

SILICON CARBIDE POWER CENTERS

The Leading Choice for Process Heating Control of Silicon Carbide Elements

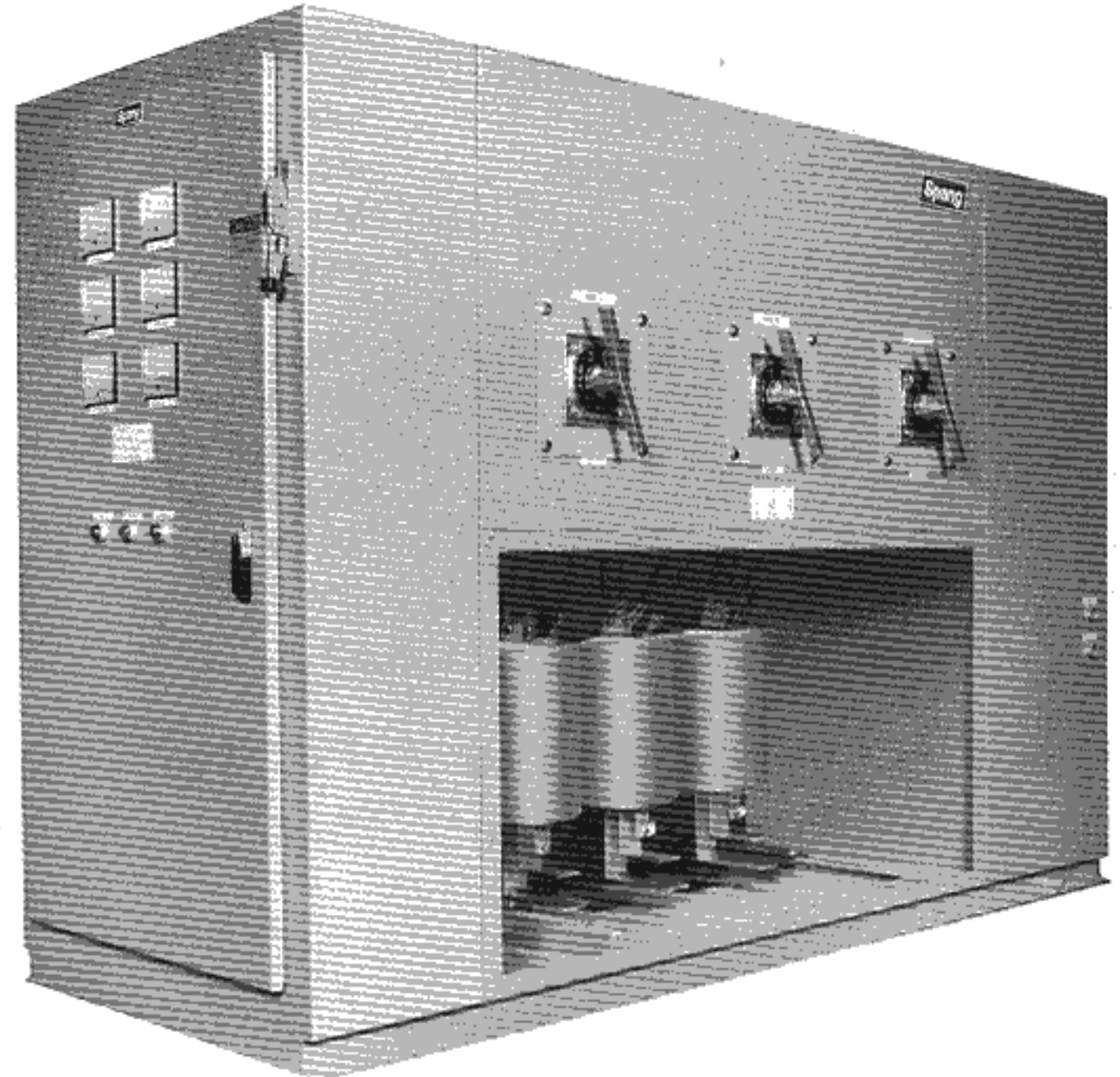
STANDARD FEATURES

- Solid State Reliability
- Extended Heating Element Life
- Low Installation Cost
- Low Operating Cost
- Optimum Utilization of Electric Power
- Modular Construction Adaptable to Multiple Zone Control

The SPANG SC Power Center maximizes the useful life of silicon carbide heating elements.

Silicon carbide heating elements change resistance with both temperature and age. From room temperature to normal operating temperature, the element passes through a negative resistance region where its resistance decreases before increasing to the operating value. At its lowest point, the element's resistance can be as much as 20 percent below nominal.

Aging is proportional to the watt density and environment to which the element is subjected. Over the life span of the element, its resistance can increase as much as four times. Due to these inherent characteristics, silicon carbide heating elements require special consideration in power supply design.



The SPANG SC Power Center protects the element in the negative resistance region.

Its RMS current limit responds to the actual heating current, prolonging element life by limiting excessive watt densities. The three phase SC Power Center senses all three lines and limits the highest current, preventing element fatigue in unbalanced systems.

The SPANG SC Power Center compensates for aging elements.

As the element ages, higher voltages are required to deliver full power. The SC Power Center provides this **Extended Full Power Voltage Range** while maintaining maximum efficiency and high power factor. A special multi-tapped transformer design allows full power operation over a two to one voltage range.

The SPANG SC Power Center is designed for reliable operation and long life.

Drawing upon years of experience in power control, and specifically power control for silicon carbide, SPANG has engineered the SC Power Center for maximum reliability. Every component is selected and designed with the particular requirements of silicon carbide in mind.

The SCR Power Control Unit (PCU) features a solid state firing circuit utilizing an Active Filter and CMOS Digital Circuitry for high Noise Immunity. SCR firing coordination is guaranteed through use of Phase Locked Loop technology. Rapid SCR turn-on is assured by 20 kHz Pulse Train firing for protection against di/dt failures.

A Phase Loss Detection circuit continuously monitors the incoming power. Should a power disruption occur, the firing circuit is inhibited, thus preventing SCR misfiring and nuisance fuse blowing.

When the disruption passes, operation returns to normal without loss of fuses. An Integral Ramp Circuit brings the Power Control Unit on in about 3 seconds, minimizing transformer in-rush currents.

The RMS current limit not only protects the heating element, but also provides overcurrent protection for the SC Power Center itself. For maximum reliability into unbalanced loads, the three phase SC Power Center is equipped with a SPANG 6 SCR Power Control Unit.

The SPANG Multi-Tapped Furnace Transformer is specially designed for primary SCR control of power for silicon carbide heating elements. Transformer saturation and losses are controlled by use of high quality, grain oriented core steel. The transformer is air-cooled, utilizing a Class H220°C Insulating

System. Designed for a low 115°C Temperature Rise over a 40°C ambient, it provides long life and a liberal safety margin. **The SPANG SC Power Center substantially reduces installation and operating costs.**

The SPANG SCR Power Control Unit utilizes silicon controlled rectifiers for power proportioning. Solid State SCR control provides maximum efficiency with lower losses than saturable reactors. Unlike contactors, there are no moving parts to wear out or replace. Maintenance and downtime costs are reduced.

The Multi-Tapped Furnace Transformer is designed to maximize efficiency and power factor. The low 115°C temperature rise attests to the high efficiency of the transformer. The multi-tapped secondary allows full power to be delivered

over a two-to-one voltage range while maintaining a high power factor of 0.80 or better at full power outlet. Compared to 0.50 and lower power factors of other approaches, the SPANG design can result in substantial installation and operation savings. Substation and power feed sizes can be reduced by up to 50 percent. Utility rate savings, due to lower demand, accumulate substantially with every hour of operation.

The SC Power Center is a complete system, pre-wired and pretested. Costly field installation and start-up time are kept to a minimum. Since it is a complete system, the SPANG SC Power Center is easier to specify and use. Hidden costs, such as those associated with purchasing and assembling separate components, are eliminated.

Power Center Components

1. Input circuit breaker, with: shunt trip coil (120VAC). Safety handle mechanism.
2. SPANG SCR Power Control Unit with: Transformer Inrush Protection (soft start).
RMS current limit feature. Solid state firing circuit. Plug-in printed circuit boards. Transient voltage protection. Phase loss protection on 3 phase units. Fast acting current limit fuses.
3. SPANG Silicon-Carbide Power Transformer, with: 115°C Temperature rise. 220°C UL listed insulation system
4. Metering:
Load ammeter (one per phase).
Load voltmeter (one per phase).

Standard Control Features

- Primary circuit breaker mechanically interlocked with access door.
- Shunt trip coil on primary circuit breaker can be used for over-temperature protection.
- Adjustable current limit, 25 to 100%.
- "Power on" indicator light.
- Power center will accept outputs from all standard temperature controllers.

Package Features

- Free-standing, ventilated NEMA 1 enclosure of 11 gauge steel construction.
- Durable industrial finish on all metal surfaces.
- Front control compartment with hinged access door.
- Easily accessible terminals for line and load connections.
- Lifting provisions.

Options Available

- Watt regulation control for improved element protection.
- Secondary tap switch with interlock.
- NEMA 12 enclosure.
- Forced ventilation.
- Temperature controller.
- High limit controller.
- Electronic overcurrent shutdown
- Under voltage release on breaker in lieu of shunt trip.

SC Power Centers—Standard Sizes					
SERIES SCP48—480 Volt, 3 Phase, 60 Hertz input <small>(note 1)</small>			SERIES SCS48—480 Volt, 1 Phase, 60 Hertz input <small>(note 1)</small>		
MODEL NO.	LOAD KW <small>(note 2)</small>	STANDARD NOMINAL OUTPUT VOLTAGES <small>(note 3, 4)</small>	MODEL NO.	LOAD KW <small>(note 2)</small>	STANDARD NOMINAL OUTPUT VOLTAGES <small>(note 3)</small>
SCP48-040	40		SCS48-020	20	
-050	50		-030	30	
-060	60		-035	35	
-075	75		-040	40	
-100	100		-065	65	
-125	125		-120	120	
-165	165		-150	150	
-225	225		-175	175	
-235	235		-190	190	
-270	270				
-300	300				
-340	340				
-400	400				
-450	450				
-525	525				

Notes:

1. Other input voltages available.
2. Ratings listed have been chosen to maximize KW vs. dollar value. Other sizes available upon special request.
3. Nominal voltage is chosen from those listed. Specify when ordering. Full power is available from nominal to twice nominal voltage in five taps. A sixth, reduced power tap, is provided at approximately 70% of nominal. Other voltages available upon special request.
4. Output voltages are transformer coil voltages. Three phase units may be connected in three single phases, delta or wye. Specify when ordering. When wye connected, the line-to-line output voltage is $\sqrt{3}$ times the coil voltage.