CONTROL CONCEPTS

3020

Three-Phase Zero Cross
4/20 mA Command

FEATURES

- Electrical isolation of command signal from load and line voltages.
- Circuitry is powered by 4-20mA Signal.
- Compact size
- Zero-Cross Operation
- Continuous operation at 55°C
- Distributive control

APPLICATIONS

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

LISTED 3L32 INDUSTRIAL CONTROL EQUIPMENT E136219

CERTIFIED BY UL TO CANADIAN NATIONAL STANDARDS

PROUDLY DESIGNED & ASSEMBLED IN THE USA

DESCRIPTION

The model 3020 is a two-leg zero-cross SCR power controller that linearly controls, proportional to a 4-20mA command signal, the power applied to a 3 phase electrical load. The controller is available with current ratings from 10 to 70 Amps and voltage ratings from 120 to 575 Vac.

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 electrically isolates the line and load voltage from the heatsink and the input command to the SCR module. The master assembly contains a circuit card, powered by the 4-20mA signal, which controls the number of on and off cycles.

The 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.

ADVANTAGES

Eliminates potential ground loops. Provides safe operation with inexpensive, non-isolated process controllers.

Eliminates need of transformer and reduces the number of electrical connections required.

Size of enclosure and panel space are reduced.

Power is switched ON and Off when voltage is zero.

Can operate at full Current to 55°C.

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

BENEFITS

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

Improves reliability and reduces installation cost and time.

Valuable space is saved, enclosure costs are reduced.

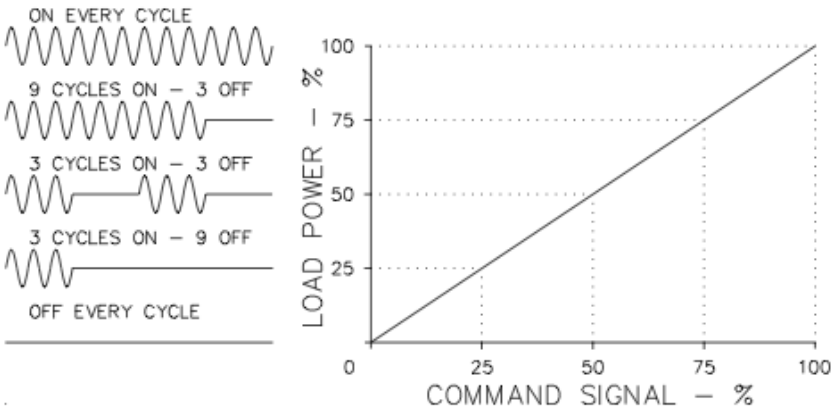
Zero-Cross operation improves reliability and reduces RFI.

Improves reliability and provides long trouble-free life.

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

THEORY OF OPERATION

The model 3020 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 3020 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.

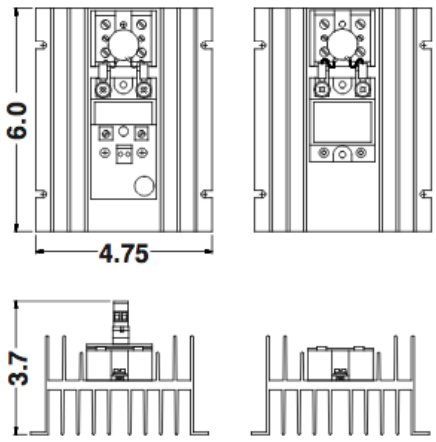
SPECIFICATIONS

Control Mode	3-phase, 2-leg, zero-cross - distributive control Delta & 3 wire WYE loads.
Command Signal	4-20 Milliamp, 7 volt maximum voltage drop at 20 milliamp input impedance equivalent to 350 ohms
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 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 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 controller = 4lbs, 70 Amp controller = 12 lbs Dimensions: refer to drawings on page 4.
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 90%, 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 controller and load be protected with fast acting class “T” fuses such as Bussmann type JJS or JJN fuses. Control Concepts maintains an inventory of fuses and fuse holders for your convenience.

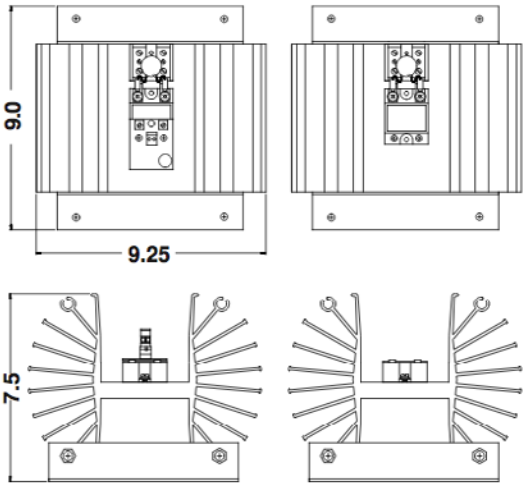
Current Capacity				**KW**				
Continuous RMS rating Amps	**RMS 1 second**	**Peak 1 cycle** (Non-Repetitive)	**I^2t rating**	**120 Vac**	**240 Vac**	**277 Vac**	**480 Vac**	**575 Vac**
10	22	10	81	2.08	4.16	4.80	8.31	9.96
20	40	250	260	4.16	8.31	9.60	16.63	19.92
30	80	625	1620	6.24	12.47	14.39	24.94	29.88
40	150	1000	4150	8.31	16.63	19.19	33.26	39.84
70	150	1000	4150	14.55	29.10	33.58	58.26	69.72

DIMENSIONS

10- 40 Amp



70 Amp



All dimensions in inches.

ORDERING INFO

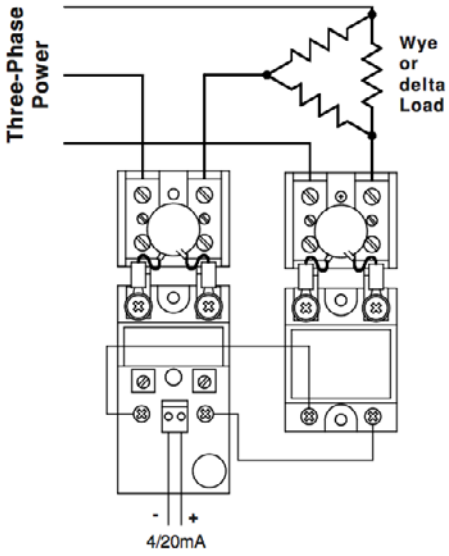
3020 - XX - XX - XX

Specify Voltage:
12 = 120Vac **24** = 240Vac
48 = 480Vac **57** = 575Vac

Specify Current:
10, 20, 30, 40 or 70 Amps

Specify Command Signal:
4/20mA = 4 to 20 milliAmp current loop signal
Other ranges may be available.

CONNECTIONS



The model 3020 control circuit is powered by the current loop command signal. It does not require a transformer

PLEASE NOTE

The model **3020** controls two of the three legs of a Wye or Delta load; the third leg is connected directly to the third phase line. (See diagram above.)

Control Concepts' model **3321A** controls all three legs of a Wye or Delta load. Controlling all three legs would be necessary if the load is a four-wire Wye with the junction wire grounded.

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

If one of the SCR's in a two-leg controller should 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.

CONTACT/ORDERING INFORMATION

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CONTROL CONCEPTS