CHROMALOX
Advanced Thermal Technologies

Chromalox Power Controller Guide

Overview:

With significant investment in growing our power control line, Chromalox now provides a multitude of power controllers designed for simple to complex applications. Whether customers just need an on/off SSR, or a fully functionally control package, we have a solution.

With our advanced SCR controllers we feature Power (P), Current (I) and Voltage (V) monitoring, communication protocols, integral fusing, fully functional configuration software, and more. With controllers like the C4/C4-IR and CFW, built in PID control means we've effectively replacing the need for temperature controllers and power controllers when customers are connected through their PC Software, Digital Communications, or their own HMI, because one box does it all.

This guide will help identify the strengths and weaknesses of each controller that we offer to better identify the right application. Whatever the application or need that our customers have, we have a controller to suit.

Score:

Each controller will be given a score from 1-5 in four different categories: Ease of use, features, price, and space. For more details on what those categories are looking at, see below.

1. Ease of Use: How difficult is the unit to program? Are the menu's and screens easy to follow and navigate? Does the controller have configuration software to simplify setup and troubleshooting?

2. Features: Does the controller have diagnostics and monitoring capabilities? Can it be outfitted with communications protocols? Does it offer analog compatibility? Are there additional features like profiling and heat/cool operation or is it more straightforward?

3. Price: What is overall price compared to other controllers? Is the price per feature in line with other controllers?

4. Space: How compact is the controller? Is it limited to front panel mount or can it be back panel or DIN mounted?

Controllers:

1. SSR/SSR1/SSR2/SSR3
2. Maxpac/Minimax
3. CS1/CS3
4. CTF/CTF-XTRA
5. C4/C4-IR
6. CFW

SSR / SSR1 / SSR1P / SSR2 / SSR3 —SSR Power Controller

Criteria	Score
Ease of Use	4
Features	1
Price	5
Space	4
Resources: Catalog Page - H-91	

OVERVIEW

The Chromalox SSR series consists of cut and dry power controllers that don't put emphasis on loaded features, but instead price and space. Limited on input signal types to 4.5-32VDC or 24-265VAC/24-190VDC, this series is not quite as versatile as other options in this line, although the SSR1P series does add phase control to the lineup. Where analog input is required, the LM2 expansion module (PCN 341260) can be used to plug into the SSR and accept 4-20mA signal.

The greatest challenge with the SSR series is the "hockey puck" style SSR has a lot of players in the market. Between competitors like Crydom or distributors like Mouser, Digikey, Automation Direct, and more, being price competitive can be a challenge. Where faced with heavy competition, drive customers to the CS1 series for added benefits like SCR overtemp and line/load interrupt while still at a value price.

APPLICATIONS

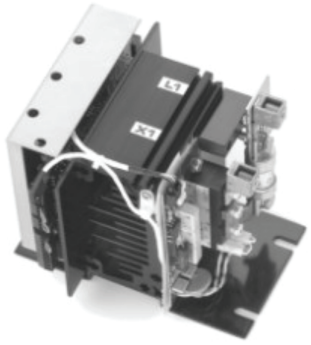
- Low budget projects or OEM's looking for simple SSR power control.
- Installations with limited space available.

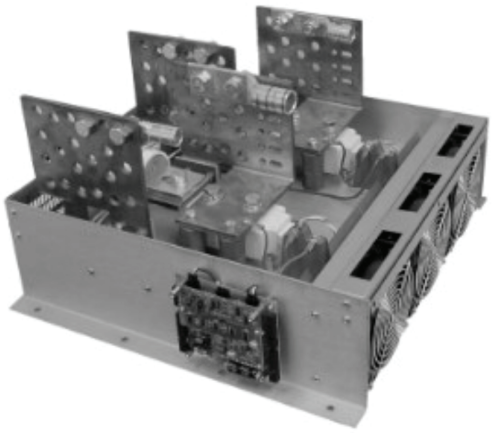
PRICE RANGE (2020): $83-$790

Pro's	Con's
Small Footprint	75A Limit (SSR/SSR1) / 55A Limit (SSR2/SSR3)
Low Price Point	Limited Features
Straight Forward Wiring and Operation	More Market Competition
Models with Phase Angle Firing Available	
LM2 Module can be added for analog input (4-20mA)	

SSR / SSR1 / SSR1P / SSR2 / SSR3 —SSR Power Controller

Criteria	Score
Ease of Use	3
Features	4
Price	1
Space	3
Resources: Landing Page	





OVERVIEW

The Maxpac series is the tried and true power controller for Chromalox. It's not the most attractive with its exposed firing board, trigger board, and I/O cards, nor is it the cheapest option for customers, but it has a large span of amperages, firing methods, phase/leg control options and flexible I/O wiring. With the latest update to the series, the Maxpac now features Modbus communications and configuration software. It doesn't reach the sky with the latest diagnostics, but with Shorted SCR detection and alarm features, it upholds more popular requests.

APPLICATIONS

- Good for applications where customers want to use a larger load SCR to drive multiple circuits. Rather than breaking up into multiple smaller SSR's, complicating wiring and challenging total cost, a larger load Maxpac with built in power distribution can be used.
- For smaller loads, the minimax is a step up from the SSR series, offering temperature warning and shut-down, dv/dt transient voltage protection and MOV protection. The MMAX series is great where a robust power controller is valued.

PRICE RANGE (2020) (MAXPAC): $1,530-$23,570
PRICE RANGE (2020) (MINIMAX): $1,345-$3,125

Pro's	Con's
High Amperage Capability	Higher cost point
Updated Configuration Software	Larger Footprint
Modbus Communications	

CS1 / CS3 —SSR Power Controller

Criteria	Score
Ease of Use	4
Features	2
Price	4
Space	5
Resources: Catalog Page - H-87	

OVERVIEW

The CS1 and CS3 power controllers take over where the SSR series leaves off with added SSR overtemperature protection, line/load interrupt, and higher amperage loads (CS1). With Line/Load interrupt, the SSR will alarm when control input is active, but there is no current on Load, or when control input is active, but there is no current on Line. Even with integrated heat sinks, the CS1 and CS3 offer slim/compact installation options. Ideal for coupling with the CTF, the CS1 is a versatile compliment in 3-Phase circuits.

APPLICATIONS

- The narrow DIN rail design of the CS1 is attractive in tight installations.
- The CS1 and CS3 are both great options where simple control and low cost control is needed, with the benefits of overtemperature protection.
- Where matched against Watlows DIN-A-MITE B series, using two CS1's can get customers the features they are after at a lower cost point. While they may be after a single package, the better price point and ability to replace individual SSR's can be a good cost advantage.

PRICE RANGE CS1 (2020): $105-$425
PRICE RANGE CS3 (2020): $260-$555

Pro's	Con's
Higher Amperage Capability In Small Package	Larger Footprint than some of the SSR series
Modbus Communications	Limited diagnostics
Integrated thermal protection a	
Line/Load Interrupt Detection	

CTF / CTF-XTRA—Advanced SCR Power Controller

Criteria	Score
Ease of Use	3
Features	4
Price	3
Space	4
Resources: Catalog Page - H-61	

OVERVIEW

Our CTF and CTF-XTRA series is part of our new line of advanced SCR power controllers. A great bridge from the low cost hockey puck style controllers to the more bulky and robust Maxpac series, the CTF offers low to medium sizes amperages, diagnostic and monitoring capabilities, and flexible firing modes in a single controller. Although a single phase SCR, the CTF can be used in Master mode to control 3-Phase 2-leg and 3-Phase 3-leg configurations. For a reduction in cost, CS1 controllers can be used for the 2nd and 3rd leg. For a final added bonus, the CTF-XTRA features a fully integrated electronic resettable fuse.

APPLICATIONS

- Processes where customers value monitoring and diagnostics including current monitoring, heater break alarm, SCR overtemp, and voltage/current/power readings among others.
- Customers looking for 1P phase angle firing and zero cross capabilities or a controller capable of a dry out mode. The CTF can manage both through the C-PWR software.
- The CTF-XTRA is ideal in critical processes where interruption is a serious concern. With the integral electronic resettable fuse, the CTF-XTRA can interrupt the supply during an event in a controlled manner, and either automatically, manually, or remotely reset the power. When automatically reset, the CTF-XTRA does so in seconds with a ramp to start feature to protect the elements and system.

PRICE RANGE (2020): $305-$2,420

Pro's	Con's
Very flexible circuit control with three phase 2-leg and three phase 3-leg configurations	Limited to 250A
Host of diagnostic and monitoring capabilities	Can not control three phase applications in phase angle
Configuration Software	
CTF-XTRA has patent pending integral fuse design	
The firing method can be switched from Zero Cross to Phase Angle through C-PWR configuration software.	

C4 / C4-IR—Advanced SCR Power Controller

Criteria	Score
Ease of Use	4
Features	5
Price	3
Space	5
Resources: Catalog Page - H-1	

OVERVIEW

The Chromalox C4 and C4-IR advanced SCR power controller is the most versatile controller in Chromalox product offering. It combines multi-loop control, PID temperature control and SCR power control in one com-pact box. In addition, the multiple loops can be combined to address 2-leg 3-Phase control or 3-leg 3-Phase control. Full current, voltage, and power diagnostics are included along with multiple Fieldbus communication protocols and options for integral I2T fusing. For more complex systems, multiple C4 or C4-IR controllers can be paired together through Modbus for complete integration and control.

APPLICATIONS

- The C4 series is an ideal option for cost reductions through consolidating PID control and power control (and multi-loops) in one box.
- Customers looking for communication protocols beyond just Modbus.
- With the C4-IR, customers can get the benefits of phase angle firing and zero cross in one box.
- This is a great product for OEM's who are looking for a small, but capable package.

PRICE RANGE C4 (2020): $920—$2,225
PRICE RANGE C4-IR (2020): $1,135—$2,5155

Pro's	Con's
Very versatile capabilities for multiple single loop control circuit or combined 3-Phase loop control	Limited to 40A (See C4X for larger loads)
Replaces multiple PID controllers and SCR controllers in small package	No local display
Competitive price point considering features	
Many firing methods available (PA, ZC, HSC, BF, etc)	
Advanced configuration software included	

CFW—Advanced Modular SCR Power Controller

Criteria	Score
Ease of Use	4
Features	5
Price	2
Space	3
Resources: Catalog Page - H-1	

OVERVIEW

The CFW series is the new work horse of the Chromalox control line. With the capability for loads to 600A, 1P, 3P-2leg and 3P-3leg wiring configurations, Zero Cross and Phase Angle firing, option for integral PID control, a full host of diagnostics, and multiple communication protocols, the CFW really does it all. While it doesn't reach the full load capability of the Maxpac series, the CFW goes above and beyond on the diagnostics and monitoring side. As we move further into Industry 4.0 and IIoT, the value of diagnostics and monitoring is becoming more realized. With power controllers like the CFW, customers are able to see exactly how their system is working so they can optimize performance to drive efficiency, or schedule preventative maintenance based on declining health of a heater.

APPLICATIONS

- Ideal where precise control and temperature monitoring and feedback are vital.
- 3 phase non typical loads that require phase angle firing or dry out
- Installations with unreliable power supply. With the P,I,V Feedback Control mode, the CFW can compensate for power supply variances.
- 690V Installations

PRICE RANGE (2020): $1,375—$14,186

Pro's	Con's
Highest level of diagnostics of all Chromalox controls	Higher price point
Loads to 600A and 690V capability	Larger footprint, especially at smaller loads
Integral PID option to consolidate control and space	
Zero cross and Phase angle options. 3P-3Leg means true phase angle firing in3-Phase applications	

CRYDOM CONTROLLER CROSSOVER AND COMPARISON GUIDE

	CRYDOM	CHROMALOX
		
Specification/Comparison	**HA/HD**	**SSR/SSR1/SSR2/SSR3**
1-Phase	125A	125A
3-Phase, 2 Leg	-	75A
3-Phase, 3 Leg	50A (53TP Series)	60A
Voltage Rating	480 VAC	600VAC
Zero Cross Firing	Yes	Yes
Phase Angle Firing	No (MCPC Series)	Yes (SSR1P Only)
Inputs	VAC, VDC	VAC, VDC (Analog w/ LM2)
SCR Overtemp Protection	No	No
Shorted SCR Protection	No	No
Load Current Monitor CT	No	No
V, I, P Feedback (Diagnostics)	No	No
Electronic Programmable Fuse	No	No
On Board Semiconductor Fusing	No	No
Modbus RTU/RS485 Communications	No	No
Configuration Software	No	No
Mounting Style	DIN Rail or Sub Panel	DIN Rail or Sub Panel
Price (2020)	$48-$191	$95-$275
Comparison	As noted on the highlight page, competing on hockey puck style SSR's can be an uphill battle with over saturation in the market. Competitors like Crydom have an extensive series list focused purely on hockey puck style SSR's. While we may have an edge in certain instances, like analog input capability and 600V, a better tactic when up against competition is to push the CS1 series. The SSR series still has its value, but be prepared to face a lot of competition in this area.	

WATLOW CONTROLLER CROSSOVER AND COMPARISON GUIDE

	WATLOW	CHROMALOX
		

Specification/Comparison	DIN-A-MITE B	CS1/CS3
1-Phase	40A	120A
3-Phase, 2 Leg	28A	-
3-Phase, 3 Leg	18A	55A
Voltage Rating	600 VAC	600VAC
Zero Cross Firing	Yes	Yes
Phase Angle Firing	No	No
Inputs	VAC, VDC, Analog	VAC, VDC
SCR Overtemp Protection	No	Yes
Shorted SCR Protection	Yes	No
Load Current Monitor CT	No	No
V, I, P Feedback (Diagnostics)	No	No
Electronic Programmable Fuse	No	No
On Board Semiconductor Fusing	No	No
Modbus RTU/RS485 Communications	No	No
Configuration Software	No	No
Mounting Style	DIN Rail or Sub Panel	DIN Rail or Sub Panel
Price (2020)	$172—$345	$105-$555
Comparison	The Chromalox CS power control series can go above and beyond the amperage ranges of the DIN-A-MITE B series, especially when 3-Phase control is required. The CS1 or CS3 should be a competitive cost considering the control ranges available. The only problem with the CS series when customers are using a DIN-A-MITE B is the analog input option. If customers are using the analog input option, consider the CTF or an SSR with LM-2 analog module.	

WATLOW CONTROLLER CROSSOVER AND COMPARISON GUIDE

	WATLOW	CHROMALOX
		

Specification/Comparison	DIN-A-MITE C	CTF
1-Phase	65A / 80A	250A
3-Phase, 2 Leg	55A / 72A	-
3-Phase, 3 Leg	40A / 62A	-
Voltage Rating	600 VAC	690 VAC
Zero Cross Firing	Yes	Yes
Phase Angle Firing	Yes (1P Only)	Yes
Inputs	VAC, VDC, Analog	VAC, VDC, Analog
SCR Overtemp Protection	No	Yes
Shorted SCR Protection	Yes	Yes
Load Current Monitor CT	Yes	Yes
V, I, P Feedback (Diagnostics)	No	Yes
Electronic Programmable Fuse	No	Yes (CTF-Xtra)
On Board Semiconductor Fusing	No	Yes
Modbus RTU/RS485 Communications	No	Yes
Configuration Software	No	Yes
Mounting Style	DIN Rail or Sub Panel	DIN Rail or Sub Panel
Price (2020)	$254—$540	$305—$2,420
Comparison	The DIN-A-MITE C is a mid range SCR from Watlow that maxes out at 80A and 600V. With the ability to perform phase angle firing in 1P setups, the CTF will be a good match. Although the price range of the CTF is higher, this is factoring in over 3X of the amperage capability and added diagnostics. Apples to apples, the CTF will be in the same arena. Outfitted with integral fusing, diagnostics, configuration software to adjust alarm and firing methodology, the CTF is a much more capable controller. If price is not competitive, and no analog input is used, consider the CS1 or CS3. If more than 1P is used on the DIN-A-MITE, consider using a CTF Master with Qty 1 or 2 CS1 controllers for 3P 2-leg or 3P 3-leg configurations.	

WATLOW CONTROLLER CROSSOVER AND COMPARISON GUIDE

	WATLOW	CHROMALOX
		

Specification/Comparison	DIN-A-MITE D	CTF
1-Phase	90A	250A
3-Phase, 2 Leg	-	-
3-Phase, 3 Leg	-	-
Voltage Rating	600 VAC	690 VAC
Zero Cross Firing	Yes	Yes
Phase Angle Firing	No	Yes
Inputs	VAC, VDC, Analog	VAC, VDC, Analog
SCR Overtemp Protection	No	Yes
Shorted SCR Protection	Yes	Yes
Load Current Monitor CT	Yes	Yes
V, I, P Feedback (Diagnostics)	No	Yes
Electronic Programmable Fuse	No	Yes (CTF-Xtra)
On Board Semiconductor Fusing	Yes	Yes
Modbus RTU/RS485 Communications	No	Yes
Configuration Software	No	Yes
Mounting Style	Sub Panel	DIN Rail or Sub Panel
Price	$473—$559	$290—$1,280
Comparison	The DIN-A-MITE D goes slightly beyond the capability of the C series by extending the amperages up to 90A and adding in integral fusing. The CTF is still a good match and will outperform the Watlow controller with its diagnostics, firing mode, and available configuration software to allow customers to fine tune their controller. The CTF should be able to compete on price when matched in the same amperage range.	

SPANG CONTROLLER CROSSOVER AND COMPARISON GUIDE

	SPANG	CHROMALOX
		

Specification/Comparison	1051/1052/1053	CTF
1-Phase	600A	600A
3-Phase, 2 Leg	600A	600A
3-Phase, 3 Leg	600A	600A
Voltage Rating	600 VAC	690 VAC
Zero Cross Firing	Yes	Yes
Phase Angle Firing	Yes	Yes
Inputs	VAC, VDC, Analog	VAC, VDC, Analog
SCR Overtemp Protection	Yes	Yes
Shorted SCR Protection	Yes	Yes
Load Current Monitor CT	Yes	Yes
V, I, P Feedback (Diagnostics)	Yes	Yes
Electronic Programmable Fuse	No	No
On Board Semiconductor Fusing	Yes	Yes
Communications	Modbus TCP/IP, DeviceNet, Profibus, Profinet, Ethernet/IP	Modbus RS-485, Modbus TCP/IP, Profibus, CANOpen, Ethernet IP, EtherCat, Profinet
Configuration Software	No	Yes
Mounting Style	Sub Panel	Sub Panel
Price (2020)	$3,000 and Up	$1,375—$14,186
Comparison	Spang 1050 Series power controllers look at combing high amperage loads with diagnostics and feedback. To pair with these capabilities, our new CFW series matches up very well. In addition to matching the features and amperages, the CFW is capable of up to 690VAC instead of just 600 VAC and also includes PC configuration software to fine tune the parameters.	