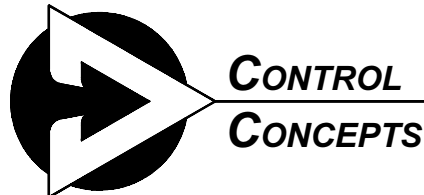


**CONTROL
CONCEPTS
INC.**

**INSTRUCTION MANUAL
MODEL 3020**



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DESCRIPTION:

The model 3020 controls the electrical power applied to a three-phase load, proportional to a 4-20mA command signal, by zero-cross operation of a pair of SCR modules. The controller is available with current ratings from 10 to 70 amps and voltage ratings from 120 to 480Vac.

Two SCR's (Silicon Controlled Rectifiers) are contained in each module, in an inverse parallel configuration, facilitating the control of AC Voltages. The command signal input terminals are electrically isolated from the line and load voltages and all are electrically isolated from the heat sink.

The circuit card, which is powered from 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: 3020 - XX - XX

Voltage Rating: _____ ↑ ↑
 12=120Vac
 24=240Vac
 48=480Vac
 (+10% -50%)

Current Rating: _____
 10, 20, 30, 40 or 70 Amps. RMS

NOTE: Adding "-SCXXXX" to the end of the part number implies that the controller has been modified to have a different input command. For example, "-SC12/20mA" implies the controller operates with a 12 to 20 mA control signal.

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 OFF 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.

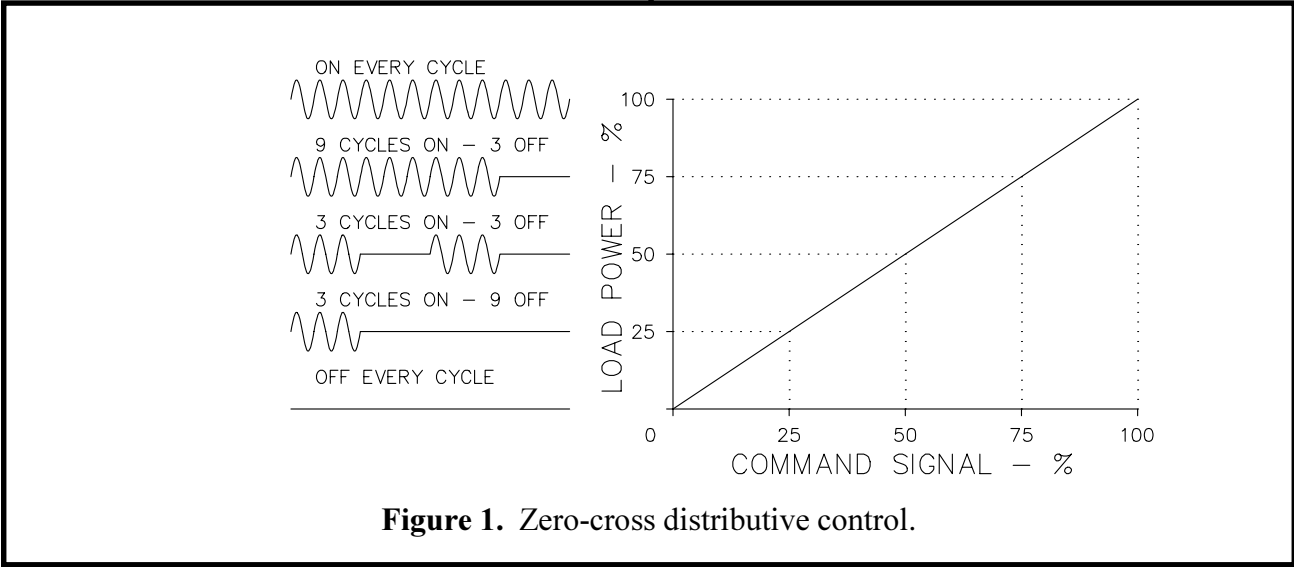


Figure 1. Zero-cross distributive control.

