

# Solid State Relays

## SOLITRON MIDI Current Sensing

### Type RJCS



- AC semiconductor contactor
- Integrated under current monitoring
- Zero switching (RJCS1A)
- Direct copper bonding (DCB) technology
- LED-indication
- Cage clamp output terminals
- 4-32 VDC control input
- Operational ratings up to 50 AACrms and 600 VAC
- Local and remote alarm status
- Set-point adjustable
- Time delay adjustable
- Local and remote setup

#### Preliminary Datasheet

### Product Description

The SOLITRON Midi Current Sensing is a compact, single-phase SSR that is sensitive to variations in load conditions in industrial heating applications. This microprocessor-based device is ideal for detection of partial load failure and to ensure the highest process quality. Current sensing is integrated inside to eliminate the need to install an external current transformer. A membrane "button" on the front is used to effect a simple "teach in" of the current setpoint. Alarm delay time is set by a potentiometer. Variations in setpoint current of more than 15% will trigger an open collector alarm. Up to 50 alarm outputs can be connect-

ed in parallel to a standard PLC input. Typical conditions that can be detected are heater break or open-circuit, partial heater short-circuit, blown fuse, semiconductor short-circuit and faulty power connection.

Device over-temperature protection is integrated as a standard feature.

The product is ready to mount on DIN-rail or chassis and comes with integral heatsink. The standard housing dimensions enable straightforward replacement of alternative products.

### Ordering Key RJCS 1 A 60 D 50 E P NO

|                             |       |
|-----------------------------|-------|
| Solid State Relay           | _____ |
| Current Sensing             | _____ |
| Number of poles             | _____ |
| Switching mode              | _____ |
| Rated operational voltage   | _____ |
| Control voltage             | _____ |
| Rated operational current   | _____ |
| Terminal Layout             | _____ |
| Over-temperature protection | _____ |
| Alarm Output Type           | _____ |

### Type Selection

| Switching mode    | Rated operational voltage        | Control voltage | Rated operational current | Terminal Layout | Protection               | Alarm output type                                |
|-------------------|----------------------------------|-----------------|---------------------------|-----------------|--------------------------|--|
| A: Zero switching | 23: 230 VACrms<br>60: 600 VACrms | D: 4 - 32 VDC   | 50: 50 AACrms             | E: Contactor    | P: Over-temp. protection | NO: NPN, Normally open<br>PO: PNP, Normally open |

### Selection Guide

| Rated operational voltage | Non-rep. voltage | Control voltage | Supply voltage | Alarm output type  | Rated operational current 50 A     |
|---------------------------|------------------|-----------------|----------------|--------------------|------------------------------------|
| 230 VACrms                | 650 Vp           | 4 - 32 VDC      | 24 VDC         | NPN, NO<br>PNP, NO | RJCS1A23D50EPNO<br>RJCS1A23D50EPPO |
| 600 VACrms                | 1200 Vp          | 4 - 32 VDC      | 24 VDC         | NPN, NO<br>PNP NO  | RJCS1A60D50EPNO<br>RJCS1A60D50EPPO |

## General Specifications

|                             | RJCS1.23..         | RJCS1.60..          |
|-----------------------------|--------------------|---------------------|
| Operational voltage range   | 24 to 265 VAC      | 42 to 660 VAC       |
| Non-rep. peak voltage       | 650 V <sub>p</sub> | 1200 V <sub>p</sub> |
| Operational frequency range | 45 to 65 Hz        | 45 to 65 Hz         |
| Measuring range             | 8-50 AAC           | 8-50 AAC            |
| Power factor                | ≥ 0.5 @ 230 VACrms | ≥ 0.5 @ 600 VACrms  |
| Approvals                   | UL, cUL, CSA*      |                     |
| CE-marking                  | Yes                |                     |

\* Approvals pending

## Input Specifications

|                               | RJCS...D   |
|-------------------------------|------------|
| Control voltage range         | 4 - 32 VDC |
| Pick-up voltage               | 3.8 VDC    |
| Reverse voltage               | 32 VDC     |
| Drop-out voltage              | 1.2 VDC    |
| Maximum control input current | 2 mA       |
| Response time pick-up         | 1 cycle    |
| Response time drop-out        | 1 cycle    |

