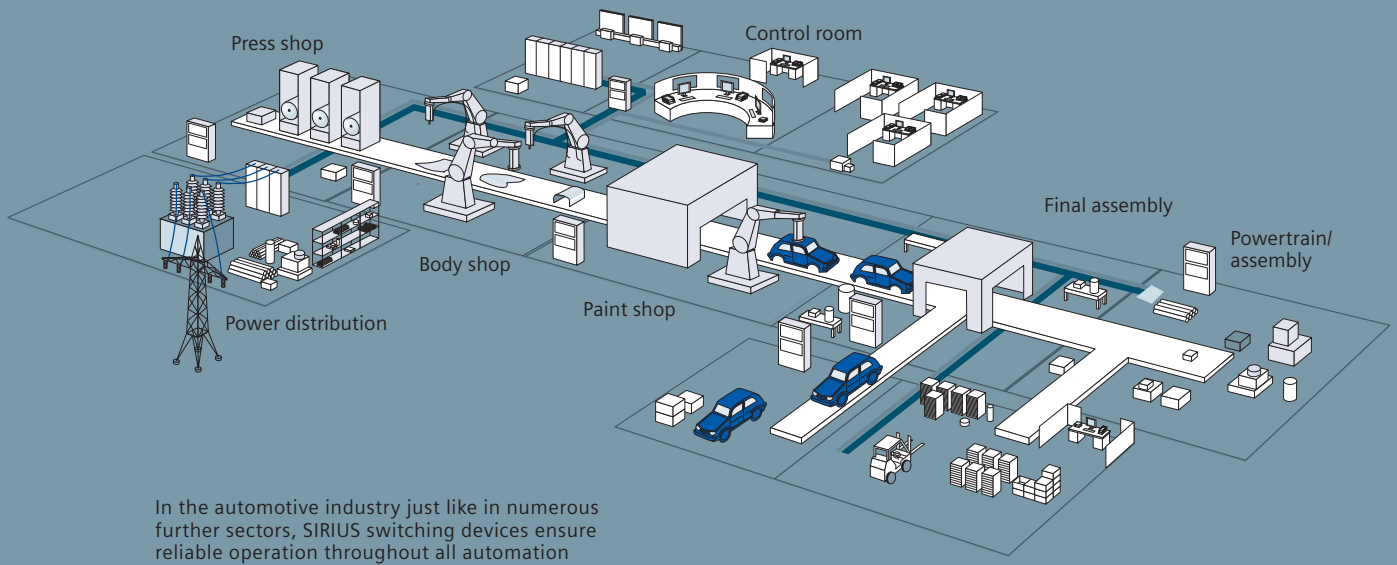
Reliable solid-state switching devices

for frequent switching of resistive or motor loads

SIRIUS

Answers for industry.

SIEMENS



In the automotive industry just like in numerous further sectors, SIRIUS switching devices ensure reliable operation throughout all automation levels

Everything. Easy.
SIRIUS Industrial Controls.

For more than 110 years now, we have been developing and manufacturing industrial control products for you. We have always followed the philosophy to make it easier for you by using innovative industrial controls – whether they are in the electrical cabinet, in the field or directly on the machine. This is the reason that today we have combined our complete range of industrial controls under just one star – SIRIUS®.

Everything required to switch, protect and start loads is now in the SIRIUS portfolio. The breath of products includes those which monitor, control, command, signal, detect and supply. Combining our portfolio with higher-level, seamless concepts such as Totally Integrated Automation™, Safety Integrated® and ECOFAST® enable the user to create optimized systems.

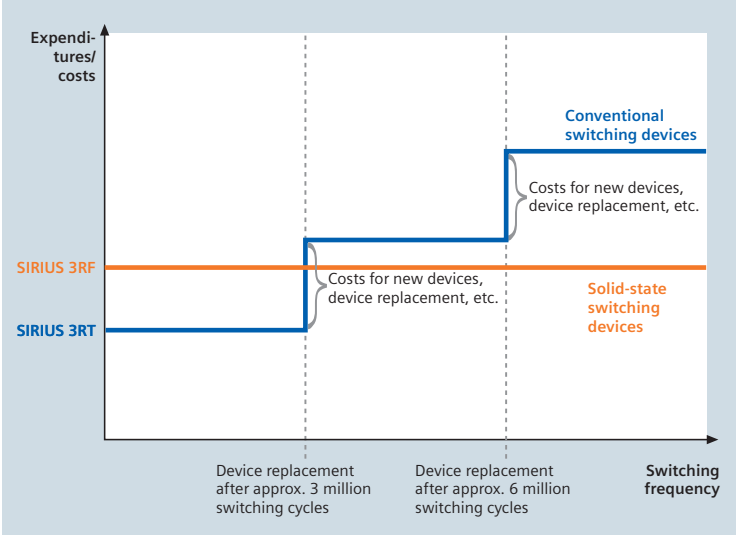
The result is that you obtain reliable and innovative industrial controls that utilize state-of-the-art features – for instance, communications and safety systems are integrated – as basis for leading-edge and seamless solutions.

The extensive range that we offer for switching motors and equipment is an important part of our SIRIUS industrial controls. Starting with well-proven and reliable contactors through simple-to-handle relays up to our innovative solid-state switching devices for use in the most rugged of applications – with SIRIUS, you simply always switch safely and reliably. With SIRIUS industrial controls, you can look forward to the future with confidence.

High switching frequencies, long service life:

Solid-State Switching Devices with Added Value

To improve the competitiveness of industrial systems and plants, the increasing of productivity is becoming more and more important. The result: rising switching frequencies, which can often no longer be mastered by conventional switching devices. A clean-cut case for our SIRIUS solid-state switching devices – once installed, they offer almost unlimited activity. Regular time- and cost-intensive device replacements are thus a thing of the past. Using SIRIUS solid-state switching devices for tasks requiring high switching frequencies is therefore profitable. See for yourself!



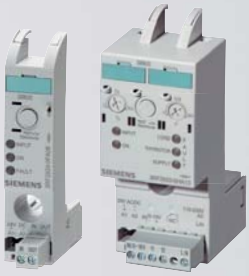
Sustainable improvements – solid-state switching technology

Compared to conventional switching devices, our SIRIUS solid-state switching devices stand out with their wear-free and quiet switching behavior. Despite the high switching frequencies, these characteristics are aided by the use of powerful semiconductors, which means that the devices do not use any mechanically moving parts. Where conventional electromechanical devices fail and need to be replaced after a certain number of switching cycles, the SIRIUS solid-state switching devices continue their reliable operation.

Single- and three-phase solid-state relays for resistive loads

Single- and three-phase solid-state contactors for resistive loads

Three-phase solid-state contactors and reversing contactors for motors



Standardized function modules for various applications

SIRIUS solid-state switching devices – a wide range of advantages

No matter how complex and diversified your tasks may be: Our seamless and integrated product range for frequent switching offers the ideal solution for all applications. We offer single- and three-phase solid-state contactors and relays for resistive loads. For switching of motor loads, we also offer three-phase solid-state contactors – as well as solid-state reversing contactors. Furthermore, we offer function modules which allow easy and highly flexible responses to new requirements.

Accurate, reliable and cost-effective

SIRIUS solid-state switching devices are accurate and reliable. Their compact design assures safe operation up to an ambient temperature of 60 °C (140 °F). Variable connection technologies and a wide control voltage range provide for universal application and variant reduction. The connection technology with removable control terminal further ensures fast and uncomplicated assembly of control cabinets and distribution boards. Ease of mounting and rapid commissioning provide substantial time and cost savings.

Convincing, manifold and proven

The use of our SIRIUS solid-state switching devices is great for multiple application cases: particularly for the control of electric heat, the actuation of valves and motors in conveyor technology or for reversing applications. Due to their quiet switching capability, they are suitable for noise-sensitive areas such as offices or hospitals.

Maximum quality

The fully automatic production of our SIRIUS solid-state switching devices forms the basis for their unique quality. Due to special carrier materials and selected semiconductors, the technical data such as heat transition and power loss is optimized. Therefore, the solid-state relays can be easily mounted onto diverse cooling surfaces while mastering the rated currents specified by the EN 60947-4-3 product standard. In addition, due to the power semiconductors' maximum blocking capacity, additional protective circuits can be eliminated.

Global application

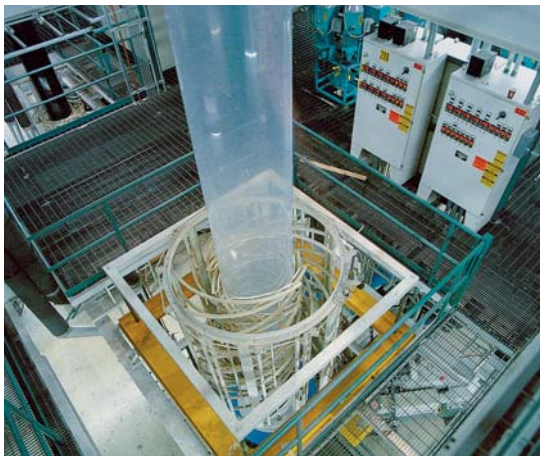
SIRIUS solid-state switching devices are equipped with particularly powerful semiconductors, thanks to which they offer an enormous short-circuit rating. They can therefore be employed in UL-compliant control cabinets without any problems and offer a high SCCR value (short-circuit current rating).

In addition to UL/UR approval, the SIRIUS solid-state switching devices of course also meet all other important standards and approvals such as IEC, CSA, CCC, C-Tick and GOST and are thus globally applicable.

Multiple individual assembly options:

Switching of Resistive Loads

Even maximum switching frequencies are easily handled by our solid-state switching devices. In addition to their basic application area, the switching of heaters, they can also be employed for valves or other inductive loads. Depending on the respective application, "zero-point switching" or "instantaneous switching" variants are available. Besides simple on- and off-switching, the load circuits are monitored by retrofittable function modules, allowing even heating power to be controlled.



SIRIUS solid-state relays

SIRIUS solid-state relays are suitable for assembly on existing cooling surfaces. The mounting process is completed quickly and easily with only two screws. The power semiconductor's special technology ensures a perfect thermal contact with the heat sink. Depending on the heat sink's characteristics, the devices offer a capacity of up to 88 A for resistive loads. If very many resistive loads have to be controlled, the relays can be mounted on a large group heat sink. With a dissipation of the power loss to the outside, the control cabinet's heating is minimized. For individual adjustments, the solid-state relays can be extended by various function modules.

Single-phase versions

Solid-state relays 22.5 mm
With its narrow width of 22.5 mm, our 3RF21 solid-state relay saves space. The logical connection technology, the power supply from the top and the load connection from the bottom ensure a structured assembly inside the control cabinet.

Solid-state relays 45 mm
The 45 mm standard version 3RF20 offers a top connection of the power supply line and the load. This facilitates easy replacement of available solid-state relays in existing assemblies. As with the 22.5 mm version, the control line is simply plugged on.

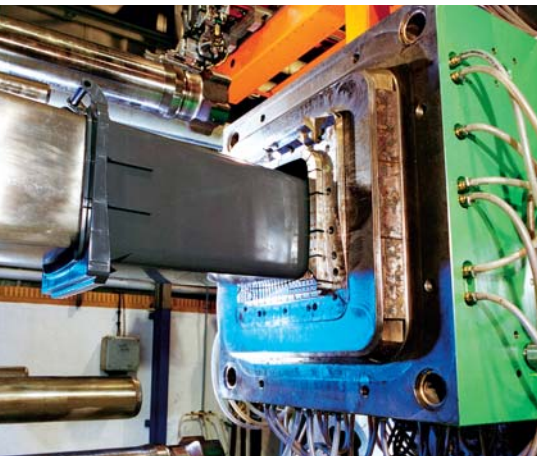
Three-phase versions

With their compact width of 45 mm, the 3RF22 three-phase solid-state relays offer a space-saving and cost-affordable solution for the operation of three-phase loads. Depending on the employed heat sink, loads of up to 55 A can be switched. You can also choose between two- and three-phase controlled versions. The two-phase controlled version distinguishes itself as a result of having the lowest power loss; the three-phase version can be used when all three phases need to be switched operationally. Similarly to the 3RF21 solid-state relays, the power supply line is connected from the top and the load from the bottom. The removable control plug allows for prewiring of the circuit.

3RF21 single-phase solid-state relay

3RF20 single-phase solid-state relay

3RF22 three-phase solid-state relay



SIRIUS solid-state contactors

The complete devices consist of a solid-state relay plus an optimized heat sink and are "ready to use". Due to the heat sink's exact matching to the power semiconductor, defined rated currents are realized. This way, solid-state switching devices which are accurately matched to the respective load can be selected rapidly and easily. Depending on the version, current strengths of up to 88 A are supported.

Like all of our solid-state switching devices, our SIRIUS solid-state contactors stand out with their compact and space-saving design. The devices can be mounted closely, side by side, due to the special design of their terminals which are protected against direct touch. The insulated mounting foot allows for the devices' easy snap-on installation on the mounting rail or fitting to mounting plates using fixation screws. This insulation facilitates the contactors' application in circuits accommodating extra-low protective or function voltages in building technology. For other application cases, e.g. extended personal protection, the heat sink can be grounded by means of screw-type connections.

Optionally, SIRIUS solid-state relays and contactors can be installed in fuseless or fused load feeders. Our single-phase solid-state contactors are furthermore available in a "short-circuit-proof" special version. This way, semiconductor protection is also assured in fuseless assemblies. Due to a convenient matching of the power semiconductor to the solid-state contactor's power rating, short-circuit-proof functionality is attained with a standard supplementary protector. When combined with a B-type supplementary protector or a conventional line protection fuse, a short-circuit-proof load feeder is assembled.

3RF23 single-phase solid-state contactor

3RF24 three-phase solid-state contactor

Single-phase versions

With seven versions, the 3RF23 single-phase solid-state contactors cover a current range up to 88 A. The 10.5 A and 20 A versions have a narrow width of 22.5 mm. Special versions facilitate the devices' application in public mains or a short-circuit-proof assembly using a supplementary protector up to 25 A.

Three-phase versions

The 3RF24 three-phase solid-state contactors are typically used in three-phase applications. With five versions, offered in two- and three-phase-controlled versions, a current range from 10 to 50 A is covered. As with the three-phase solid-state relays, they serve a voltage range from 48 to 600 V AC and are offered as "zero-point switching" version. The wide control voltage range from 4 to 30 V DC allows for the devices' operation on digital controls (PLC) or simple temperature controllers.

Maximum reliability in every respect:

Motor Switching

Ever increasing productivity requirements are driving an increase in the switching frequency requirements for motor applications. This challenge poses no problem for our SIRIUS solid-state contactors for motor switching. With three-phase motors up to 7.5 kW (5 hp), they reliably operate even the maximum switching frequencies. The application of solid-state reversing contactors allows for a continuous reversal of the motor rotation. The typical application examples include conveyor belts in parcel distribution systems or palletizing machines.

3RF34 three-phase solid-state contactor up to 5 A

Three-phase solid-state contactors

These two-phase-controlled, instantaneous switching solid-state contactors embedded in an insulated enclosure are rated up to 5 A in a width of 45 mm and up to 16 A in a width of 90 mm. Motors of up to 7.5 kW (5 hp) can be operated.

Three-phase solid-state reversing contactors

The integration of four current paths in a reversing circuit accommodated in a single enclosure turns this device into a particularly compact solution. Compared to conventional systems, for which two contactors are required, the three-phase reversing contactors facilitate space savings of up to 50 % of the width. Devices with a width of 45 mm cover motors up to 2.2 kW (3 hp) and the 90 mm width design serves motor applications up to 3 kW (3 hp).

3RF34 three-phase solid-state reversing contactor up to 16 A

Systematic combination and mounting

The SIRIUS solid-state contactors and reversing contactors are designed to be easily combined with components of the SIRIUS modular system. Connection with SIRIUS motor starter protectors, SIRIUS overload relays or current monitoring relays is effortlessly possible. This saves time in the assembly of fuseless and fused motor feeders for frequently switching applications.

Fuseless and fused motor feeders

Extended functionality, improved options:

Function Modules

In the industrial world, challenges form part of everyday business. Production capacities need to be adjusted to the respective requirements with even more flexibility. This presents a clean-cut case for our SIRIUS solid-state switching devices for the switching of resistive loads. Combined with standardized function modules, these devices can be quickly and reliably extended and adapted to individual requirements.

Single-phase solid-state contactor with load monitoring

Three-phase solid-state contactor with converter

Simply snap on and work away

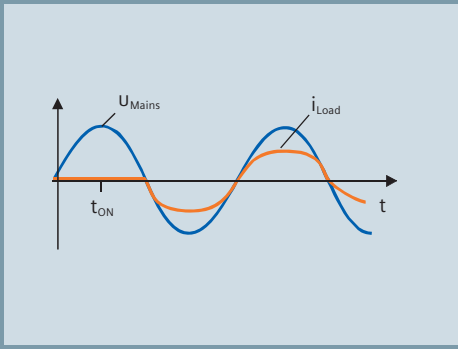
Assembly of our function modules is completed in quickly. By simply snapping them on, all connections to the solid-state relay or contactor are established. The plug connection for the control of the solid-state switching devices can be used. It could hardly be simpler.

The function extension of the single-phase solid-state relays with a width of 22.5 mm and the single-phase solid-state contactors by the function modules' simple plug-on installation supports numerous different applications.
With three-phase applications, the three-phase solid-state contactors and relays can be extended by converters to assemble a simple power control.

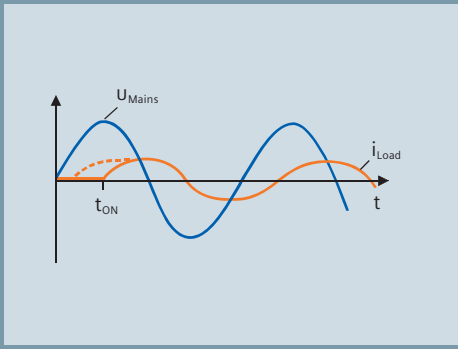
For resistive and inductive loads:

Optimized Control Principles

Variable Connection Technology



Zero-point switching:
Switching of resistive loads, e.g. heating circuits



Instantaneous switching:
Switching of inductive loads, e.g. motors

Variable connection technology:
Screw-type connection, spring-loaded or ring cable lug connection: SIRIUS solid-state switching devices offer the optimum technology for all applications

Version for resistive loads: "zero-point switching"

To assure an optimized control principle for various loads, the functionality of our single- and three-phase solid-state switching devices has been adapted. For resistive loads, the "zero-point switching" principle is best. This means: The power semiconductor is controlled exactly when the voltage passes through zero.

Version for inductive loads: "instantaneous switching"

For inductive loads, such as valves, the "instantaneous switching" principle is a better solution. Due to the distribution of the switch-on point over the complete sinusoidal curve of the mains voltage, disturbances are minimized. This version of the solid-state switching devices is specifically matched to inductive loads. Tasks such as the frequent operation of valves in a filling system as well as the start-up and shutdown of small drives in parcel distribution systems are reliably and quietly completed.

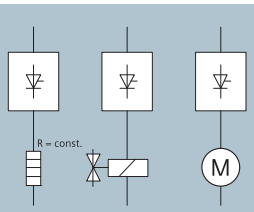
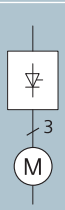
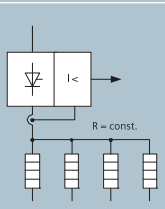
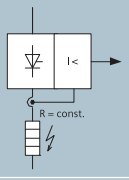
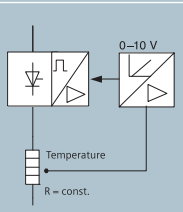
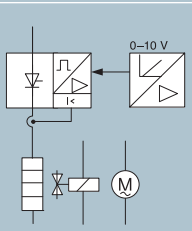
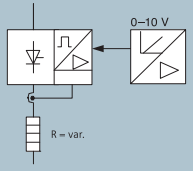
Special version for resistive loads: "low-noise"

Due to a special control circuit, this version of the single-phase solid-state contactor can be used in public mains up to 16 A without additional measures such as noise suppression filters. Thus, the emitted interference does not exceed the limit value curve Class B in accordance with EN 60947-4-3.

All SIRIUS solid-state switching devices are characterized by a large number of available connection technologies. You can choose between screw-type connection, the industrial standard for loads up to 50 A, or the innovative spring-loaded technology for loads up to 20 A, which requires no screw connections while guaranteeing a high vibration resistance. Another option is the ring cable lug connection technology for safe attachment of large cross-sections with currents up to 88 A. SIRIUS solid-state switching devices offer the best suited main current connection for all assembly types including protection against direct touch.

Overview table:

The SIRIUS Solid-State Switching Devices Portfolio

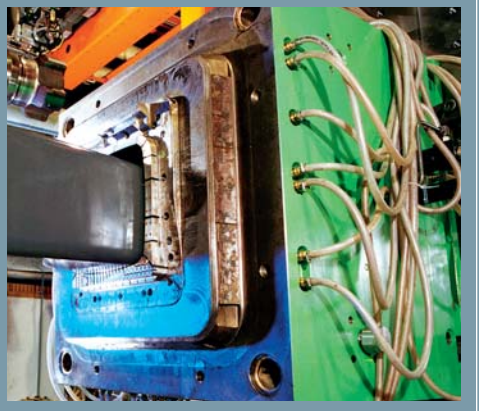
Function	Applications
Frequent switching of resistive and inductive loads Solid-state relay or solid-state contactor 	■ Operation of individual heating elements with constant resistance ■ Operation of valves ■ Starting and stopping small single-phase motors 
Frequent switching of motors Solid-state contactor or solid-state reversing contactor, three-phase units with two or three phase control 	■ Starting and stopping small three-phase motors – Connection to the 3RV motor starter protector via link module – Capable of attaching to the 3RB2 solid-state overload relay 
Frequent switching and load monitoring of solid-state relays/solid-state contactors Solid-state relay or solid-state contactor plus load or heat monitoring module 	■ Operation of several heating elements with constant resistance at a solid-state relay or solid-state contactor  ■ Operation and monitoring of critical heating systems 
Control of the heating power through ON/OFF ratio Solid-state relay or solid-state contactor plus converter module 	■ Distributed autonomous temperature control (the temperature controller directly cooperates with the SIRIUS solid-state switching device) 
Control of the heating power through ON/OFF ratio (or phase angle control) Solid-state relay or solid-state contactor plus power controller module 	
Power control Solid-state relay or solid-state contactor plus power regulator module 	■ Complex heating systems ■ Heating elements with temperature-dependent resistance ■ Heating elements with long-time aging ■ Simple indirect temperature control through power control 

Solid-State Switching Devices in Practical Application

Resistive loads

Solid-state relays

Future-safe control of plastic injection machines



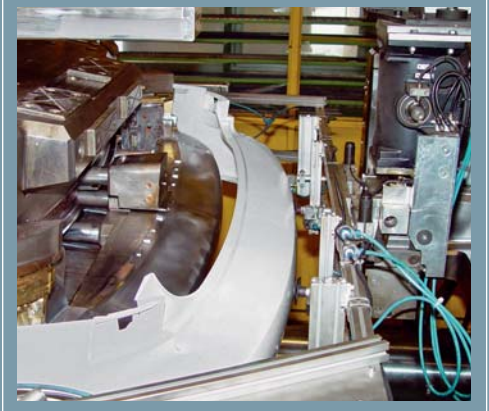
Challenge
A monitoring option for the individual heating zones is required for the efficient control of plastic injection machines. Also a cost-favorable and space-saving assembly as well as optimum stability, even with high switching frequencies, represent further crucial aspects.

Solution
The ideal devices for these requirements: SIRIUS solid-state relays 3RF2130 with a maximum load current of 30 A and a width of 22.5 mm. As an alternative, the application of 3-phase solid-state relays 3RF2230 supports even further space savings. With these devices, for example three loads respectively can be operated in three-phase circuit with only one solid-state relay – with a width of only 45 mm.

Advantages
- Easy mounting directly on group heat sink thanks to compact design
- Easy plug-on retrofitting of load monitoring modules (e.g. 3RF29) on 1-phase devices
- Virtually unlimited service life for high system availability

Solid-state contactors

Optimized bumper production in the automotive industry



Challenge
The retrofit process for bumper production machines amongst others aims at the target of increased temperature control quality. For this purpose, conversions must be realized rapidly, effortlessly and with minimum cost expenditures.

Solution
Predestined for application in injection molding plants: SIRIUS solid-state contactors. These extremely rugged devices facilitate particularly fast switching and ensure the required temperature quality at all times.

Advantages
- Silent and wear-free switching – even with high switching frequencies
- Immediate applicability – thanks to optimally adjusted heat sink
- Improved quality and cycle time reduction from 80 to 54 seconds – thanks to optimized temperature control
- Power setting in percentage – conversion of analog into pulse width-modulated digital signals by means of plug-on converter module

Function modules

Easy heating zone monitoring of gluing robots in the automotive industry

Challenge
Hot glue is applied by a gluing robot for disk mounting. For this purpose, the glue is transported from the drum pump to the dosing head via a heated line system. During this process, monitoring of the individual heating zones is of vital importance. The current limit value must be easily adjustable.

Solution
First choice for this application case: SIRIUS solid-state contactors 3RF23 in connection with the function module load monitoring basic 3RF2920-0FA. Every module is able to monitor up to six sub-loads per solid-state switching device. Besides sub-load failure, the load monitoring also signals mains failure as well as thyristor faults to the control – at a fault response rate of 100 ms.

Advantages
- Easy and flexible teach-in of the setpoint current via the teach button
- Immediate display of radiator faults or failures via the load monitoring module – short response times for prevention of downtimes
- Easy and space-saving plug-on mounting of the load monitoring modules on a SIRIUS solid-state contactor

Motor loads

Heating control SIPLUS HCS300I

Reliable and precise control of resistive loads: Modular, easy and flexible

Challenge
Whether in automotive production or in the plastics industry: Heating controls have to ensure the right temperature at the right location at all times. This necessitates systems which are characterized by maximum reliability and flexible adjustability to individual requirements.

Solution
Together with the solid-state switching devices SIRIUS 3RF2, the modular heating control SIPLUS HCS300I represents the ideal solution for such applications. The switching devices can be easily connected to the HCS300I via pre-assembled cables. This considerably reduces wiring expenditures in the control circuit and minimizes mounting times.
Every basic device of the SIPLUS HCS300I is able to control maximally 24 solid-state switching devices via 6-channel digital outputs and to operate four 4-channel temperature detections. The current and voltage of the loads can be monitored. Communication to the superior control is realized via PROFIBUS DP.

Advantages
- Flexible, modular heating control of resistive loads
- Easy integration in existing automation systems such as SIMATIC and SIMOTION
- Flexible wiring and commissioning

Further information is available at:
www.automation.siemens.com/_en/heating-control

Solid-state contactors/reversing contactors

Compact, extremely durable reversing circuit in solar plants

Challenge
The following installation alternatives are available for the configuration of photovoltaics plants: fixed installation or tracking of the solar panels in one or two axes. The tracking of these modules is controlled via solid-state contactors 3RF24. The plant's automation has to be realized with minimum expenditures. The special maintenance situation calls for a service-friendly and particularly durable solution.

Solution
The rugged and compact SIRIUS solid-state reversing contactors represent the perfect solution for these requirements. Thanks to their minimum dimensions, they reduce space requirements and thus minimize the control cabinet.

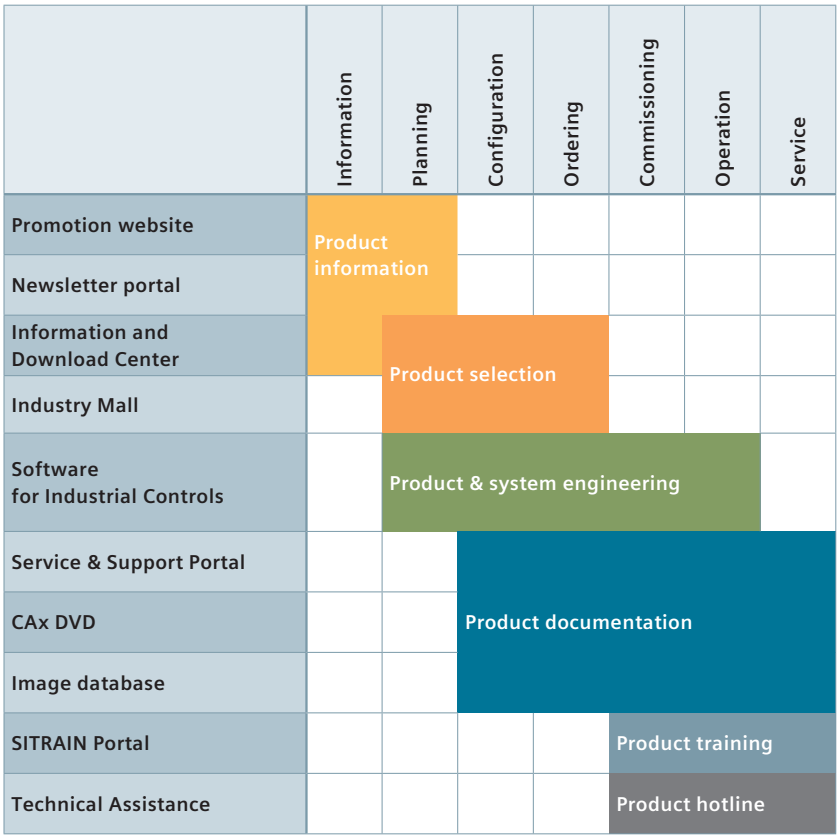
Advantages
- Considerably increased plant availability and reduced service costs – thanks to extremely long service life
- Perfect combination options with components from the SIRIUS modular system (e.g. with SIRIUS circuit breakers or SIRIUS overload relays)

Support

As competent and reliable partner, we do not only offer tried-and-tested products and systems, but also comprehensive support – from initial information to planning, configuration and ordering, right to commissioning, ongoing operation and technical service:

- Access to all important and up-to-date information: From the website to the newsletter, to the download of complete brochures
- Ordering and information platform for all products and systems
- Efficient tools for increased productivity, e.g. CAx DVD for your configuration process
- Service & Support Portal for comprehensive technical information on configuration and system documentation

We thus provide you with a comfortable basis for optimizing your processes. In short:
Support for improved efficiency!



Product information

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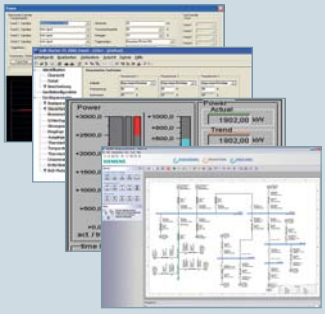

Software for Industrial Controls:
easy, fast and safe
Our software supports you throughout all project phases – from planning to parametrization, right to operation.

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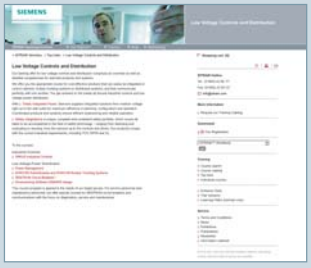
Product training



Training: expand your knowledge
Our training offer both comprises an overview as well as detailed competencies regarding selected products and systems. Amongst others, you can expand your product and system know-how of SIRIUS.

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Product hotline

Technical Assistance:
competent Industrial Controls expert consulting
We support you with all technical enquiries regarding our products and systems – both before and after delivery.

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- Special versions, special requirements
- Commissioning, operation

Tip: the Service & Support Portal, including the FAQ database, can be called up via www.siemens.com/industrial-controls/technical-assistance. You can also directly submit your support request to a technical consultant.

www.siemens.com/industrial-controls/technical-assistance
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