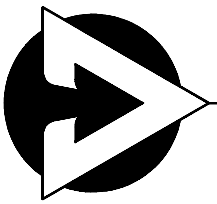
CONTROL CONCEPTS INC.

INSTRUCTION MANUAL
MODEL 3023



CONTROL
CONCEPTS

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DESCRIPTION:

The model 3023 is a 2-leg zero-cross three-phase time proportioning SCR power controller. The model 3023 linearly controls the power applied to a three-phase electrical load proportional to a 4-20 mA command signal by operating an inverse pair of silicon controlled rectifiers (SCRs) in a zero-cross time proportioning manner. The control circuit is powered by the electrically isolated 4-20 mA command signal. The cycle time can be field adjusted from 1 to 10 seconds by a single turn potentiomer on the circuit board. Multi-turn potentiometers are provided for zero and span adjustment.

THEORY OF OPERATION:

An electrically isolated zero-cross AC switch consisting of two inverse pairs of silicon controlled rectifiers (SCRs) are used to control the power to the load. The electronic circuit, which causes the zero-cross AC switches to turn "ON" and "OFF", is powered by the the 4-20 command signal. The circuit determines the percentage "ON" time within the cycle time to maintain the load power linear with respect to the command signal. Zero-cross operation applies and removes the load power only at the beginning and at the end of the electrical cycle. Because the power is switched at zero voltage by solid state components the voltage transients and RFI is greatly reduced. In addition, the solid state contacts have no inherent wear out modes or contact bounce as exists with mechanical switching devices.

Time proportioning operation applies power to the load for a percentage of a fixed cycle time such that the load power is linear with respect to the command signal.

For example:

If the command signal is 8mA (25% of the 4-20mA Span) and the cycle time is set for 10 seconds, load power will be applied for 2.5 seconds and removed for 7.5 seconds. If the command signal is 12mA, load power is applied for 5 seconds, then removed for 5 seconds to obtain an average load power of 50%.

MODEL No. IDENTIFICATION:

MODEL NUMBER: 3023-XX-XX

Voltage Rating:

12=120Vac

24=240Vac

48=480Vac

57=575Vac

(+10% -50%)

Current Rating:

10, 20 30, 40 or 70 Amps. RMS

NOTE: The addition of "-SCXXXX" implies that the controller has been modified to have a different input command. For example, a "-SC12/20mA" implies the controller opererates with a 12 to 20 mA control signal. The addition of "-MO#" implies that the two controllers have been assembled on to a mounting plate.

INSTALLATION:

The controller must be mounted on a vertical surface such that the heat radiating fins are vertical, located in an environment that will not exceed 135ºF 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 away 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.

Slave wiring:

If the controllers are not prewired for slave operation, they can be field wired by adding a lenth of 18 ga. wire from the positive terminal on the firing circuit to the positive terminal on the relay on the slave unit (without the firing circuit). Add a similar length of 18 ga wire from the negative terminal on the firing circuit to the negative terminal of the relay on the slave unit.

See diagram on page 4.

SPECIFICATIONS:

Control Mode	Three-phase zero-cross, time proportioning
Command Signal	4-20 Milliamp, 50 mA maximum continuous over current Circuit is reversed current protected.
Cycle time Range	Field adjustable from 1 to 10 seconds.
Linearity	Load power is linear within 2% with respect to the command signal.
Zero and Span Adjustment	Field adjustable over range of ±20%.
Isolation	2500 Vrms command signal to ground and power circuit.
Cooling	Convection cooling, all units.
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, 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; 6 lbs, incl. baseplate & transformer, 70 amp; 12 lbs Dimensions: Refer to installation drawing.
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 convience.

MODEL:	**SCR MODULE**	**FUSES**	
	CCI PART #	**CCI PART #**	**BUSSMAN #**
3023-12-10	41100-412-310	42110-0430-315	JJN-15
3023-12-20	41100-412-325	42110-0430-325	JJN-25
3023-12-30	41100-412-340	42110-0430-335	JJN-35
3023-12-40	41100-412-375	42110-0430-350	JJN-50
3023-12-70	41100-412-375	42110-0430-390	JJN-90
3023-24-10	41100-424-310	42110-0430-315	JJN-15
3023-24-20	41100-424-325	42110-0430-325	JJN-25
3023-24-30	41100-424-340	42110-0430-335	JJN-35
3023-24-40	41100-424-375	42110-0430-350	JJN-50
3023-24-70	41100-424-375	42110-0430-390	JJN-90
3023-48-10	41100-448-310	42110-0460-315	JJS-15
3023-48-20	41100-448-325	42110-0460-325	JJS-25
3023-48-30	41100-448-340	42110-0460-335	JJS-35
3023-48-40	41100-448-375	42110-0460-350	JJS-50
3023-48-70	41100-448-375	42110-0460-390	JJS-90

