CONTROL CONCEPTS

3021B

Three Phase, 2-Leg Zero-Cross **Command Signal: 0-5, 0-10Vdc or Potentiometer**

FEATURES

- Compact size
- Electrical isolation of command signal from load and line voltages.
- Controller accepts 0-5Vdc, 0-10Vdc or potentiometer commands.
- Zero-Cross Operation
- Diagnostic indicator
- Continuous operation at 55°C
- Distributive control
- Line voltage compensation Sync-Guard™

LISTED 3L32 INDUSTRIAL CONTROL EQUIPMENT E136219

CERTIFIED BY UL TO CANADIAN NATIONAL STANDARDS

PROUDLY DESIGNED & ASSEMBLED IN THE USA

APPLICATIONS

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

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.

ADVANTAGES

Size of enclosure and panel space are reduced. Eliminates potential ground loops. Provides safe operation with inexpensive, non-isolated process controllers.

Load power can be linearly controlled from 0 to 98% by either a potentiometer or by a process controller.

Power is switched ON or Off as voltage goes through zero. (See theory of operation, below)

LIght emitting diode (LED) provides visual indication of controller operation.

No de-rating required below 55°C.

Provides highest cycle to cycle resolution of the power level required.

Maintains the load power constant independent of line voltage changes.

Reduces synchronous operation of multiple SCR controllers to obtain a smoother power demand.

BENEFITS

Valuable space is saved, enclosure costs are reduced.

A less costly, more reliable means to achieve good process control.

Provides flexibility and readily allows the use of auto/manual and run/idle control circuits.

Zero-Cross operation improves reliability and reduces RFI.

Provides an easily understood means to troubleshoot by inexperienced personnel.

Improves reliability and provides long trouble-free life.

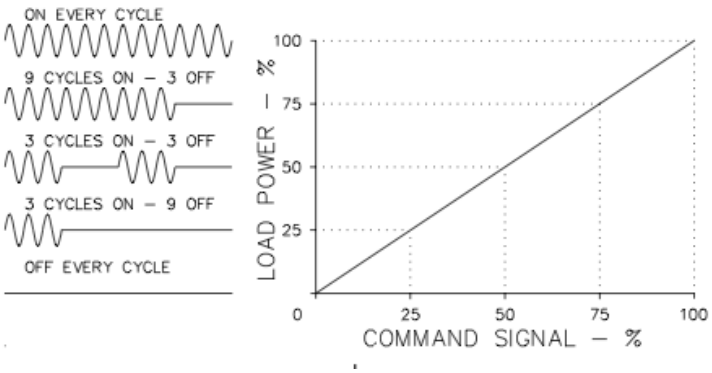
Infinite resolution of load power and fast response provides superior process control.

Line voltage variations do not affect load power, provides better process control.

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 3021A 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 3021A 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.

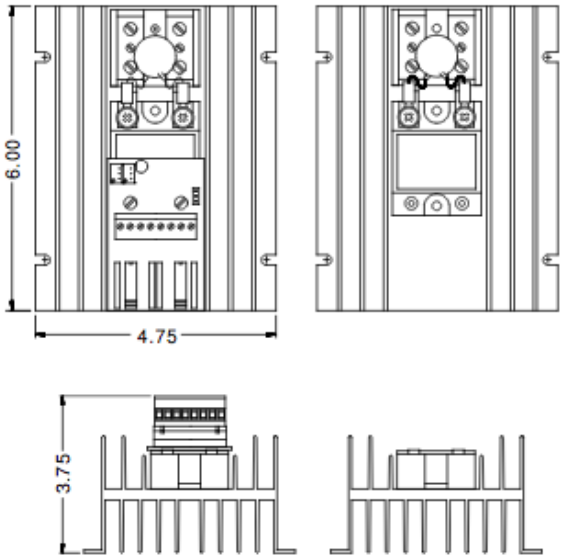
SPECIFICATIONS

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 ±20% of span.
Isolation	Dielectric strength input/line & load voltage/heatsink 4000$V_{RMS.}$ 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%, -15% 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.
Approximate Shipping Weight and Box Size	70A 18-14-12” Box Size
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 JJN (300V) or JJS (600V) fuses. Control Concepts maintains an inventory of fuses and fuse holders for your convenience.

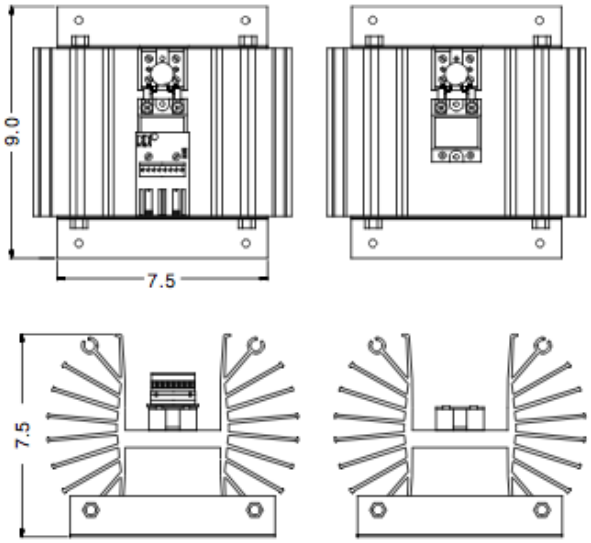
Current Capacity				**KW**			
Continuous RMS rating Amps	**RMS 1 second**	**Peak 1 cycle** (Non-Repetitive)	**I^2t rating**	**120 Vac**	**240 Vac**	**480 Vac**	**575 Vac**
10	22	140	81	2.08	4.16	8.31	9.96
20	40	250	260	4.16	8.31	16.63	19.92
30	80	625	1620	6.24	12.47	24.94	29.88
40	150	1000	4150	8.31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

DIMENSIONS

10 - 40 Amps



70 Amps



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

ORDERING INFO

3021B - XX - XX - XX

Specify Voltage:
48 = 480V
Other voltages may be available

Specify Current:
20 Amps
Other Current ranges may be Available

Specify Command Signal:
0/5V = 0-5 Vdc Command
0/10V = 0-10 Vdc Command
Pot = 1K to 20K Potentiometer

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.

CONTACT/ORDERING INFORMATION

TEL: (952) 474-6200 I (800) 765-2799
FAX: (952) 474-6070 I www.ccipower.com
8077 Century Blvd, Chanhassen, MN 55317, USA

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