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**INSTALLATION, OPERATION and  
MAINTENANCE MANUAL**

**MODEL SCZF1 15, 25, 40 & 65 AMP  
SCR POWER CONTROLS**

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UL/cUL FILE NUMBER – E151547

CE - See last page of manual for CE Declaration of Conformity



**AMETEK HDR POWER SYSTEMS  
3563 INTERCHANGE ROAD  
COLUMBUS, OHIO 43204**

**TEL: 614-308-5500  
TOLL FREE: 1-888-PWR-CNTL (797-2685)  
FAX: 614-308-5506**

## SCR Power Controls/Systems & Power Supplies

Dear Client:

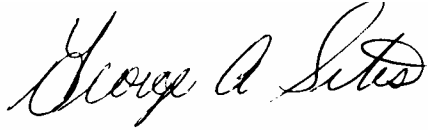
On behalf of all of AMETEK HDR's employees, I want to take this opportunity to "thank you" for purchasing an AMETEK HDR Power Systems' SCR Power Control.

We believe AMETEK HDR represents the best overall solution to your SCR Power Control needs in the industry today. We do this by providing a quality manufactured, reliable unit with fast, on-time delivery and a competitive price.

All of our employees are dedicated to your success. If you have any questions, comments or concerns, please call me toll free at 1-888-PWR-CNTL (797-2685).

Sincerely,

AMETEK HDR POWER SYSTEMS



George A. Sites  
Vice President

GAS/be

**REVISION PAGE**

<b><u>Page</u></b>	<b><u>Change</u></b>	<b><u>Revision</u></b>	<b><u>Date</u></b>
All	1	Revised for Scanner.....	11/04/96
Many	2	Revised for CE .....	7/2001

**NOTE: SPECIFICATIONS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.**

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## Section 1 - DESCRIPTION

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### 1-1 MODELS COVERED

This manual covers the SCZF1 models rated 15, 25, 40 & 65 amperes and its options.

### 1-2 GENERAL DESCRIPTION

The SCZF1 is a solid-state, single-phase, zero-fired (ZF) SCR power control which will operate on line voltages up to 575 VAC. It accepts most all standard process command signals and controls the average output voltage. Zero and Span Multi-turn potentiometers are to ease calibration. The SCZF1 utilizes an isolated base Solid-State-Relay (SSR) Module that contains two SCRs connected back to back. The firing circuit is based on common integrated circuits that allow for very reliable operation. Terminals are provided to ease installation.

### 1-3 APPLICATIONS

The SCZF1 provides a variable time base for precise control of single-phase power to resistive loads. The SCZF1 should never be used on inductive loads. It is versatile enough to be used in place of mechanical contactors and mercury relays on dryers, kilns, ovens, environmental chambers, extruders and molding equipment.

### 1-4 SPECIFICATIONS

Specifications for the SCZF1 SCR Power Control are given in Table 1.

**Table 1**  
**Specifications for the SCZF1 15, 25, 40 & 65 Amp Models**

<b>CONTROL METHOD</b>	- Zero firing of back to back SCRs.
<b>VOLTAGE RATING</b>	- Up to 600 VAC, 1 Ph., 50/60 Hz.
<b>CURRENT RATING</b>	- 15, 25, 40 & 65 Arms.
<b>COMMAND SIGNAL</b>	- 4-20 ma, 0-5 VDC/0-10 VDC, Manual Control
<b>ISOLATION</b>	- 2500 Vrms from line/load to command signal to ground.
<b>LINEARITY</b>	- Average output voltage is linear to command signal.
<b>ADJUSTMENTS</b>	- Zero and Span, multi-turn.
<b>AMBIENT TEMPERATURE</b>	- Operating, 0 - 50 °C; Storage, -10 - 70 °C.
<b>AGENCY LISTING</b>	- UL/cUL Listed, CE Certified

## 1-5 OPTIONS

A load failure alarm option is available on the SCZF1 models.

The Load Failure Alarm detects changes in load resistance and provides a Form C relay output. The level is adjustable.

## 1-6 OPERATION

The SCZF1 controls power by the switching action of two SCRs connected in a back to back configuration. The gating of these SCRs is synchronized with the line frequency (either 50 or 60 HZ) by the zero crossing detector built into the solid-state relay module. The firing circuit provides timing pulses proportional to the command signal. The output may be adjusted by the on-board potentiometers or by a voltage or current signal from a process controller. Zero and Span controls allow the user to calibrate the SCR unit's output to the process signal. Terminals are also available for connection of a remote manual potentiometer.

### **WARNING**

**Hazardous voltages exist at the power controller heat sinks and at the load at all times when the input voltage is connected. This condition exists even when the controller is set to delivery zero output.**

## Section 2 - INSTALLATION

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### 2-1 MOUNTING

Prior to mounting, verify the voltage and current rating of the SCZF1. The information is provided on the nameplate located on the left side of the unit. Determine the mounting dimensions from the outline drawing located in Figures 2. Mount the SCZF1 with line/load terminals to the top so that air-flow is upward through the heat sink fins. Ensure that air-flow is unrestricted.

### 2-2 LINE/LOAD POWER WIRING

Connect the line/load using appropriately sized and insulated wire/cable per NEC, based on the voltage and current rating of the SCZF1. Torque the line/load power connections to 25 in-lbs. min.

**NOTE: 75 °C (minimum) rated wire is required for all power connections to the SCZF1.**

<b>WARNING</b>
<b>Hazardous voltages exist at the Power Controller's internal heatsink and at the load at all times when the input voltage is connected. This condition exists even when the Power Controller is set to deliver zero output.</b>

### 2-3 SAFETY ISSUES

The rated operational voltage of each Power Controller is shown on its nameplate, i.e. 120V, 240V, 400V, 480V and 575V. The Power Controller is designed to operate between +10% and -15% of this rated operational voltage in an Over Voltage category III environment.

The voltage drop across the switching semiconductor while in the conducting mode is approximately 1.5 volts and is somewhat a function of current. To calculate the Power Control's power loss, multiply the load current times 1.5.



The minimum operational current is approximately 1 amp and the maximum off state current is approximately 15 ma.

<b>WARNING</b>
Power Control units are not suitable to provide isolation due to the use of semiconductors and other components that allow a small current to flow from line to load even when the unit is in the non-conducting mode.

The Power Controllers described in this instruction manual are designed to operate in a pollution degree 2 environment.

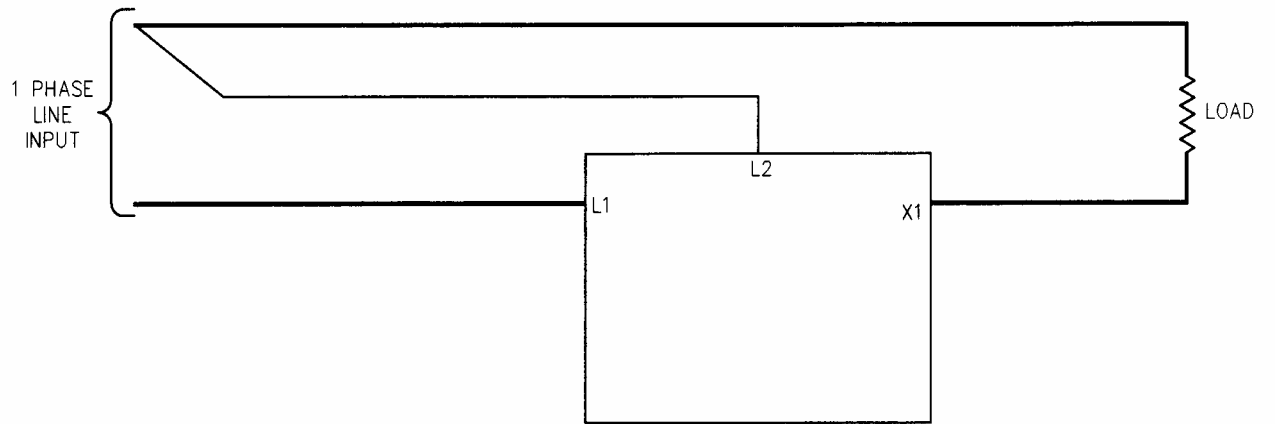


**HAZARDS EXIST**

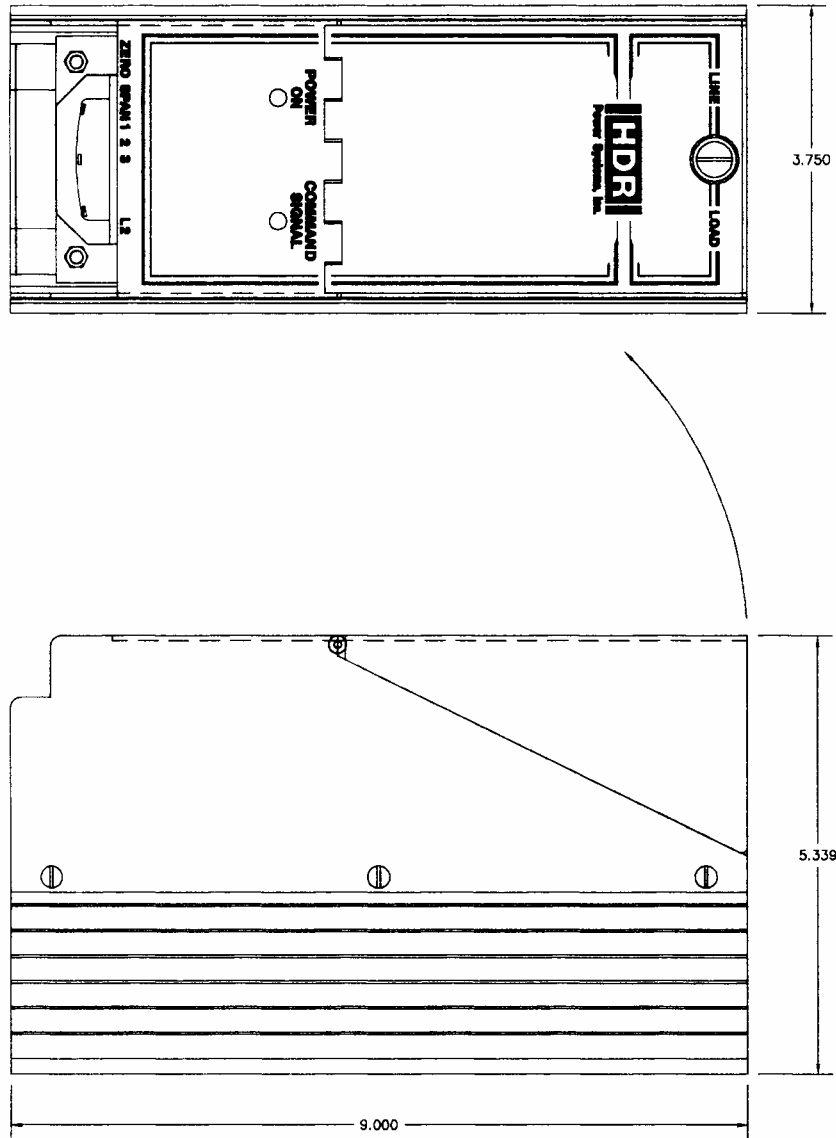


**DANGEROUS VOLTAGE S EXIST**

**Figure 1**  
**LINE/LOAD POWER WIRING**



**Figure 2**  
**OUTLINE AND MOUNTING DIMENSIONS**



Note: unit is 10.5" high with mounting brackets

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### **Section 3 - COMMAND SIGNAL CALIBRATION**

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#### **3-1 ZERO AND SPAN ADJUSTMENTS**

On the SCZF1 model, the Zero potentiometer has both positive and negative voltages available making it usable as a manual or zero control. By turning the Zero control clockwise the unit's output voltage will increase proportionally to the adjustment. Turning it counter-clockwise will decrease or zero the output for any non-zero based command signals.

The Span potentiometer is used to adjust the maximum output. It will adjust for either a remote manual control or a command signal input. Clockwise adjustment increases the output while counter-clockwise adjustment decreases the output. Due to some interaction between controls, it may be necessary to repeat these adjustments.

#### **3-2 POWER ON INDICATOR**

The Power On Indicator is a red light emitting diode (LED) located on the front of the unit. This red LED will light when power is applied.

#### **3-3 COMMAND INDICATOR**

The Command Indicator is a green Light Emitting Diode (LED). The flash rate of this LED will vary with the output of the unit. The rate will be faster with higher outputs and slower with lower outputs.

#### **3-4 REMOTE MANUAL CONTROL**

A remote manual control can be connected on the SCZF1. Start with the Zero Control set approximately at mid rotation and the Span Control set at minimum (counter-clockwise). Connect a 5K ohm remote manual control with CCW on terminal 1, wiper on terminal 2 and CW on terminal 3. With the unit energized and the Zero control fully counter-clockwise, adjust the Zero Control until the unit is just off. Next turn the manual control fully clockwise and adjust the Span Control until the desired output voltage is reached. This procedure may have to be repeated since some interaction between the Zero and Span Controls exist.

### **3-5 PROCESS COMMAND SIGNAL**

This procedure is similar to the Remote Manual Control procedure. Start with the Zero Control set approximately at mid rotation and the Span Control set at minimum. Connect the Command Signal with the (-) on terminal 1 and the (+) on terminal 2. Then energize the unit. With the Command Signal at minimum, adjust the Zero Control so the unit is just off (zero output voltage) then with the Command Signal at full output, adjust the Span Control so the output voltage is at the desired level. Repeating this procedure may be necessary due to some interaction between the Zero and Span Controls.

## **Section 4 - MAINTENANCE**

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### **4-1 ENVIRONMENTAL CONCERNS**

Always verify that the SCZF1 is mounted in a clean, dust free environment. Clean the heat sink and printed circuit board periodically so no dust and/or dirt accumulates on the unit. Dust and/or dirt on the heat sink fins can prevent proper airflow causing overheating of the semiconductors. Conductive dust and/or dirt can cause shorts or arcing, which can cause damage to the unit.

