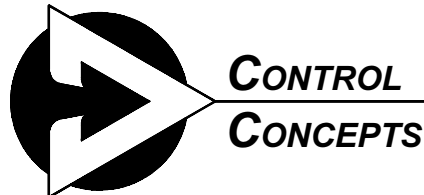


**CONTROL  
CONCEPTS  
INC.**

**INSTRUCTION MANUAL  
MODEL 1023**



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## DESCRIPTION:

The model 1023 is a single-phase, time proportioning, zero-cross SCR power controller. The model 1023 linearly controls the power applied to a single-phase electrical load proportional to a 4-20mA command signal. It does this by operating an inverse parallel 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 potentiometer on the circuit board. Multi-turn potentiometers are provided for field adjustment of the zero and span.

## THEORY OF OPERATION:

An electrically isolated zero-cross AC switch consisting of an inverse parallel pair of silicon controlled rectifiers (SCRs) is 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 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.


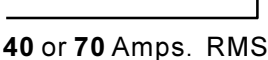
Time proportioning operation applies power to the load for a percentage of a fixed cycle time such that the load power is linear with respect to the command signal.

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:** 1023-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 "-**SC(XXXX)**" to the part number would imply that the controller has been modified to have a different input command.

For example,

1023-48-40-**SC12/20mA** means that a model 1023 controller, rated for 480Vac at 40Amps will operate from a 12 to 20 mA control signal.

## 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 conform to local electrical codes.

The supply and load terminals will accept up to #2ga wire.

The command signal terminals will accept up to #18ga wire.

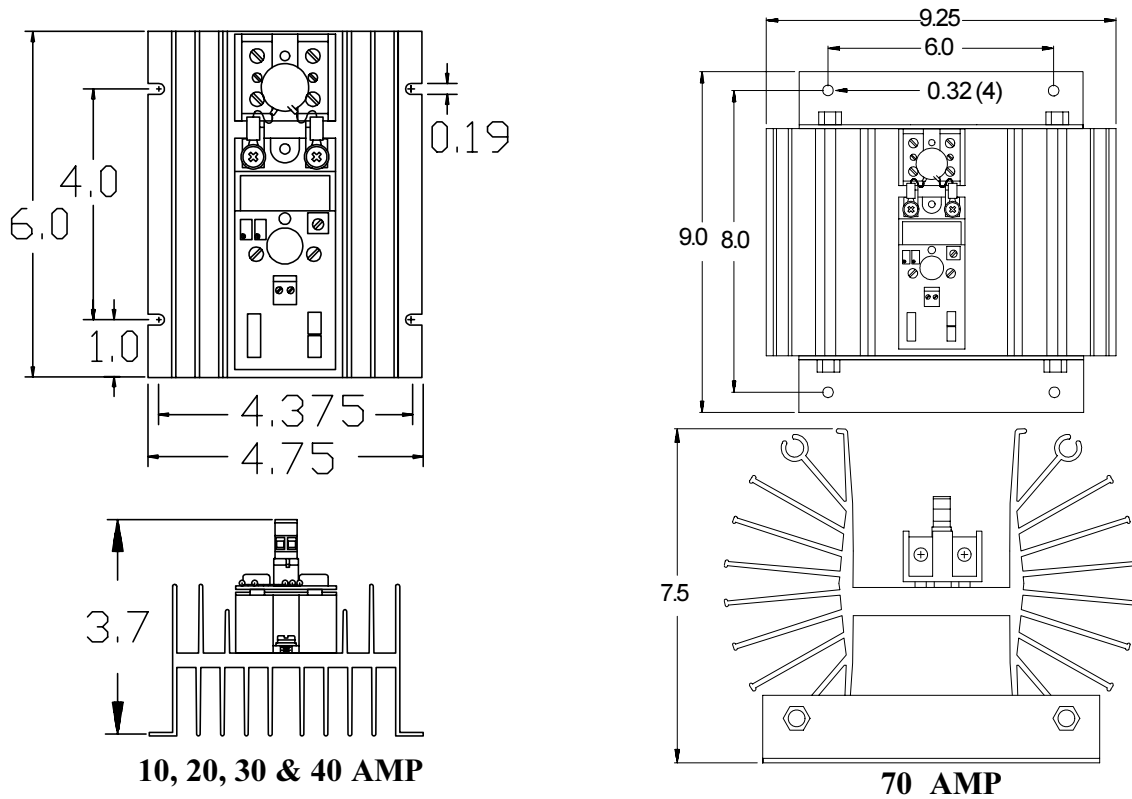
### CAUTION:

**Do not over-tighten the wire connections.**

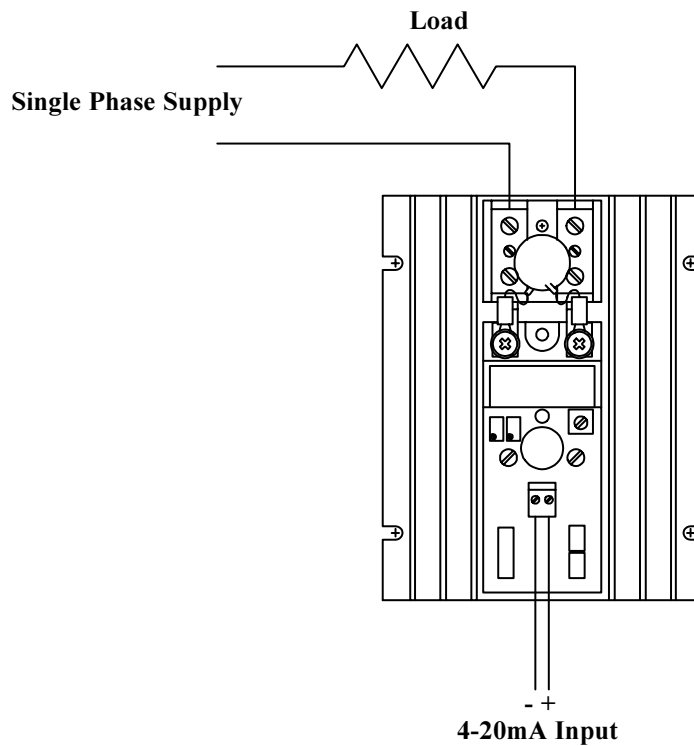
**NOTE:** It is recommended that the controller and the load be protected with fast acting class "T" fuses such as described in the specification portion of this instruction manual.

<b>SPECIFICATIONS:</b>				
<b>Control Mode</b>	Single-phase zero-cross, time proportioning.			
<b>Command Signal</b>	4-20 Milliamp, 13 volt maximum. Voltage drop at 20 milliamp input: 12.5 Vdc. Impedance equivalent to 625 ohms.			
<b>Cycle time Range</b>	Field adjustable from 1 to 10 seconds.			
<b>Linearity</b>	Load power is linear within 2% with respect to the command signal.			
<b>Zero and Span Adjustment</b>	Field adjustable over range of $\pm 20\%$ .			
<b>Isolation</b>	2500 Vrms command signal to ground and power circuit.			
<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 +10%, -50% 50/60 Hertz.			
<b>Diagnostic Indicator</b>	An LED turns ON whenever the solid state relay is ON. This feature provides a quick and safe means to check controller operation.			
<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.			
	1.5 watt per amp of controlled current.			
<b>Dissipation Replacement SCR Modules.</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 JN or JJs type fuses. Control Concepts maintains an inventory of SCR modules, fuses and fuseholders for your convenience. Please include the model # and the Serial # with orders for replacement SCR modules.			
<b>SCR's, Fuses and fuseholders.</b>	<b>CCI MODEL</b>	<b>SCR MODULE</b>	<b>FUSE</b>	<b>FUSE HOLDER</b>
		CCI PART #	CCI PART #	CCI PART #
	1023-12-10	1651-12-10	42110-0430-315	43112-0430-330
	1023-12-20	1651-12-20	42110-0430-325	43112-0430-330
	1023-12-30	1651-12-30	42110-0430-335	43112-0430-360
	1023-12-40	1651-12-40	42110-0430-350	43112-0430-360
	1023-12-70	1651-12-70	42110-0430-390	
	1023-24-10	1651-24-10	42110-0430-315	43112-0430-330
	1023-24-20	1651-24-20	42110-0430-325	43112-0430-330
	1023-24-30	1651-24-30	42110-0430-335	43112-0430-360
	1023-24-40	1651-24-40	42110-0430-350	43112-0430-360
	1023-24-70	1651-24-70	42110-0430-390	
	1023-48-10	1651-48-10	42110-0460-315	43112-0460-330
	1023-48-20	1651-48-20	42110-0460-325	43112-0460-330
	1023-48-30	1651-48-30	42110-0460-335	43112-0460-360
	1023-48-40	1651-48-40	42110-0460-350	43112-0460-360
1023-48-70	1651-48-70	42110-0460-390		

## INSTALLATION DRAWINGS:



## ELECTRICAL CONNECTIONS:



## 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 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:

#### **NO LOAD POWER, LED IS OFF:**

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.

#### **NO LOAD POWER, LED IS FUNCTIONAL:**

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.

#### **FULL LOAD POWER, LED IS OFF:**

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

## ADJUSTMENTS:

#### **Zero:**

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

#### **Span:**

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

The span and zero have been adjusted at the factory and should require no further adjustments.

If adjustments become necessary, the following procedure should be used.

1. Set the command signal to 4mA and adjust the zero potentiometer until 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.

## REFERENCE DRAWINGS:

B1000295A2

Schematic Drawing

AS1401

Transformer Inst. Dwg.

## MANUFACTURED BY:

