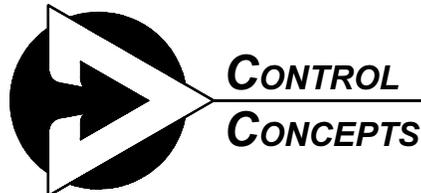


**CONTROL  
CONCEPTS  
INC.**

**INSTRUCTION MANUAL  
MODEL 1020**



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## DESCRIPTION:

The model 1020 controls the electrical power applied to a single phase load, proportional to a 4-20mA command signal, by zero-cross operation of a pair of SCR's. The controller is available with current ratings from 10 to 70 amps and voltage ratings from 120 to 575Vac.

The SCR's (Silicon Controlled Rectifiers) are contained in a module which electrically isolates the line and load voltage from the heat sink and the command signal, and which contains the circuitry allowing the SCR's to be turned on or off only when the instantaneous value of the applied voltage is zero. The circuit card which is powered by the 4-20mA signal controls the ON and OFF time of the SCR's, causing the load power to be directly proportional to the command signal.

## MODEL No. IDENTIFICATION:

**MODEL NUMBER: 1020 - XX - XX**

Voltage Rating:

**12** = 120:

**24** = 240:

**48** = 480:

**57** = 575Vac

(+ 10% - 50%)

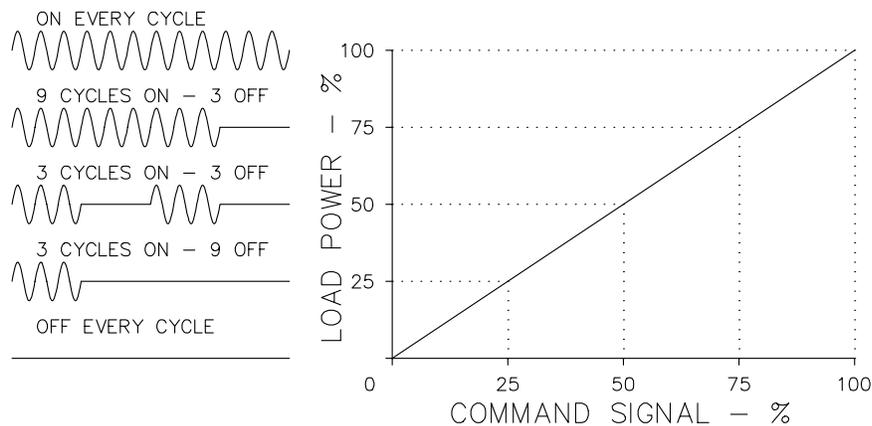
Current Rating:

**10, 20, 30, 40** or 70 Amps. RMS

NOTE: The 1020 controller normally operates with a 4/20mA control signal. The addition of "-SCXXXX" to the model number implies that the controller has been modified to have a different input command.

For example, **1020-24-40-SC12/20mA** implies a model 1020, 240Volt, 40Amp controller that operates with a 12 to 20 mA control signal.

## THEORY OF OPERATION



The model 1020 is a zero-cross distributive controller. Zero-cross implying 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 1020 controller is ON for 3 electrical cycles and OFF for 3 electrical

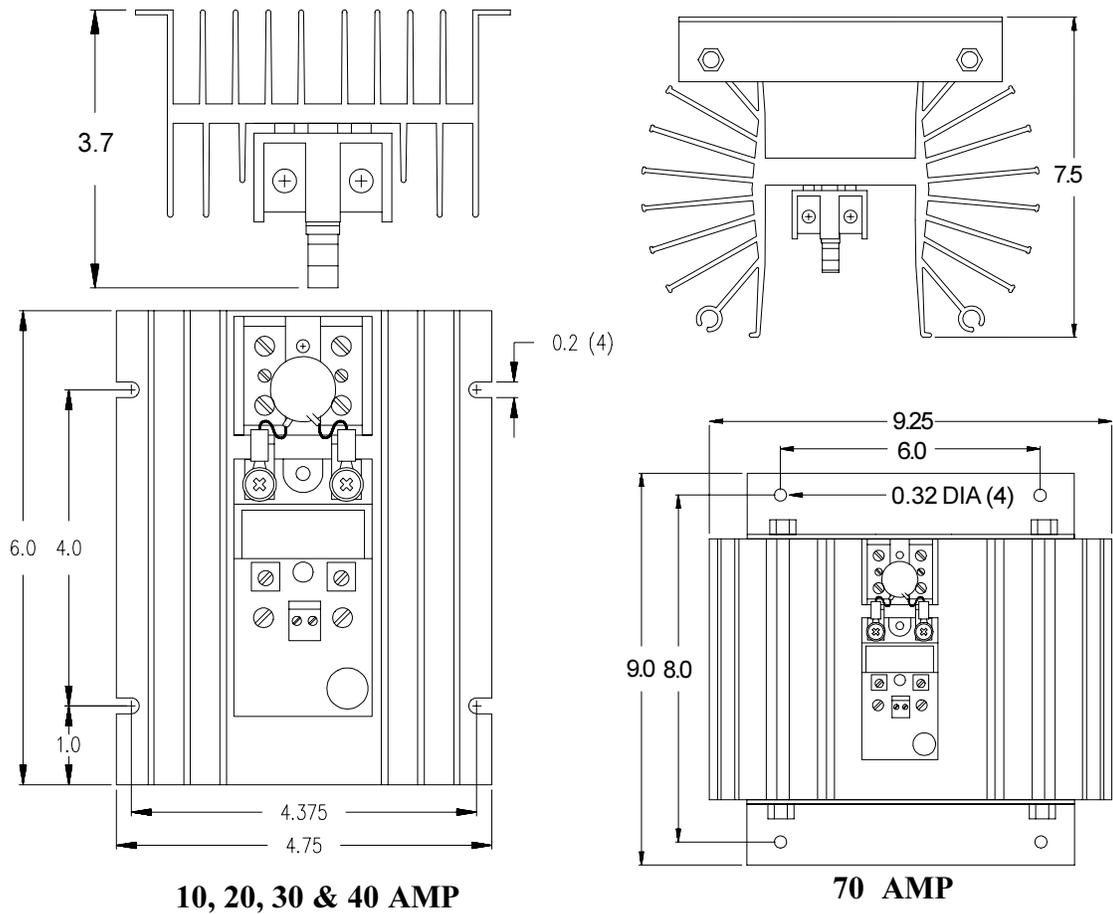
cycles.

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.

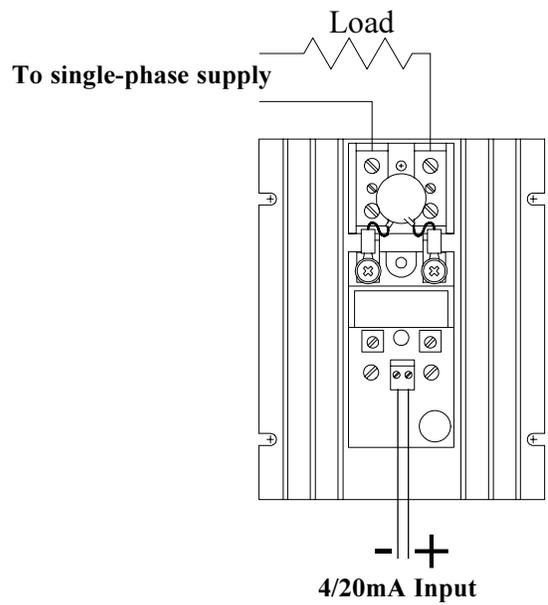
<b>SPECIFICATIONS:</b>	
<b>Control Mode</b>	Single-phase zero-cross - distributive control.
<b>Command Signal</b>	4-20 Milliamp, (unless specified otherwise) 7 volt minimum compliance; input impedance equivalent to 350 ohms at 20 milliamp.
<b>Control Range</b>	0 to 100% of line voltage.
<b>Linearity</b>	Average load power is linear within 2% of the command signal.
<b>Zero and Span Adjustment</b>	User adjustable over range of $\pm 20\%$ of span.
<b>Isolation</b>	Dielectric strength input/line & load voltage/heatsink 2500V <sub>(RMS)</sub> Insulation resistance input/line & load voltage/heatsink $10^{10}$ ohms. Maximum capacitance input to output 8pf.
<b>Cooling</b>	Convection.
<b>Mounting</b>	Must be mounted on vertical surface with fins vertical. Units may be mounted adjacent to each other. Heat sink is electrically isolated.
<b>Line voltage</b>	120, 240, 480, 575Vac $\pm 10\%$ , $-50\%$ 50/60 Hertz.
<b>Diagnostic Indicator</b>	An LED is ON whenever power is applied by the SCR module and therefore the frequency varies as a function of the 4/20 mA command signal.
<b>Physical</b>	Weight: 10 thru 40 amp 2 lbs , 70 amp 6 lbs Dimensions: Refer to installation drawing.
<b>Environment</b>	Operating: 0 to 55°C (32 to 131°F) Storage: -40 to 80°C (-40 to 176°F) Humidity: 0 to 95% Non-condensing.
<b>dv/dt &amp; Transient Voltage</b>	200 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.
<b>Dissipation</b>	1.5 watt per amp of controlled current.
<b>Recommended Fusing</b>	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.