## Supply Specifications

|                                       | RJCS...D           |
|---------------------------------------|--------------------|
| Power supply voltage, V <sub>cc</sub> | 24 VDC ± 15%       |
| Max. supply current                   | 25 mA (per device) |
| Max. PLC current @ 24VDC (50 devices) | 15 mA              |

## Housing Specifications

|                             |   |
|-----------------------------|---|
| Weight                      |   |
| 50 A                        | Approx. 360 g   |
| Housing material            | PBT FR  |
| Control terminal cable size |   |
| Min                         | 1 x 0.5 mm <sup>2</sup> (1 x AWG20)   |
| Max                         | 1 x 4.0 mm <sup>2</sup> (1 x AWG12) or<br>2 x 2.5 mm <sup>2</sup> (2 x AWG14) |
| Mounting torque max.        | 0.3 Nm Posidriv 1   |
| Power terminal cable size   |   |
| Min                         | 1 x 4 mm <sup>2</sup> (1 x AWG12)   |
| Max                         | 1 x 25 mm <sup>2</sup> (1 x AWG3) or<br>2 x 10 mm <sup>2</sup> (2 x AWG6)     |
| Mounting torque max.        | 2.5 Nm Posidriv 2   |

## Output Specifications

|  | RJCS..50               |
|--|------------------------|
| Rated operational current                                  |                        |
| AC51 @Ta=25°C  | 50 AACrms              |
| AC53a @Ta=25°C   | 30 AACrms              |
| Min. operational current                                   | 8A                     |
| Rep. overload current t = 1s                               | < 200 AACrms           |
| Non rep. surge current                                     |                        |
| T <sub>j</sub> (init.) = 25°C and t = 10 ms                | 1900 Ap                |
| Off-state leakage current @<br>rated voltage and frequency | < 3 mArms              |
| I <sup>2</sup> t for fusing t = 10 ms                      | 18000 A <sup>2</sup> s |
| Critical dI/dt   | ≥ 150 A/μs             |
| On-state voltage drop @<br>rated current                   | 1.6 Vrms               |
| Critical dV/dt commutating                                 | 500 V/μs               |
| Critical dV/dt off-state                                   | 1000 V/μs              |

## Thermal Specifications

|                       |                               |
|-----------------------|-------------------------------|
| Operating temperature | -20 to +60°C (-4 to 140 °F)   |
| Storage temperature   | -40 to +100°C (-40 to 212 °F) |

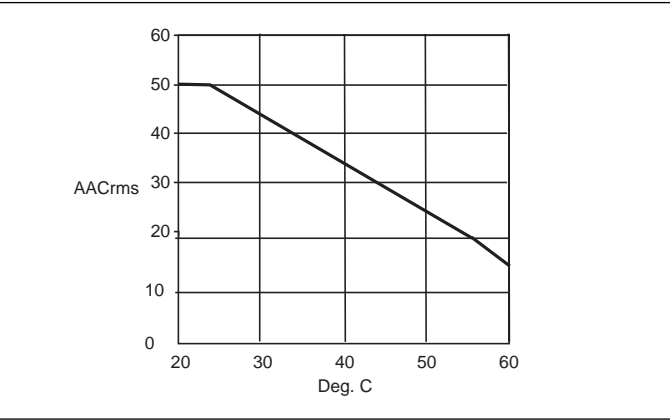
## Insulation

|                          |               |
|--------------------------|---------------|
| Rated insulation voltage |               |
| Input to output          | ≥ 4000 VACrms |
| Output to case           | ≥ 4000 VACrms |

## Alarm Specifications

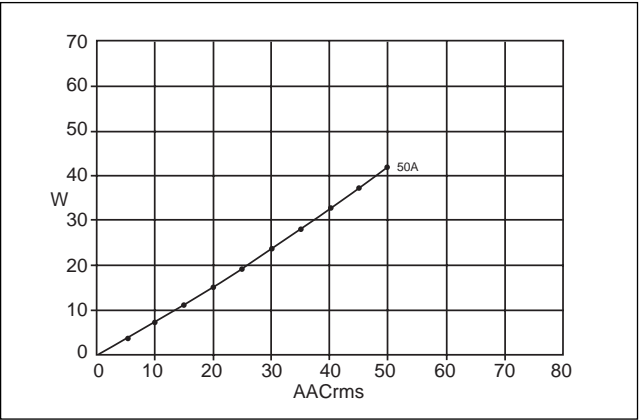
|                            |                      |
|----------------------------|----------------------|
| Output current             | ≤50 mADC             |
| Output voltage             |                      |
| NPN                        | 2V                   |
| PNP                        | V <sub>cc</sub> - 2V |
| No. of outputs in parallel | ≤50                  |

Derating Curve

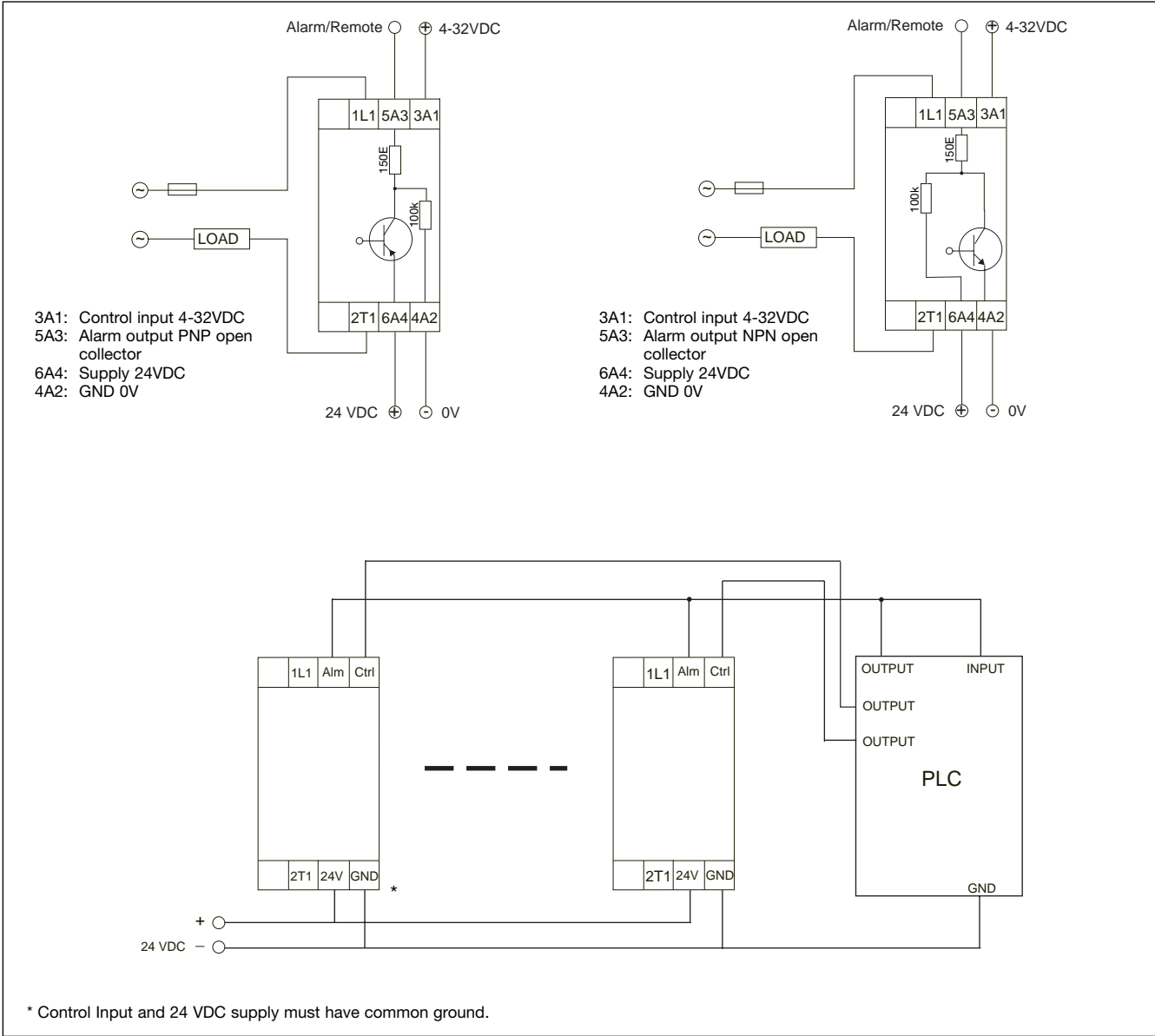


Note: Based on 100% duty cycle

Dissipation Curve



Connection Examples



## Alarm Operation

### 1.1 Current Setpoint

The current setpoint is the nominal operating current that is expected when all the heater loads are functioning properly. If the heater loads are faulty or the supply voltage is not close to the nominal level, the wrong setpoint will be stored.

### 1.2 Initialisation

When the device is shipped, no setpoint is stored in the flash memory. Both green and red LEDs will flash intermittently to indicate that a setpoint must be stored using the **TEACH** procedure.

### 1.3 Local Functions

Local functions can be activated by using the push button on the front of the device.

#### 1.3.1 Local TEACH

Press and hold the push button for approximately 3 seconds. The red LED will flash after each second. After the LED flashes 3 times, release the button. If the "teach" command has been accepted the red LED will flash quickly 10 times. The heater loads are automatically switched ON. When the current setpoint has been stored successfully, the red and green LEDs will scroll intermittently to indicate that the **TEACH** procedure has been completed.

It is very important to hold the button down for only 3 flashes of the red LED to make a successful **TEACH**. If the **TEACH** procedure is not successful, the device will automatically reset to factory default (i.e. no setpoint stored).

#### 1.3.2 Local RESET

When an alarm has occurred the device can be locally **RESET** by pressing the push

button for 1 second. The red LED will flash once. This will reset the alarm. If the alarm condition has been cleared the device will return to normal operation. If the alarm condition is still active, the device will automatically go back to alarm status.

#### 1.3.3 Local TEST

In the absence of a signal on the "control input" terminal, a local **TEST** can be made by pressing and holding the button for 5 seconds. After the red LED flashes 5 times, release the button. The device will switch ON the loads for 1 second. This test detects if there is an under-current or heater break alarm condition.

#### 1.4 Remote Setup Procedure

Remote functions can be activated with a PLC or any other logic controller by applying timed pulses to the alarm terminal.