### **4-2 LINE/LOAD POWER CONNECTIONS**

Periodically turn the power off to the SCZF1 and check for corrosion and tightness of the power connections. If any corrosion is evident, clean the cable and connector and reconnect making sure to tighten to 25 in-lbs.

### **4-3 TROUBLESHOOTING TYPICAL SYMPTOMS**

Any one of the following symptoms usually indicate a problem with the SCZF1:

1. No output.
2. Full output regardless of command signal input.
3. The unit is not variable from 0 to full output.

**Table 2**  
**Troubleshooting the SCZF1**

**Symptom 1** - No Output

**Cause** – Open Fuse

**Solution** – Disconnect power and check the fuse, replace if faulty – if not, contact the factory.

**Symptom 2** – Full Output Regardless of command signal

**Cause** – Shorted SCR

**Solution** – Disconnect power and remove the SCR module. Check resistance on SCR – resistance should be very high in both polarity directions. If not, replace with new SCR module or contact the factory.

**Symptom 3** – The output is not variable from 0 to full output.

**Cause** – Defective Firing Circuit

**Solution** – Order replacement firing circuit or return the unit to the factory.

## Section 5 - SERVICE AND SPARE PARTS

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### 5-1 CUSTOMER SERVICE

If you have operational problems which cannot be resolved using this manual, please contact the Service Department at AMETEK HDR. Our normal work hours are 8 a.m. to 5:00 p.m., U.S.A. EASTERN TIME ZONE, Monday through Friday.

**TELEPHONE:** 1- 888-PWR-CNTL (797-2685) OR 614-308-5500. Our answering machine at 614-308-5500 will answer after hours and we will return your call the next working day.

**FAX:** 614-308-5506. 24 hours per day automatic answering.

### 5-2 SPARE PARTS

Inside Sales should be contacted for any spare parts orders whether routine or emergency during normal working hours. All after hours requirements should be called in on our 614-308-5500 answering machine. Please have as much information available as possible pertaining to the model number, serial number, order number and parts required. A purchase order number should be available.

### 5-3 WARRANTY

AMETEK HDR warrants that the equipment delivered will be free from defects in workmanship and material for a period of five years from the date of shipment. AMETEK HDR will repair or replace, at AMETEK HDR's option, any part found defective during proper and normal use, provided that written notice of the nature of the defect is received by AMETEK HDR within the five year warranty period and that the customer returns the part to AMETEK HDR freight paid both ways. This warranty is not transferable by the initial end user.

AMETEK HDR MAKES NO OTHER WARRANTIES, EXPRESSED OR IMPLIED (INCLUDING, WITHOUT LIMITATION, MERCHANTABILITY, FITNESS FOR PURPOSE, OR AGAINST INFRINGEMENT OF ANY PATENT) EXCEPT AS EXPRESSLY PROVIDED HEREIN.

THE REMEDY OF REPAIR OR REPLACEMENT IS CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND WILL SATISFY ALL OF AMETEK HDR'S LIABILITIES, WHETHER BASED ON CONTRACT, NEGLIGENCE, TORT, PRODUCT LIABILITY, STRICT LIABILITY, OR OTHERWISE. IN NO EVENT WILL AMETEK HDR BE LIABLE FOR INCIDENT OR CONSEQUENTIAL DAMAGES, NOR IN ANY EVENT SHALL HDR'S LIABILITY EXCEED THE UNIT PRICE OF ANY DEFECTIVE PRODUCT OR PART.



**EC DECLARATION OF CONFORMITY**

**WE:**           **AMETEK HDR POWER SYSTEMS**  
3563 Interchange Road  
Columbus, Ohio 43204 - USA

**Declare under our sole responsibility that the products listed below and bearing the CE label:**

**Type:**   SCR power controllers with the following model designations and current ratings:

SCZF1, SCPF1 - 15, 25, 40 and 65A  
All applicable options

**To which this declaration relates is in conformity with the technical requirements of the following documents:**

<b>Title:</b>	Low-voltage switchgear and controlgear	<b>No.</b>	IEC 947-5-1
		<b>Year:</b>	1990-03
	Low Voltage Directive	<b>No.</b>	IEC 73/23/EEC
		<b>Year:</b>	1973-02
	Degrees of protection provided by enclosures (IP Code):	<b>No.</b>	IEC 529-2nd Edition
		<b>Year:</b>	1989-11
	Electromagnetic Compatibility (EMC)	<b>No.</b>	IEC 89/336/EEC
		<b>Year:</b>	1989-05

**Warning**

All phase-fired (PF) controllers will require line filters and possibly shielded cables to meet the EMC requirements.

(Environmental protection classification IP00 - for mounting inside an enclosure)

**Note:**           Characteristics are according to mfg specifications.

**Name:**   George A. Sites

**Title:**     Vice President

**Date:**    November 9, 2000

**Signature:**



Declaration written in accordance with I.S.O. - IEC/22 Guide