

**Our semiconductor switchgear survives –  
even where violent forces prevail.**



# sirius

# SC

**SIEMENS**

### **SIRIUS SC – for almost infinite activity**

As operating frequencies increase, conventional electromechanical switching devices are often stretched beyond their limit. High switching frequencies result in frequent failure and shorter replacement cycles. But it doesn't have to be this way – because we can now offer our latest generation of SIRIUS SC semiconductor switchgear with solid-state relays and contactors. These solid-state relays and contactors have an extremely long lifetime – for almost infinite activity even under the toughest conditions and when subject to high mechanical stressing. They are also predestined for areas which are sensitive to noise.

### **Proven many times over in the field**

SIRIUS SC semiconductor switchgear has firmly established itself in the industrial environment. This switchgear is used wherever loads must be frequently switched – predominantly for switching resistive loads, controlling electrical heating elements or valves and motors in conveyor systems. In addition to use in areas with high switching frequencies, SIRIUS SC is admirably suited, thanks to its silent switching, for applications in areas which are sensitive to noise such as offices and hospitals.

### **The most reliable solution for every application**

When compared to mechanical switchgear, our SIRIUS SC semiconductor switchgear distinguishes itself as a result of its significantly higher lifetime. The high product quality ensures that it switches with extreme precision, reliably, and especially with low associated disturbances. The SIRIUS SC family can be universally used thanks to the versatile connection system and the wide range of control voltages. Depending on the individual application, our modular switchgear can be quite simply expanded using standard function modules.

### **Always on the bright side with SIRIUS SC**

This is because SIRIUS SC offers that much more. The compact design saves space. And safe reliable operation is possible up to ambient temperatures of +60 °C with side-by-side mounting. And, not only this, but with the fast engineering, simple installation and commissioning, you not only save time but also reduce costs.



## SIRIUS SC – the rugged semiconductor switchgear for high switching frequencies.



*Since it was created about 4.6 billion years ago, violent fire storms and sudden eruptions of energy take place on the sun's 6000 °C surface. These eruptions of energy are so-called protuberances.*

Processes in space are fast – very fast. In the meantime, things have also speeded up back here on earth. Productivity is continually increasing and production capacities must be able to be flexibly adapted to the particular demand. Today, high switching frequencies are standard – demanding that state-of-the-art switchgear has an extremely high endurance. This is precisely where SIRIUS SC comes into its own.

# The SIRIUS SC product range.

## Technology in detail.

### SIRIUS SC solid-state relays

SIRIUS SC solid-state relays can be mounted on existing cooling surfaces. They can be quickly and simply retained using just two screws. The special power semiconductor technology ensures extremely good thermal contact to the heatsink. Depending on the heatsink characteristics for resistive loads, the power capability ranges from 0 to 90 A. Solid-state relays can be expanded using various function modules to individually adapt them to the particular application.

### SIRIUS SC solid-state contactors

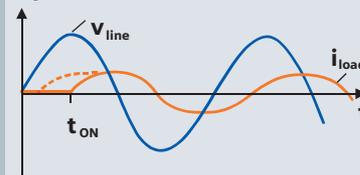
These complete devices comprise a solid-state relay and an optimized heatsink which means that they are "ready to use." They offer defined rated currents so selection is extremely simple. Depending on the particular version, currents of up to 90 A can be switched. Just like all of our semiconductor switchgear, it distinguishes itself thanks to its compact space-saving design. The devices are simply snapped onto a mounting rail using the insulated mounting foot or are screwed onto support panels. This insulation means that the devices can be used in circuits with safety or functional extra-low voltages in building systems. For other applications, e.g. for extended personnel protection, the heatsink can be grounded using a screw connection.

### Version for slightly inductive loads "Instantaneous switching"

In this particular version, the solid-state contactor has been especially harmonized to switch inductive loads. Valves in a filling system can be frequently operated and small drives in packet distribution systems can be frequently started and stopped – and that reliably and silently.

#### Instantaneous switching

Switching inductive loads –  
e.g. motors



#### Special "Low Noise" version

Using a special control circuit, this version can be used in public line supplies up to 16 A – and that without any additional measures such as noise suppression filters. For instance, when it comes to noise emission, the limit value characteristic Class B according to EN 60947-4-3 is maintained.

#### Special "short-circuit proof" version

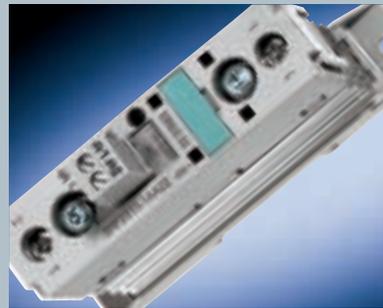
Using a standard miniature circuit breaker the device is made "short-circuit proof" by smartly harmonizing the power semiconductor to the rating of the solid-state contactor. This means that a short-circuit-proof feeder can be created in conjunction with a B-type miniature circuit-breaker or a conventional fuse.

#### 22.5-mm/0.89-in solid-state relay

It is just 22.5 mm wide – and that for currents up to 90 A – making our 3RF21 solid-state relay a real space saver. The logical connection system – the power is connected at the top and the load at the bottom – ensures that cabinet layouts are straightforward and transparent.

#### 45-mm/1.77-in solid-state relay

The 3RF20 45-mm design allows the power and the load to be connected at the top. This permits existing solid-state relays to be simply replaced in existing circuits. The control cable is simply plugged in just the same as for the 22.5-mm design.



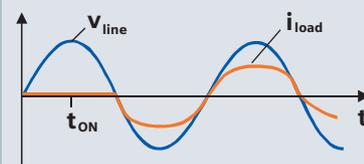
#### Versions for resistive loads

##### "Zero-point switching"

This standard version is often used to power up and power down heating elements.

#### Zero-point switching

Switching resistive loads –  
e.g. heating circuits



## Functionality

The functionality of our semiconductor switchgear can be appropriately adapted in order to guarantee optimum control characteristics for a wide range of loads.

The “zero-point switching” technique has proven itself to be optimal for resistive loads. This means that the power semiconductor is precisely controlled at the zero-voltage crossover. On the other hand, for slightly inductive loads, the “instantaneous switching” technique is better. Valves are good examples of slightly inductive loads. Disturbances are reduced to a minimum by distributing the turn-on point over the complete sinusoidal characteristic of the line voltage.

## Function modules

A wide range of applications demand an extended functionality. These requirements can be extremely simply fulfilled using our function modules. These modules are simply snapped on and the necessary connections established to the solid-state relay or contactor. The plug-in connection to control the semiconductor switchgear can be simply re-used.

**The following modules are available for SIRIUS SC:**

### Converter

Using this module, analog control signals are converted into a pulse-width modulated digital signal. Many temperature controllers output these types of analog control signals. This means that the connected solid-state contactors and relays can set the power of a load as a percentage depending on an input signal.

### Load monitoring

Many faults can be quickly detected by using this module to monitor a load circuit connected to the semiconductor switchgear. For instance, when load elements fail (up to 6 in the basis version or up to 12 in the extended version), destroyed power semiconductors, missing voltages or load circuit interrupted. A fault is displayed using one or several LEDs and signaled to the control system using a PLC-compatible output.

### Power controller

This module permits a functionality to be implemented which is similar to a power controller. The following functions are integrated:

**Power controller with P control** to adjust the power of the connected load, and also to maintain the power constant even when the voltage fluctuates or the load resistance changes.

**Soft start current limiting:** The inrush current is limited using phase control with an adjustable voltage ramp. This is especially practical for loads, e.g. lamps which have a high inrush current.

**Load circuit monitoring** to detect load failure, destroyed power semiconductors or missing voltages and interrupted load circuits.



*Solid-state contactor completely wired up*



*Solid-state contactor with the control connector withdrawn*



*Function module inserted*



*Connector re-inserted on the function module*



SIRIUS SC in use.

## SIRIUS SC in the field

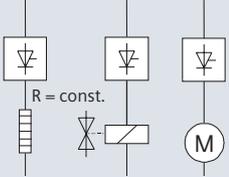
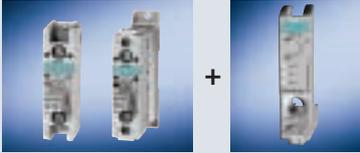
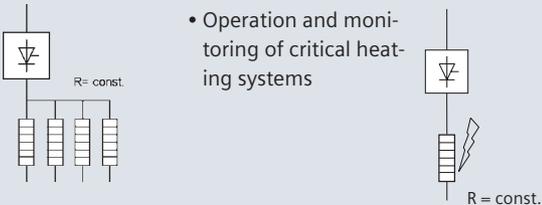
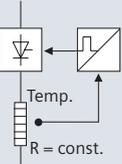
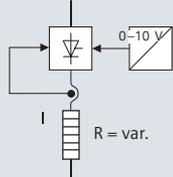
### Using the plastic machine industry as example

Thanks to its high electrical endurance, SIRIUS SC semiconductor switchgear is the optimal solution to control electrical heat. This is because the finer the temperature control must be, the higher is the switching frequency. Electrical heat is precisely controlled, for example, in many processes in the plastic machine industry:

- Radiating heating elements heat up the plastic blanks to the correct temperature
- Heated drums dry the plastic granulate
- Heating elements keep molds at the correct temperature in order to perfectly manufacture various plastic parts

Several heating loads can be controlled using the high-performance SIRIUS SC solid-state relays and contactors. The partial loads can be monitored in a user-friendly fashion by using a load-monitoring module and when a failure occurs, a signal can be output to the control system.