SPECIFICATIONS								
Control Mode		Three-phase zero-cross, distributive control.						
Command Signal		4-20 Milliamp, 7 volt maximum ; voltage drop at 20 milliamp input. Impedance equivalent to 350 ohms.						
Control Range		0 to 97% 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 2500V _(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. Heat sink is electrically isolated.						
Line voltage		120, 240, 480, 575 Vac +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; 6 lbs, incl. baseplate & transformer, 70 amp; 12 lbs. Dimensions: Refer to installation drawings.						
Environment		Operating: 0 to 55°C (32 to 131°F) Storage: - 40 to 80°C (-40 to 176°F) Humidity: 0 to 95% Non-condensing.						
dv/dt & Transient Voltage		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.						
Dissipation		1.5 watt 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				TOTAL LOAD KW				
Continuous RMS rating	RMS 1 Second	Peak 1 cycle (Non-Repetitive)	I ² t rating	120Vac	240Vac	277Vac	480Vac	575Vac
10	22	140	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	29.94	29.98
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

ELECTRICAL CONNECTIONS:

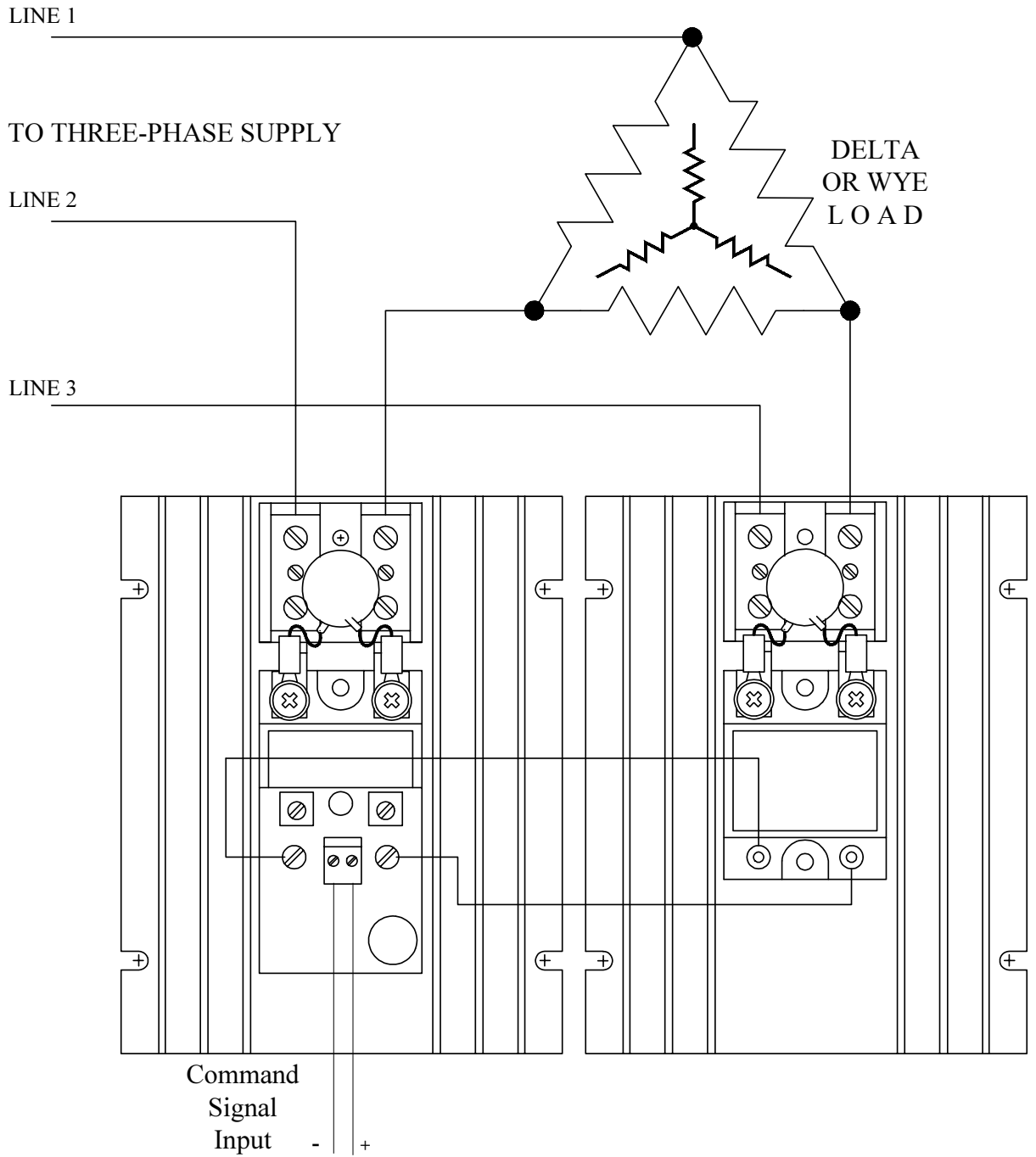


Figure 2. Model 3020, Electrical connections.

INSTALLATION DRAWINGS:

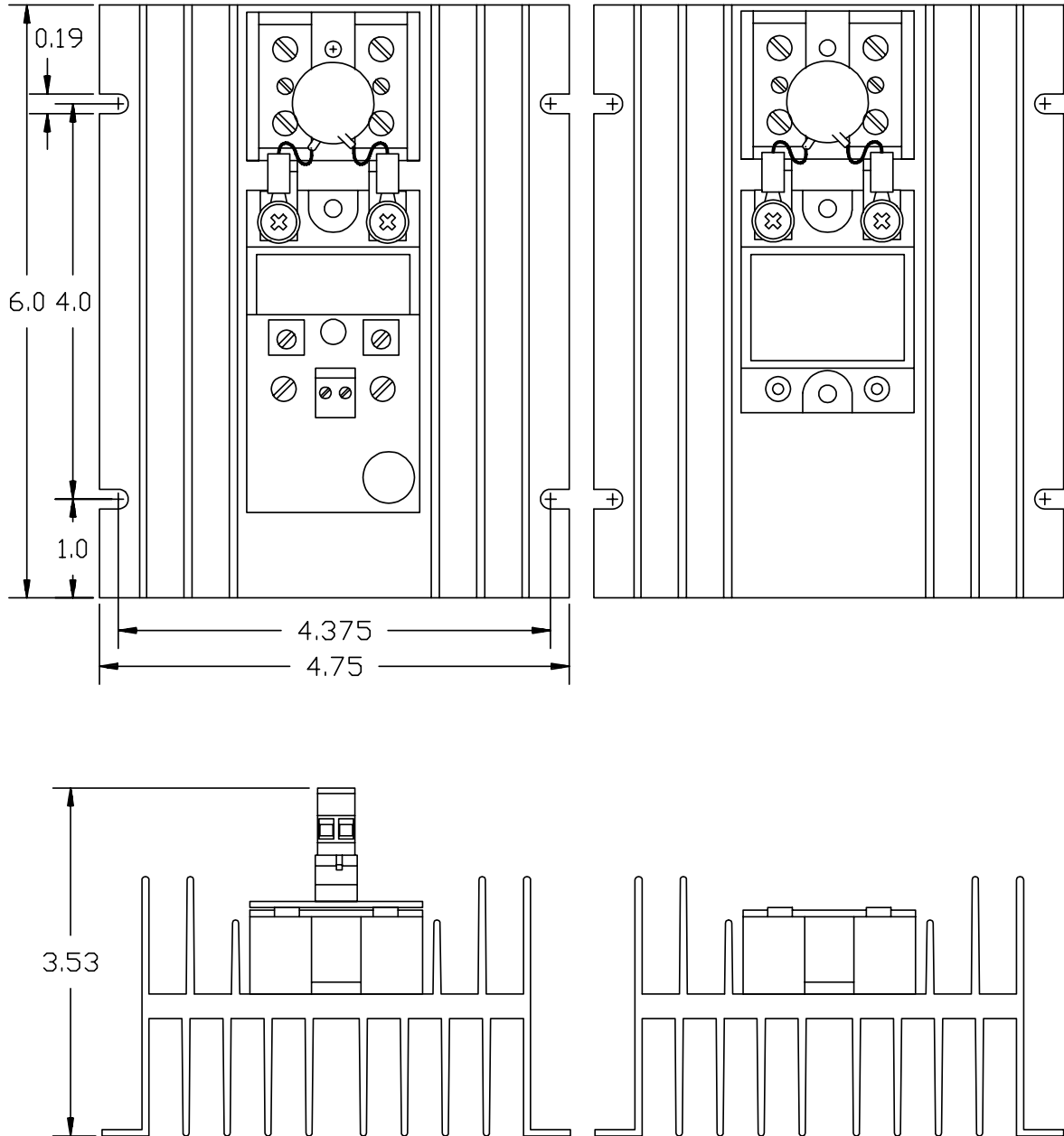


Figure 3. Model 3020 - 10, 20, 30 & 40 AMPS (BOTH ASSEMBLIES REQUIRED)

INSTALLATION DRAWINGS:

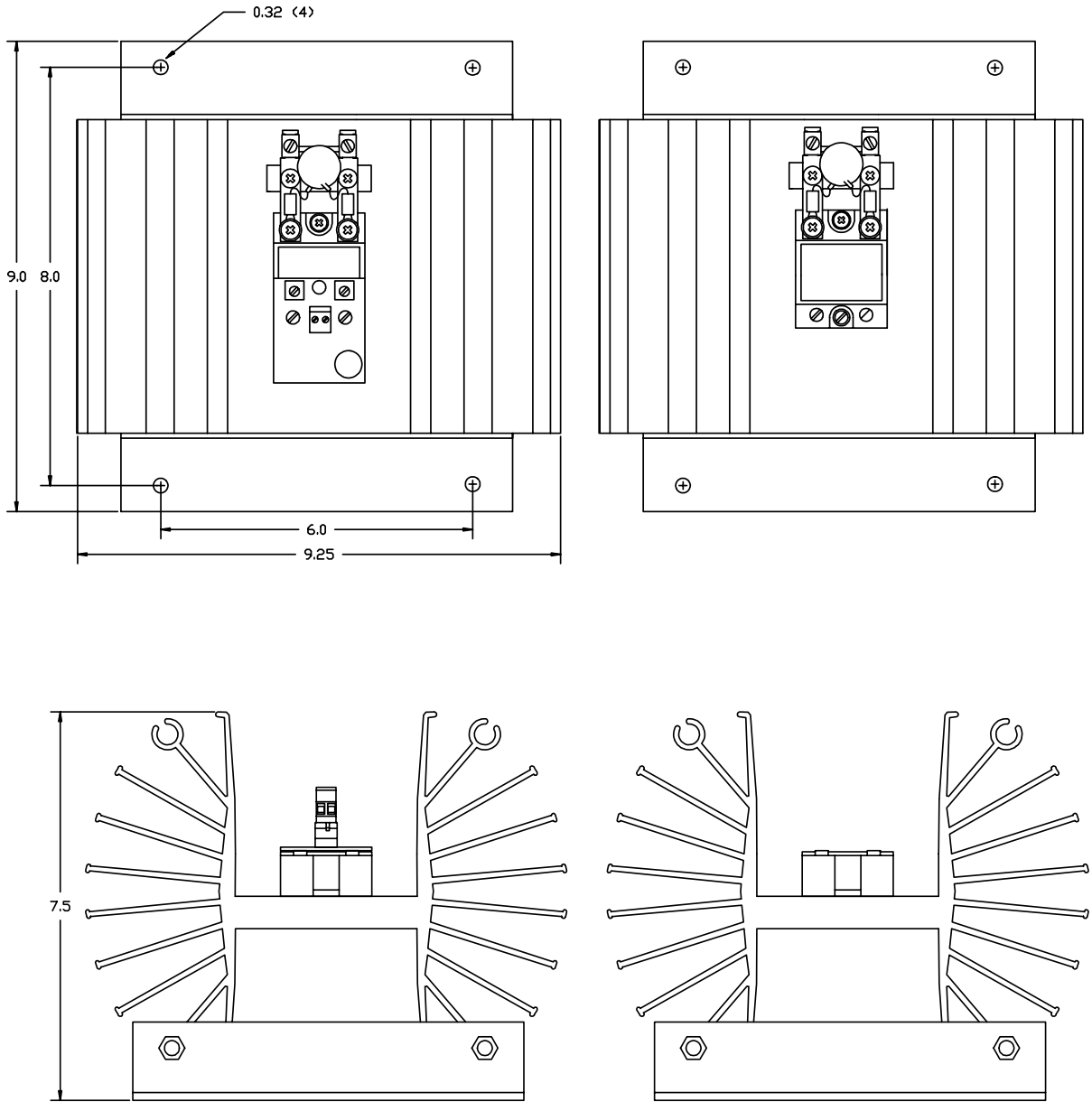


Figure 4. Model 3020 - 70 AMPS (Both assemblies required)

INSTALLATION:

The model 3020 controller must be mounted on a vertical surface with the heat radiating fins aligned vertically. It should be protected from dirt and dust and located in an environment that will not exceed 135 °F.

The wiring to the controller must be installed according to prevailing electrical codes. The supply and load terminals will accept up to # 2 wire. Use a maximum of 50 inch pounds of torque on these terminals.

The terminals for the command control signal are on a plug-in connector and will accept wire up to # 18. The connector can be removed by pulling it straight away from the circuit card.

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

TROUBLESHOOTING:

Control Concepts has service engineers who can help with controller problems.

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 FOLLOWING ARE SYMPTOMS AND POSSIBLE CAUSES:

LED IS OFF AND NO LOAD POWER CAN BE OBTAINED:

Determine that the output of the process controller is connected correctly and the signal is greater than 4mA. The voltage across the input should be approaching 6Vdc. If the voltage is correct, the circuit has probably failed.

LED IS OFF BUT POWER IS APPLIED TO THE LOAD:

Determine if the SCR module has failed as a short and therefore allows power to be continuously applied to the load.

LED IS ON 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 will exist across the line and load terminals of the SCR module. If a fuse has opened, determine the cause prior to replacing the fuse and applying power.

