full power would be applied to one leg, and a minimum of half power would be applied to each of the other two legs.

Controlling all three legs would be necessary if the load is a four-wire Wye with the junction wire grounded.

Complementary Products

Control Concepts, Inc., offers a wide variety of phase angle and zero cross power controllers designed for your toughest process control applications.

Single and Three Phase controllers with current ratings from 10 to 1000 amps can typically be shipped in two weeks or less. Many models can be shipped next day.

Control Concepts, Inc. has the expertise and the products to meet your specific control needs.

Call us today for solutions. (800) 765-2799