##### 1.4.1 Remote TEACH

Apply a 3 second pulse. The red LED will flash after each second. After the LED flashes 3 times and the "teach" command has been accepted, the heater loads are automatically switched ON and the red LED will flash quickly 10 times. When the current setpoint has been stored successfully, the red and green LEDs will scroll intermittently to indicate that the **TEACH** procedure has been completed.

##### 1.4.2 Remote RESET

When an alarm has occurred the device can be remotely **RESET** by applying a 1 second pulse. The red LED will flash once. This will reset the alarm. If the alarm condition has been cleared the device will return to normal operation.

If the alarm condition is still active, the device will automatically go back to alarm status.

## 2 Alarms

### 2.1 Alarm DELAY

A potentiometer on the front of the device allows a time delay on the heater break alarm between 2 and 40 seconds. For an alarm signal to occur, the alarm condition must persist throughout this time period. The alarm output is enabled only after this time delay has passed.

### 2.2 Relay remains OFF due to Line Voltage Loss or Thyristor Open Circuit Failure.

The device generates one pulse with duration of 7 seconds on the alarm terminal. The alarm signal is non-latching. The red LED remains ON after this alarm condition until a **RESET** is made.

### 2.3 Heater Break.

A **Heater Break** alarm is given if the current measured through the device is more than 15% lower than the Current Setpoint stored in the flash memory. The device generates one pulse with duration of 8 seconds on the alarm terminal. The alarm signal is non-latching. The red LED remains ON after this alarm condition until a **RESET** is made. If the measured current changes to within 5% of the Current Setpoint, before the **Alarm DELAY** time has elapsed, the **Alarm DELAY** timer is reset.

### 2.4 Over-temperature or Over-current.

This alarm occurs if any one of following two conditions is true:

1. The device detects an internal over-temperature condition at any time during operation and switches off the output.

2. A current above the nominal device rating is measured during current setpoint **TEACH**.

On alarm, the device generates one pulse with duration of 9 seconds on the alarm terminal. The alarm signal is non-latching. The red LED remains ON intermittently after this alarm condition until a **RESET** is made.