ADJUSTMENTS:

The potentiometers labeled zero and span have been factory adjusted and under normal conditions, will need no further adjustment. If adjustment becomes necessary, the following procedures should be used.

ZERO: Reduce the command signal to minimum and adjust the **zero** pot so that the output of the controller just stays off.

SPAN: Increase the command signal to maximum and adjust the **span** pot until the output of the controller is just on continuously.

(The zero and span adjustments may interact, therefore it may be necessary to repeat these two steps.)

Unless another command signal range has been specified, the **zero** and **span** potentiometers will be factory adjusted so that when 4mA or less is applied, the controller will be OFF, and when 20mA is applied, the controller will be ON continuously.

When the command signals are greater than 4mA but less than 20mA, the LED will blink.

RECOMMENDED SPARE PARTS:

FIRINGCIRCUIT

1020-FC-4-20ma

SCRMODULES

Voltage and current Rating	Control Concepts Part No.
120 Volt, 10 to 30 Amps	41070-0424-345
120 Volt, 40 & 70 Amps	41070-0428-390
240 Volt, 10 to 30 Amps	41070-0424-345
240 Volt, 40 & 70 Amps	41070-0428-390
480 Volt, 10 to 30 Amps	41070-0448-350
480 Volt, 40 & 70 Amps	41070-0448-390

REFERENCE DRAWINGS:

B1000163C	SCHEMATIC
AS 1022	INSTALLATION DRAWING.
BS 1045	CONNECTION DIAGRAM.
CS 1057	ASSEMBLY DRAWING.

MANUFACTURED BY:

