



## Solid State Relays and Contactors

- Featuring Direct Copper Bonding Technology
- Most Switching Types in the Industry
- For PCB, Chassis or DIN Rail Mounting
- Innovative Fast-Connect ThyReX Series



Switch



# Switching Principles Designed for *Your* Application Requirements

### Zero Switching

*For resistive, inductive and capacitive loads*

Upon application of the control voltage, the SSR's output is activated at the first zero crossing of the line voltage. The response time is less than a half period, i.e. typically less than 8.33 ms. Also offered with an optional system monitoring function and current sensing function, as shown in the lower right.

Due to the high surge current and blocking voltage capabilities, SSRs of this switching type will also perform successfully with most inductive and capacitive loads. They are the most commonly used SSRs in plastics molding machinery, packaging machines, soldering equipment and machinery for the food processing industry.

### Instant-on Switching

*For inductive loads*

The SSR output is activated immediately after applying control voltage. Consequently, this relay can turn on anywhere along the AC sinusoidal voltage curve. Response times can typically be as low as 1 ms.

The SSR is particularly suitable in applications where a fast response time is desired, such as solenoids or coils.

### Peak Switching

*For heavy inductive loads*

The peak switching SSR is designed in a way that the power output is activated at the first peak of the line voltage upon application of the control voltage. After the first half period, the Peak Switching SSR operates as an ordinary Zero Switching SSR. The peak of the inrush current could hereafter be reduced during the first half period for inductive loads. Ideally suited for inductive loads with a remnant iron core (i.e. transformers).

### DC Switching

*For resistive and inductive loads*

The power semiconductor in the DC switching relay operates in accordance with the control input. The response time is less than 100 ms. DC Switching SSRs are used with resistive and inductive loads for the control of DC motors and valves.

When switching inductive loads it will be necessary to interconnect a free wheeling diode surplus voltage parallel to the load as protection.

### Analog Switching

*For resistive loads*

Since the 4-20mA or 0-10VDC control input of the analog relay can be varied, the output operates in accordance with the phase control principle. The relay is equipped with a built-in synchronization circuit in order to achieve phase angle control. The output is proportional to the input signal. The transfer function is linearized and reproducible.

These SSRs are highly advantageous in closed loop applications or where soft starting can limit high inrush currents. Ideal for use in switching quartz heaters or in applications which demand precise temperature control.

### Analog Full Cycle Switching

*For resistive loads*

With this particular switching principle, the SSR provides a number of full cycles, evenly distributed over a fixed time period, depending on the control input (either 4-20mA or 0-10VDC) — with the low value of the input corresponding to zero and the high value of the input to a full output with a period of 1.28 seconds.

Typical applications include: Analog control of heating elements with manual or automatic controllers with 4-20mA or 0-10VDC control signal. Control of heating zones, controlled individually by a number of temperature controllers with analog output. Analog control of fragile heating elements which are used for cutting, welding etc., which can have their lifetime extended due to the reduced thermal load stress.

### Zero Switching with System Monitoring

*For resistive and inductive loads*

Normal Operation	Line Relay OFF	Line Relay ON	Line Voltage Loss	Line Voltage Loss	Load Open Circuit	Load Loss	DC Supply Loss	DC Supply Loss	Relay Remains	Relay OFF	Relay Shorted	Shorted Relay
Line Voltage	Present	Present	Present	Absent	Present	Absent	Present	Absent	Present	Absent	Present	Absent
Load Current	Present	Present	Present	Absent	Present	Absent	Present	Absent	Present	Absent	Present	Absent
Control	Present	Present	Present	Absent	Present	Absent	Present	Absent	Present	Absent	Present	Absent
Green LED	On	On	On	Off	On	Off	On	Off	On	Off	On	Off
DC Supply	On	On	On	Off	On	Off	On	Off	On	Off	On	Off
Red LED	Off	Off	Off	On	Off	On	Off	On	Off	On	Off	On
Alarm Output	Off	Off	Off	On	Off	On	Off	On	Off	On	Off	On

Legend: █ = Half LED light intensity

The system monitoring (sense) SSR provides an alarm output in the event of a circuit failure. Internal circuitry monitors:

- Line Voltage
- Load Current
- Correct Functioning of the SSR
- SSR Input Status

The relay is designed for applications where immediate fault detection is required. An alarm output signal is available to determine fault status.

### Zero Switching with Current Sensing

*For resistive and inductive loads*

Line voltage loss or thyristor open circuit	LED Visual Indication	Heater Break	LED Visual indication	Over-temperature / current over-range	LED Visual Indication	Thyristor short-circuit	LED Visual Indication
Seven Seconds	On	Eight Seconds	On	Nine Seconds	On	Ten Seconds	On

Legend: █ Alarm Output █ LED Indication

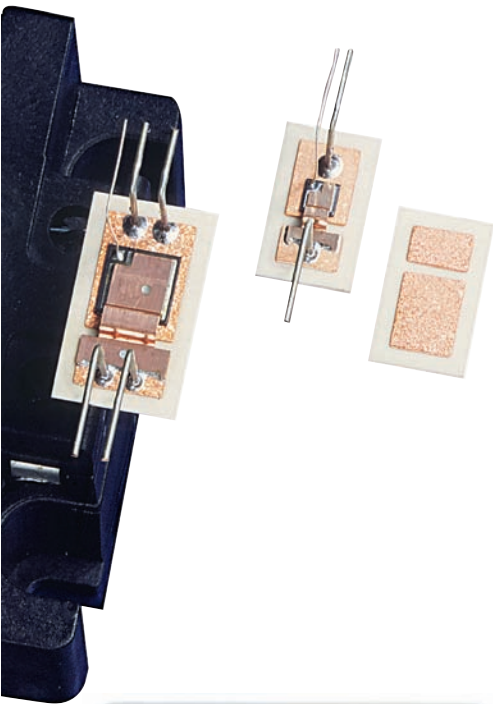
The Solitron MIDI current sensing SSR is a zero switching type which also provides an alarm output when it senses variations in the load. Typical conditions that can be detected include: heater break, open circuit, partial heater short circuit, blown fuse, semiconductor short circuit and faulty power connection. Integral current sensing eliminates the need for additional external equipment. "TEACH-IN" set point is achieved by pushbutton or remotely where an HMI is preferred.

As shown above, the PNP alarm output provides a series of pulses which identify the specific type of fault detected. Interfacing to a PLC can provide a clear indication of fault. An NPN alarm output is also available.

The RJ1P Modbus combines the functionality of Zero Switching, Analog Switching, Analog Full Cycle Switching, System Monitoring and Current Sensing, with the addition of voltage, current, power and frequency measurements.

# Prolonged life expectancy – Utilizing direct copper bonding

Cutting edge manufacturers of solid state devices have started to change from their previous production technology - the soldering of power semiconductors on copper conductors which, in turn, are soldered on a metallized ceramic disc and finally, to a copper or aluminum base - to state-of-the-art substrate technology. By looking at the comparison in the lower corner of this page, you will see - previously, at least four solder joints between the output chip and the heat sink were required, whereas the new production means has cut the number of solder joints in half. This technology makes use of what is called a DCB (direct copper bonding) substrate which, in terms of load change strength, is superior to all previous techniques. The reduction in the number of required components with the DCB substrate simplifies the production process and improves the quality of the product.



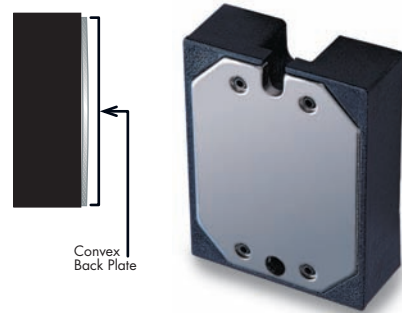
## The DCB Substrate

With the DCB substrate, the copper is bonded directly to the ceramic substrate. In the production process, copper conductors with a thickness of 0.3 to 0.5 mm are bonded to ceramic, at temperatures in excess of 1900°F. The temperature is chosen such that a joint layer is generated between the ceramic surface and the copper, the expansion coefficient of which is slightly higher than that of the ceramic substrate. This also assures the material expansion coefficient against silicon (the output chip) is negligible. Hence, thermal stress or fatigue will not cause premature failure of power output semiconductors.

## Reliability determines the standard of power semiconductors

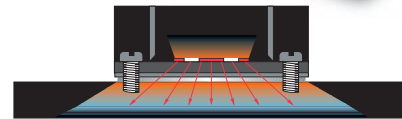
The major benefits to the customer result from improved heat transfer from the chip to the external heat sink and from a reduction of the mechanical stress in connection with major load changes. Due to the direct makeup of the DCB substrate, an optimum solder joint is accomplished. Materials such as beryllium oxide and molybdenum, that have been used up until now, are no longer required. With the conventional soldering technique, they were used to compensate for negative thermal and electrical characteristics.

conducting paste will not increase the thermal resistance - optimum heat conductance is a guarantee!



## Solid state relays make use of new technologies

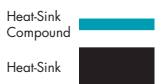
Semiconductor relays combine the advantages of power modules with the function of separate control. Primarily, they are used as interface modules between controller (logic) and load. As a result of their outstanding advantages over electromechanical components, they are gaining more and more market share. They take advantage of the fact that new applications demand faster and more accurate processes, defined switching sequences and more reliability. It is therefore obvious that when designing and producing solid state relays, no compromises can be made. Carlo Gavazzi produces single and three phase solid state relays. Only DCB substrates with high quality thyristors and alternistors are used in their manufacture. The design of their casing and heat sink excels in functionality and efficiency. The casing carries a slightly protruding or convex back plate, assuring ideal thermal contact to the external heat sink. Therefore, any excess heat



## Carlo Gavazzi - the supplier of choice!

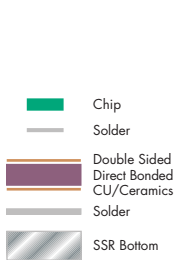
With solid state relays for currents in excess of 100 amps and for voltages up to 690 VAC, Carlo Gavazzi offers a variety of solid state switching controls. For the customer, it is of importance to have knowledge of the manufacturer's production techniques and internal relay design. Only production at a high quality level and advanced market-oriented product design guarantees successful use in the field. This brochure will give you a glimpse of our solid state switching relays and contactors, for a more in-depth look, please visit our website at [www.GavazziOnline.com](http://www.GavazziOnline.com), where you can specify products, download data sheets and CAD drawings, and so much more. Also, as you can see from the back cover of this brochure, in addition to our solid state switching controls, Carlo Gavazzi offers you a multitude of automation control components.

## Conventional SSR Construction



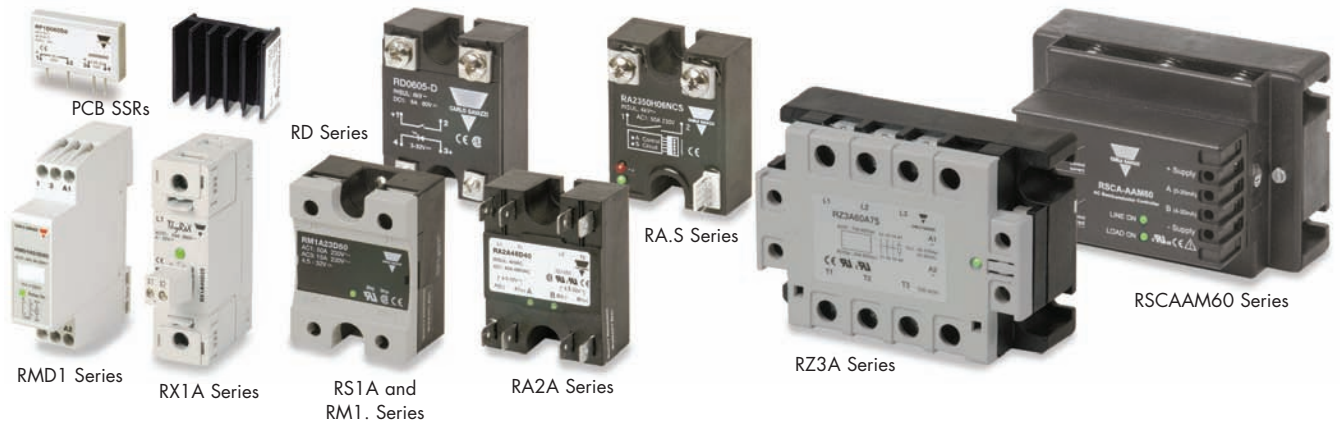
Ambient

## Carlo Gavazzi SSR Construction



Ambient

# PCB, Chassis and DIN Rail Mount SSRs



## PCB Mount SSRs

RP1A Series: Zero switching, up to 10A @ 480VAC

RP1B Series: Instant on switching, up to 10A @ 480VAC

RP1D Series: DC switching, up to 8A @ 60VDC or 1A @ 350VDC

## RMD1 Series Hybrid Relays

- Thyristors initially switch the current, and then after a short delay, they transfer to an internal electromechanical relay
- Zero switching, up to 20A @ 253VAC
- Over 5 million operations
- 4-32VDC or 24-275VAC control voltage
- Green LED status indicator
- 81 x 17.5 x 67.2mm (H x W x D) DIN rail mount housing

## RX1A Series Fast-Connect Thyrex SSRs

- Quick efficient wiring via fast-connect terminals:
  - » Screw terminals or
  - » Spring terminals or
  - » Fast-on (power) terminals
- Two 22.5mm wide Thyrex-specific heat sinks
- M4 mounting holes are interchangeable with standard 'hockey puck' SSRs, but half the width
- Zero switching thyristor, up to 50A @ 552VAC
- 4-32VDC or 36-265VAC control voltage
- Up to 1200Vp non-repetitive peak voltage
- Green LED status indicator and built-in snubber protection
- 76 x 22.5 x 56mm (H x W x D) chassis mount housing

## RS1A Series Zero Switching SSRs

- Economically priced triac (10A) or alternistor (25 and 40A)
- Zero switching, up to 40A @ 530VAC
- 3-32VDC, 18-35VAC/DC, 110, 230 or 400VAC control voltage
- Up to 1200Vp non-repetitive peak voltage
- Green LED status indicator
- 58.2 x 44.8 x 28.8mm (H x W x D) chassis mount housing

## RM1A Series Zero Switching SSRs

- Zero switching thyristor, up to 100A @ 660VAC
- 3-32VDC, 5-24VAC/DC or 22-48VDC / 20-280VAC control voltage
- Instant on switching (RM1B), 3-32VDC control voltage only
- Up to 1400Vp non-repetitive peak voltage
- Green LED status indicator and built-in MOV protection
- 58.2 x 44.8 x 28.8mm (H x W x D) chassis mount housing

## RM1C Series Peak Switching SSRs

- Peak switching thyristor, for inductive loads up to 30A @ 660VAC
- 4.25-32VDC control voltage
- Up to 1400Vp non-repetitive peak voltage
- Green LED status indicator
- 58.2 x 44.8 x 28.8mm (H x W x D) chassis mount housing

## RM1E Series Analog Switching SSRs

- Analog switching thyristor, up to 100A @ 660VAC
- 4-20mA or 0-10VDC control signal
- Up to 1400Vp non-repetitive peak voltage
- Green LED status indicator
- 58.2 x 44.8 x 28.8mm (H x W x D) chassis mount housing

## RD Series DC Switching SSRs

- DC switching transistor, up to 5A @ 60VDC or 1A @ 350VDC
- 3-32VDC control voltage
- 58.2 x 45.5 x 30mm (H x W x D) chassis mount housing

## RA2A Series Dual Output SSRs

- Dual output, zero switching alternistor, up to 40A @ 660VAC
- Dual input, 4.5-32VDC control voltage
- Up to 1200Vp non-repetitive peak voltage
- Fast-on spade terminals
- Two green LED status indicators
- 57.8 x 44.5 x 31.7mm (H x W x D) chassis mount housing

## RA...S Series System Monitoring (Sense) SSRs

- Provides a transistor alarm output upon failure of supply, function or load
- Zero switching alternistor, up to 110A @ 530VAC
- 20-32VDC supply voltage with a 4.5-32VDC control voltage
- Up to 1200Vp non-repetitive peak voltage
- Diagnostic green and red LED status indicators
- 57.8 x 44.5 x 31.7mm (H x W x D) chassis mount housing

## RZ3A 3-Phase Zero Switching SSRs

- Three zero switching alternistors, up to 75A @ 660VAC
- 5VDC, 4-32VDC or 24-50VDC / 24-275VAC control voltage
- Up to 1200Vp non-repetitive peak voltage
- Green LED status indicator, built-in snubber networks, IP20 protective cover, captive wire clamps and
- Optional over-temperature protection, transistor alarm output and red LED alarm status indicator
- 73.5 x 103 x 41mm (H x W x D) chassis mount housing

## RSCAA 3-Phase Analog Switching SSR

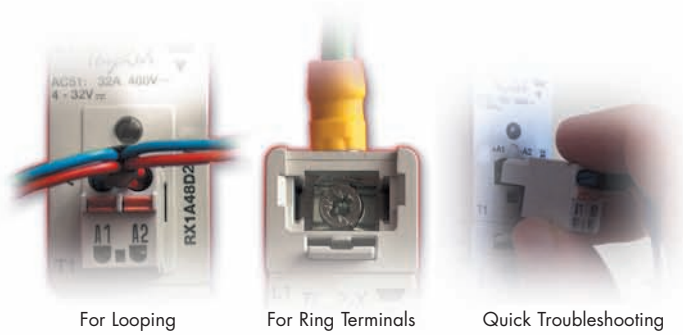
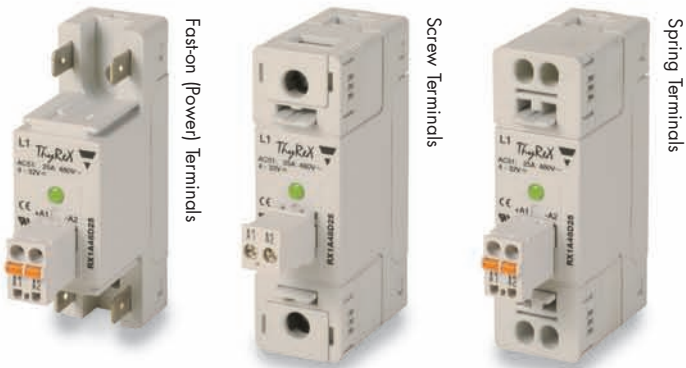
- Phase angle controller for inductive/resistive loads (pumps, fans, heaters, lights, etc.)
- Three zero switching alternistors, up to 110A @ 625VAC
- 10-32VDC supply voltage with a 0 or 4 to 20mA control signal
- Up to 1600Vp non-repetitive peak voltage
- Red LED status indicators for line and load energization, built-in MOV protection
- Optional over-temperature protection
- 66 x 103 x 73.5mm (H x W x D) chassis mount housing

# PCB & Chassis Mount Solid State Relays

## Innovative *Fast-Connect ThyReX* Series

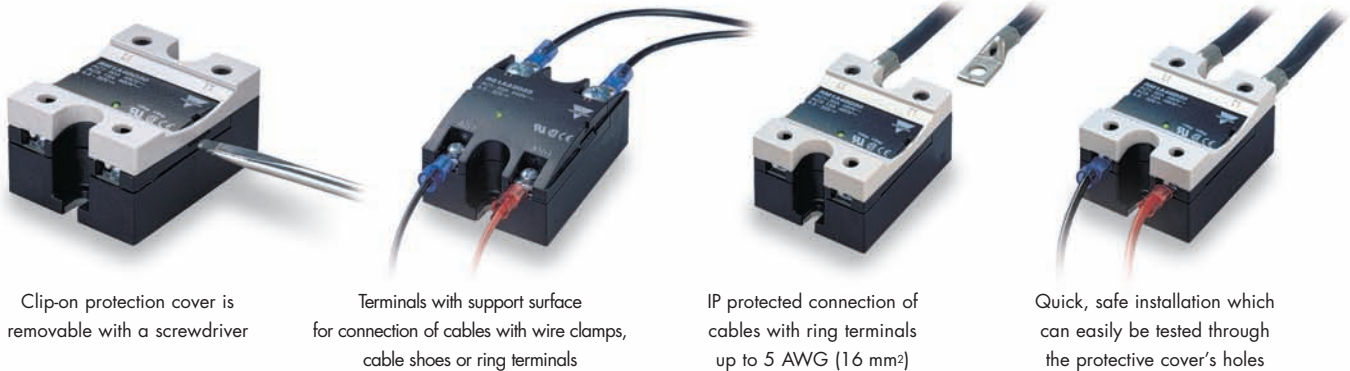
Three Options in One Device

Various Solutions to Fit All Your Needs



**Faster, More Efficient Panel Building:** The revolutionary THYREX fast-connect system allows technical staffs to pre-wire the cable harness outside of the panel. Base modules can be separately pre-mounted onto their heatsink – an operation requiring much less expertise. **Result:** Leaner panel building. **Fast assembly:** Both power and control terminals plug-on.

## RM1x Series Chassis Mount Solid State Relays



## A Wide Variety of Heat Sinks for Efficient Heat Dissipation



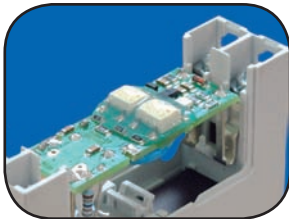
# SOLITRON Solid State Relays and Contactors



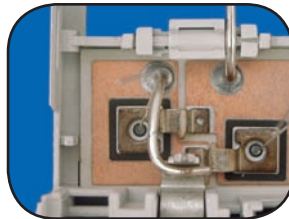
Larger amperage SOLITRONS are provided with an integral fan

CARLO GAVAZZI's SOLITRON Series is the result of over two decades experience in designing, manufacturing and marketing solid state relays. With the SOLITRON family, customers get a product with exceptional features, which provide unparalleled benefits, resulting in a prolonged application life. It is offered in several switching types, including dual input/output types, which is unmatched in the industry. They provide a fast switching, long lasting alternative to noisy electromechanical contactors and environmentally hazardous mercury contactors.

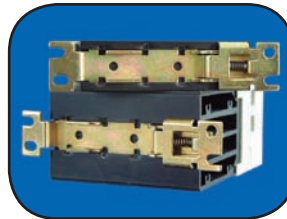
## Features



Surface mount technology provides reliability



Direct copper bonding technology used throughout



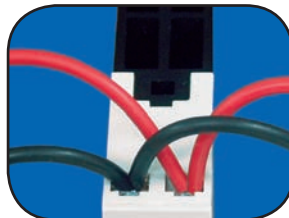
DIN-rail or panel mounting supports



Mounting holes for forced air cooling (Midi & Power only)



Self-lifting terminal clamps (Mini only)



Secure looping of cables up to 2.5mm<sup>2</sup> — AWG 12 (Mini only)



Removeable IP20 cover (Mini only)



Use of ring terminals for cables up to 4mm<sup>2</sup> — AWG 10 (Mini only)



Cage-clamp terminals from 45 to 90A guaranteeing secure connection of cables up to 25mm<sup>2</sup> — AWG 3 (Midi & Power only)



Choice of two terminal layouts making it easier to fit into existing panel designs



Identification window and LED indication of input status and optional over-temperature alarm status



Optional over-temperature alarm signal output (Midi & Power only)

# DIN Rail Mount Solid State Relays/Contactors



## RJ1A Series SOLITRON MINI\*

- Zero switching thyristor, up to 30A @ 660VAC
- 4-32VDC or 24-275VAC control voltage
- 80 x 22.5 x 103mm (H x W x D) DIN rail mount housing

## RJ2A Series SOLITRON MINI (2 Pole)\*

- Two pole, zero switching thyristors, up to 18A @ 530VAC
- Common control input for two single pole switching or 2-pole 3-phase economy switching (leaving one pole live)
- 4-32VDC control voltage
- 103 x 22.5 x 125mm (H x W x D) DIN rail mount housing

## RJ1A Series SOLITRON MIDI\*

- Zero switching thyristor, up to 75A @ 660VAC
- 4-32VDC or 24-275VAC control voltage
- 45A/50A: 81.7 x 45 x 103mm (H x W x D) DIN rail mount housing
- 75A: 122 x 45 x 103mm (H x W x D) DIN rail mount housing

## RJ1A Series SOLITRON POWER\*

- Zero switching thyristor, up to 90A @ 660VAC
- 4-32VDC or 24-275VAC control voltage
- 70A: 81.7 x 90 x 103mm (H x W x D) DIN rail mount housing
- 90A: 122 x 90 x 103mm (H x W x D) DIN rail mount housing

## RJD2A Series Two Pole SOLITRON\*

- Two pole, zero switching thyristors, up to 45A @ 660VAC
- Individually controlled by two inputs, 4-32VDC control voltage
- 30A: 81.7 x 45 x 103mm (H x W x D) DIN rail mount housing
- 45A: 81.7 x 90 x 103mm (H x W x D) DIN rail mount housing

## RJ2A Series 3-Phase SOLITRON (2-Pole)\*

- Three phase, zero switching thyristors, up to 32A @ 660VAC
- Two pole switching (with one live pole) provides economical switching of three phase resistive loads, i.e. heating elements
- Optional over-temperature protection
- 5-32VDC or 24-275VAC/24-190VDC control voltage
- 25A: 81.7 x 45 x 103mm (H x W x D) DIN rail mount housing
- 32A: 122 x 90 x 103mm (H x W x D) DIN rail mount housing

## RJ3A Series 3-Phase SOLITRON (3 Pole)\*

- Three phase, zero switching thyristors, up to 32A @ 660VAC
- Three pole switching provides switching of three phase resistive loads, i.e. heating elements, bands, etc.
- Over-temperature protection on 32A version (optional on 20 and 25A) versions
- 5-32VDC or 24-275VAC/24-190VDC control voltage
- 20A: 81.7 x 45 x 103mm (H x W x D) DIN rail mount housing
- 25A: 81.7 x 90 x 103mm (H x W x D) DIN rail mount housing
- 32A: 122 x 45 x 103mm (H x W x D) DIN rail mount housing which features an integral fan and over-temperature protection

## RJCS Series Current Sensing SOLITRON\*

- Provides a transistor alarm output upon detecting a voltage or current load or line failure
- Relay 'teaching' can be done manually or remotely from PLC
- Adjustable 2-40 second time delay for current sensing alarm output
- Over-temperature protection
- Zero switching thyristor, up to 50A @ 660VAC
- Diagnostic green and red LED status indicators
- 81.7 x 45 x 103mm (H x W x D) DIN rail mount housing

## RJ1P Analog Switching SOLITRON\*

- Single pole analog switching of resistive loads up to 50A @ 660VAC
- Five selectable mode of operation: Phase Angle, Distributed Full Cycle, Burst Control (1, 3 or 10 seconds)
- 0-10VDC or 4-20mA control input
- Load and control status indication
- 81.7 x 45 x 107mm (H x W x D) DIN rail mount housing

## RJ1P Modbus SOLITRON\*

- Four software selectable modes: On/Off, Phase Angle, Distributed and Burst Firing
- Single phase switching of resistive loads up to 50A @ 265VAC
- SSR control is done in Modbus protocol over RS485 interface
- 81.7 x 45 x 122mm (H x W x D) DIN rail mount housing
- Monitoring of over-temperature, SSR fault and line and load loss are standard features
- Measurement of voltage, current, power and frequency is an optional feature

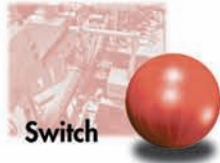
\*All SOLITRONS feature one or more green LED status indicator(s), a built-in protective snubber network and up to 1200Vp non-repetitive peak voltage ratings.

# The Complete Product Package



**Sense**

Inductive Proximity Sensors  
 Tripleshield™ Capacitive Sensors  
 Photoelectric Sensors  
 Ultrasonic Sensors  
 Level Sensors  
 Limit Switches  
 Magnetic Switches



**Switch**

Solid State Relays  
 Contactors and Overloads  
 Manual Motor Starters  
 Motor Controllers  
 Electromechanical Relays  
 Pilot Devices  
 Cam Switches  
 Rotary Disconnects



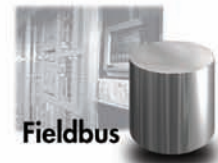
**Control**

Energy Management  
 Digital Panel Meters  
 PID Controllers  
 Time Delay Relays  
 Current Monitoring Relays  
 Voltage Monitoring Relays  
 Three Phase Monitoring Relays  
 Signal Conditioners  
 Current Transformers  
 Enclosures



**Safety**

Safety Light Curtains  
 Safety Control Modules  
 Safety Interlock Switches  
 Safety Mat Systems  
 Safety Magnetic Sensors



**Fieldbus**

Dupline Field & Installation Bus  
 Building Automation Systems  
 Elevator Systems

## A Global Force in Industrial Automation

CARLO GAVAZZI has a multitude of sales offices spanning North America (*not to mention our hundreds of distributors*). Therefore, we can be viewed as "your local automation resource" - assisting you every step of the way in finding the proper solution for your various application requirements. Naturally, our job is greatly simplified as we have such a vast range of solutions to offer you via our comprehensive *product package*.

Our worldwide sales offices make us an ideal business partner, *especially for manufacturers of exported machinery*, as our products are available locally and they are CE marked.

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