### 2.5 Thyristor Short Circuit.

The device generates one pulse with duration of 10 seconds on the alarm terminal. The alarm signal is non-latching. The red LED remains ON after this alarm condition until a **RESET** is made.

### 2.6 Alarms Connected in Parallel to one PLC Input and one PLC Output.

For **REMOTE** operation, up to 50 devices can be connected in parallel to at least one PLC input. This PLC input must also be connected in parallel to a PLC output. The PLC input must be programmed to detect alarms while the PLC output must be programmed to supply the pulses required for **REMOTE Setup**. When more than one device is present, pulses from the PLC output or alarm pulses from any device will cause the red LEDs on all devices in parallel to flash intermittently for 5 seconds. After this time, if there is a device in alarm condition, only the red LED of that device will be ON.

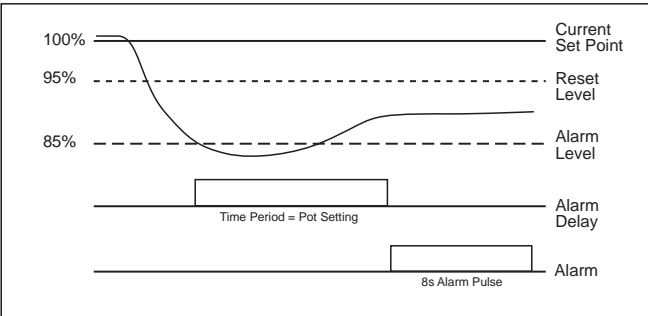
## Example

The alarm delay is set at 2s (min). If the full load current is set at 30A, then there will be an alarm condition if the cur-

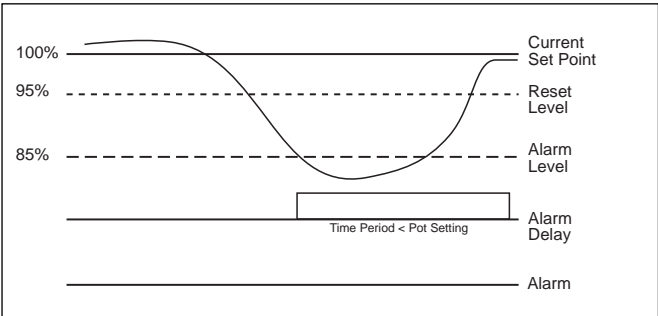
rent is under or over by >4.5A for more than 2s (any alarm condition that is present for <2s will not be signalled – this

is intended to eliminate false alarms due to short duration under- and over-voltage conditions on the supply phase).

Alarm Operation



Alarm Condition



Reset Condition

Setup and Alarms

|        |  |   |  |
|--------|--|---|--|
| RESET  | Remote reset   | PLC output to alarm terminal high >1s (<2s) |  |
|        | Local reset  | Push and hold button for >1s (<2s)          |  |
|        | Visual indication  | Red LED ON                                  |  |
| TEACH  | Remote teach   | Alarm terminal                              |  |
|        | Local teach  | Push and hold button for >3s (<4s)          |  |
|        | Visual indication  | Red LED ON                                  |  |
| TEST   | Remote test  | Not available                               |  |
|        | Local test   | Push and hold button for >5s (<6s)          |  |
|        | Visual indication  | Red LED ON                                  |  |
| ALARMS | Relay remains OFF due to line voltage loss or thyristor open circuit fault | Transistor alarm non-latching pulse         |  |
|        | Visual indication  | Red LED ON (latching)                       |  |
|        | Heater Break   | Transistor alarm non-latching pulse         |  |
|        | Visual indication  | Red LED ON (latching)                       |  |
|        | Over-temperature / current over-range                                      | Transistor alarm non-latching pulse         |  |
|        | Visual indication  | Red LED ON intermittent (latching)          |  |
|        | Thyristor short-circuit  | Transistor alarm non-latching pulse         |  |
|        | Visual indication  | Red LED ON (latching)                       |  |
|        |  |   |  |

Note: Above shows pulses for PNP device

Dimensions