### Overview of the SIRIUS SC product range

What	No problem with SIRIUS SC	Applications
Frequent switching	Solid-state relay or solid-state contactor 	<ul style="list-style-type: none"> <li>• Controlling several heating elements with constant resistance</li> <li>• Actuating valves</li> <li>• Starting and stopping small motors</li> </ul> 
Frequent switching and monitoring the load and the solid-state relay/contactor	Solid-state relay or solid-state contactor plus load-monitoring module 	<ul style="list-style-type: none"> <li>• Several heating elements are controlled with constant resistance using a solid-state relay or solid-state contactor</li> <li>• Operation and monitoring of critical heating systems</li> </ul> 
Controlling the heating power using the on/off ratio	Solid-state relay or solid-state contactor plus converter module 	<ul style="list-style-type: none"> <li>• Distributed, autonomous temperature control; the temperature controller operates directly with SIRIUS SC</li> </ul> 
Closed-loop control	Solid-state relay or solid-state contactor plus power control module 	<ul style="list-style-type: none"> <li>• Complex heating systems</li> <li>• Heating elements with temperature-dependent resistance</li> <li>• Heating element with long-time aging</li> <li>• Basic, indirect temperature control using closed-loop power control</li> </ul> 

# 100% functionality for every application – SIRIUS SC.

## Unique level of functionality

SIRIUS SC has a unique production quality as it is produced completely automatically without any manual intervention. Thanks to the special substrate and selected semiconductors, the technical data, such as the thermal transition and power loss, are optimized. This is the reason that solid-state relays can be simply mounted onto various cooling surfaces – but can still handle the rated currents specified in the Product Standard EN 60947-4-3. As a result of the high blocking capability of the power semiconductors, they essentially don't require additional protective circuitry, even when connected to rugged industrial line supplies.



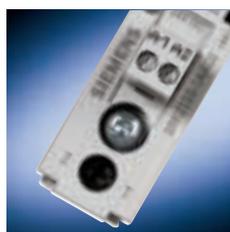
High tech made in Amberg.

## Versatile connection system

SIRIUS SC semiconductor switchgear distinguishes itself as a result of a versatile range of connection systems. You can select between the SIGUT connection system – the industrial standard for loads up to 50 A; or the innovative spring-loaded terminal system for loads up to 20 A. These don't require any screw connection and therefore guarantee high resistance to vibration. There are also ring-type cable lugs for reliably retaining even large cable cross-sections for currents up to 90 A. SIRIUS SC offers the optimum system to connect up the main circuit for every mounting type and naturally with extensive finger-touch safety.

## Structure of a typical load feeder

SIRIUS SC can be used for a wide range of applications as a result of the versatile connection systems and the wide range of control voltages. SIRIUS SC solid-state relays and contactors can be used in fuseless or fused load feeders. Our solid-state contactors are also available in a special "short-circuit proof" version. This means that semiconductor protection is also provided in fuseless configurations.



Versatile connection systems: SIGUT, spring-loaded terminal or ring-type cable lug: SIRIUS SC always offers the optimum connection system.

## Product features:

Which semiconductor switchgear for which application?

Feature		Solid-state relay 22.5 mm/0.89-in	Solid-state relay 45 mm/1.77-in	Solid-state contactor
<b>Use</b>	Existing solid-state relays can be simply replaced	○	●	○
	Complete "ready to use" device	○	○	●
	Space-optimized	●	○	●
	Can be expanded in a modular fashion using function modules	●		●
<b>Mounting</b>	Mounted on DIN rails			●
	Can be used on "cool plate" heatsinks	●	●	
<b>Cable routing</b>	The load circuit is connected just like other switchgear 	●		●
	The load circuit is connected at the top 		●	
<b>Connection system</b>	Spring-loaded terminal	●		●
	SIGUT	●	●	●
	Ring-type cable lug	●		●

○ Conditionally applicable

● Completely applicable

### Siemens AG

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