INSTALLATION DRAWINGS

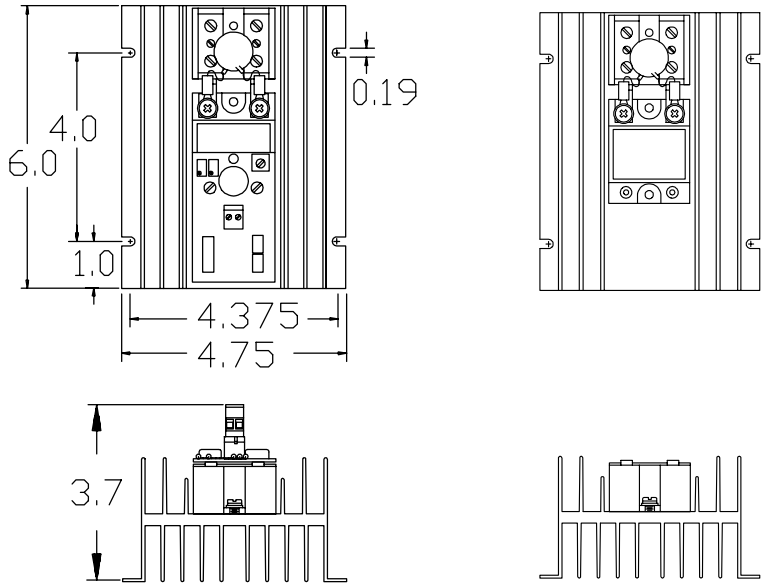

Fig. 1. 10, 20, 30 & 40 AMP (BOTH ASSEMBLIES REQUIRED)

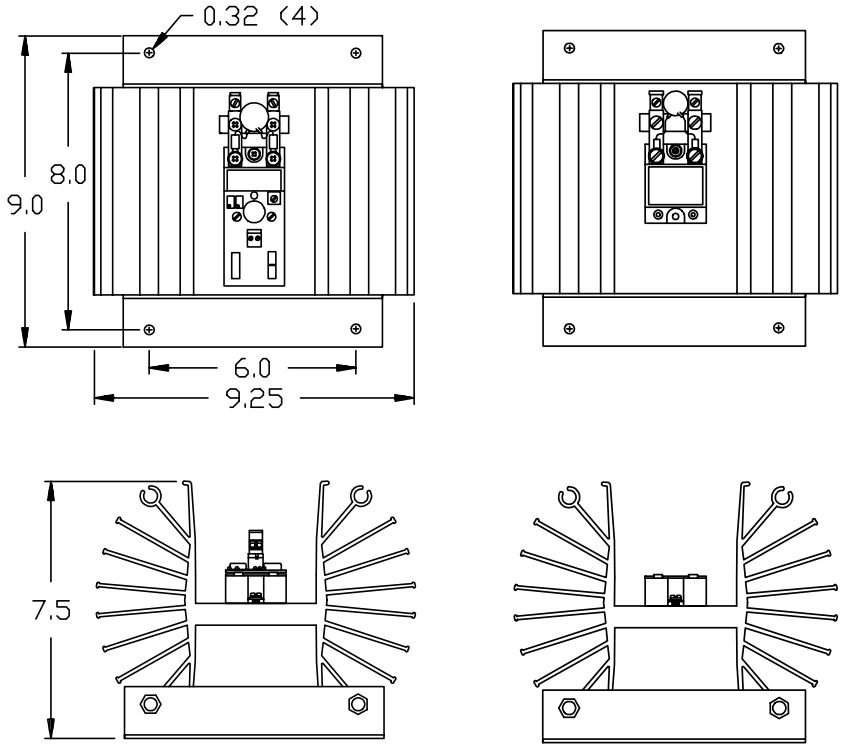

Fig. 2. 70 AMP (BOTH ASSEMBLIES REQUIRED)

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 labled "zero" is used to adjust the value of the command signal at which the controller just begins to operate. The potentiometer labled "span" is used to adjust the value of the command signal at which the controller is full on. The potentiometers have been factory adjusted such that the LED will be OFF therefore the controller will be OFF and 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 therefore 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:

The SCR module has probably failed in the shorted mode, allowing full or partial load power to be applied.

ADJUSTMENTS:

The 3023 is fully calibrated before leaving the factory, and should require no further adjustments.

If recalibration is necessary, the following procedure should be followed for best results. Contact the factory for help if problems occur.

Zero: (Factory set to provide zero load power when the command is 4mA) The zero potentiometer is used to adjust the controller to zero output when the command is at minimum.

Span: (Factory set to provide 100% load power when the command is 20mA) The span determines the load power when the command is at maximum.

1. Set the command signal to 4mA and adjust the zero potentiometer until the the controller just remains off.
2. Set the command signal to 20mA and adjust the span potentiometer until the controller is just on continuously.
3. The span and zero adjustments may interact, therefore it may be necessary to repeat steps 1 and 2.

ELECTRICAL CONNECTIONS:

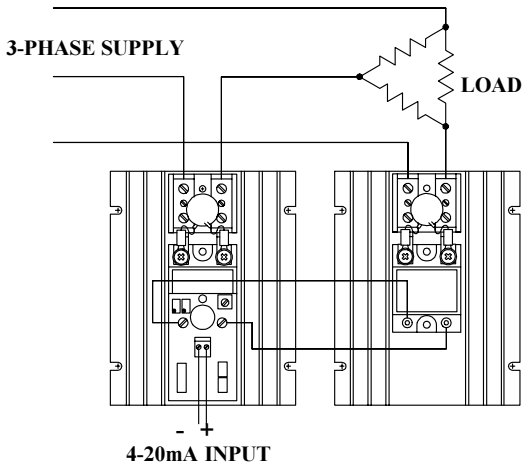

Fig. 3. Electrical Connections.

MANUFACTURED BY:

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