<b>CURRENT CAPACITY</b>				<b>KW</b>				
<b>Continuous RMS rating</b>	<b>RMS 1 Second</b>	<b>Peak 1 cycle (Non-Repetive)</b>	<b>I<sup>2</sup>t rating</b>	<b>120Vac</b>	<b>240Vac</b>	<b>277Vac</b>	<b>480Vac</b>	<b>575Vac</b>
10	22	140	81	1.20	2.40	2.77	4.80	5.75
20	40	250	260	2.40	4.80	5.54	9.60	11.55
30	80	625	1620	3.60	7.20	8.31	14.40	17.31
40	150	1000	4150	4.80	9.60	11.08	19.20	23.08
70	150	1000	4150	8.40	16.80	19.39	33.60	40.39

## INSTALLATION DRAWINGS:



## ELECTRICAL CONNECTIONS:



## INSTALLATION:

The controller must be mounted on a vertical surface such that the heat radiating fins are vertical and located in an environment that will not exceed 135°F and is protected from dirt and dust.

The wiring to the controller must be per local electrical codes. The supply and load terminals will accept up to # 6 wire. The terminals for the 4-20mA control signal accept wire up to # 18. The terminal provided for the 4-20mA command signal is a plug\_in connector and can be removed by pulling it straight off from the circuit card.

**CAUTION:** Do not over tighten the wire connections.

**NOTE:** It is recommended that the controller and the load be protected with fast acting class "T" fuses such as described in the specification portion of this instruction manual.

## TROUBLE SHOOTING:

**CAUTION:** High voltage exists on the supply and load terminals of this controller and may exist on other equipment located near the controller. Use extreme caution to avoid electrical shock.

The LED located on the controller circuit can be used to aid in determining problems. This LED should be ON whenever the SCR Module is ON and therefore whenever power is being applied to the load. The potentiometer labeled "zero" is used to adjust the value of the command signal at which the controller just begins to operate. The potentiometer labeled "span" is used to adjust the value of the command signal at which the controller is full on. These potentiometers have been factory adjusted such that the LED will be OFF and therefore no power will be applied to the load when the command signal is 4mA or less. The span potentiometer has been factory adjusted such that when 20mA is applied the LED will be on continuously and maximum load power will be applied. At command signals greater than 4mA and less than 20mA the LED will blink.

## THE FOLLOWING ARE SYMPTOMS AND POSSIBLE CAUSES:

### LED DOES NOT FUNCTION AND NO LOAD POWER CAN BE OBTAINED:

Determine that the positive output of the process controller is connected to the positive input of the 4–20mA input terminal. The voltage from the negative input to the positive input will be approximately 6Vdc. If the voltage is negative the leads to the controller are reversed. If the voltage is correct the circuit has probably failed.

### LED OPERATES BUT NO LOAD POWER CAN BE OBTAINED:

Determine that power has been applied and that all fuses are OK. If the SCR module is not ON the supply voltage should exist across the line and load terminal of the SCR module. If a fuse has opened determine the cause prior to replacing the fuse and applying power.

### LED IS OFF BUT POWER IS APPLIED TO THE LOAD:

Determine that the SCR module has not failed as a short and therefore allows power to be continuously applied to the load.

## MANUFACTURED BY:

