# RP1A, RP1B

## 1-phase PCB mount solid state relays




### Main features

- AC Solid State Relay for PCB mounting
- Zero-cross switching or instant-on
- Rated operational current: 3, 5 or 5.5 AACrms
- Rated operational voltage: up to 480 VACrms
- Surface mount technology
- Flexible encapsulation for extended life
- Control voltage: 3 to 32 VDC / 16 to 32 VAC
- Opto-isolation: > 4000 VACrms
- Blocking voltage: up to 1000 Vp
- Non-repetitive surge current: up to 250 Ap

### Description

The **RP1** is an SSR series for socket or PCB mounting, providing an ideal interface between logic controls and AC loads.
The **RP1** is designed for resistive and inductive loads up to 480 VACrms.
Internally this new series enjoys an improved technical design with the introduction of stress-free flexible encapsulation and automated assembly of components.
The solid state technology used can withstand peak voltages of 1000 V, making the **RP1** series suitable to drive AC loads such as valve solenoids and small induction motors.

Specifications are at a surrounding temperature of 25°C unless otherwise specified.

### Applications

These relays can be used to switch heaters, motors, lights, valves or solenoids.

### Main functions

- Zero-cross or instant-on AC switching
- Ratings up to 480 VACrms, 5.5 AACrms
- 3-32 VDC or 16-32 VAC control voltage



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## Order code

RP1 □□□□□

Enter the code option instead of □. Refer to the Selection guide section for valid part numbers.

| Code | Option | Description | Comments |
|---|---|---|---|
| R | - | Solid State Relay (PCB) | |
| P | - | | |
| 1 | - | 1-pole switching | |
| □ | A | Switching mode: zero-cross switching | |
| | B | Switching mode: instant-on switching | |
| □ | 23 | Rated operational voltage: 230 VACrms | |
| | 40 | Rated operational voltage: 400 VACrms | |
| | 48 | Rated operational voltage: 480 VACrms | |
| □ | D | Control voltage: 3 - 32 VDC | 4 - 32 VDC for RP1A48..<br>4 - 32 VDC for RP1B40.. and RP1B48.. |
| | A | Control voltage: 16 - 32 VAC | Only available for 230 V, 5.5 A |
| □ | 3 | Rated operational current: 3 AACrms | |
| | 5 | Rated operational current: 5 AACrms | |
| | 6 | Rated operational current: 5.5 AACrms | |
| □ | Mx | M1 = Mounting on DIN EN adaptor **RPM1** | Max. 250 V |
| | | M2 = Mounting on DIN EN adaptor **RPM2** | Max. 600 V |

## Selection guide

| Rated operational voltage | Blocking voltage | Control voltage | Rated operational current | | |
|---|---|---|---|---|---|
| | | | 3 AACrms | 5 AACrms | 5.5 AACrms |
| 230 VACrms | 650 Vp | 3 - 32 VDC | RP1A23D3<br>RP1B23D3 | RP1A23D5<br>RP1B23D5 | RP1A23D6<br>RP1B23D6 |
| | | 16 - 32 VAC | - | - | RP1A23A6 |
| 400 VACrms | 850 Vp | 3 - 32 VDC | RP1A40D3 | RP1A40D5 | RP1A40D6 |
| | | 4 - 32 VDC | RP1B40D3 | RP1B40D5 | RP1B40D6 |
| 480 VACrms | 1000 Vp | 4 - 32 VDC | RP1A48D3<br>RP1B48D3 | RP1A48D5<br>RP1B48D5 | RP1A48D6<br>RP1B48D6 |



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## Selection guide: mounted on DIN EN adaptor

| Rated operational voltage | Blocking voltage | Control voltage | Rated operational current | | |
|---|---|---|---|---|---|
| | | | 3 AACrms | 5 AACrms | 5.5 AACrms |
| **230 VACrms** | 650 Vp | 5 - 34 VDC | RP1A23D3M1<br>RP1B23D3M1 | RP1A23D5M1<br>RP1B23D5M1 | RP1A23D6M1<br>RP1B23D6M1 |
| | | 16 - 32 VAC | - | - | RP1A23A6M1* |
| **480 VACrms** | 1000 Vp | 6 - 34 VDC | - | RP1A48D5M2 | - |

* Version RP1A23A6M1 does not include an LED on the DIN adaptor.

## Carlo Gavazzi compatible components

| Description | Component code | Notes |
|---|---|---|
| **DIN adaptors** | RPM1*<br>RPM1V*<br>RPM1P<br>RPM1PD*<br>RPM2 | DIN adaptor 250 V with LED<br>DIN adaptor 250 V with LED + varistor<br>DIN adaptor 250 V with pins for removal of RP<br>DIN adaptor 250 V with pins for removal of RP + LED<br>DIN adaptor 600 V with LED |

* not suitable for use with RP1A23A6



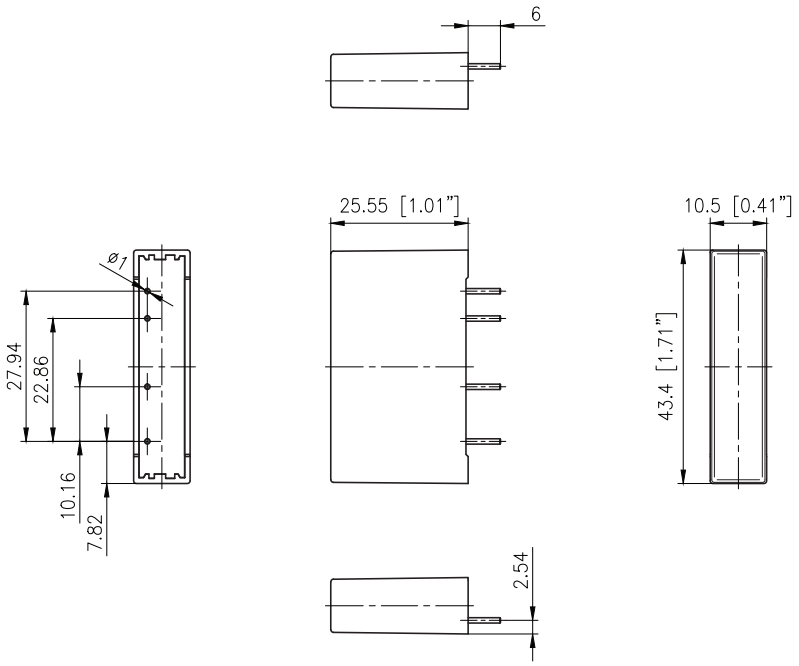
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# Features

## General data

| | |
|---|---|
| **Material** | PBT, RAL7035 |
| **Potting compound** | Flame-retardant flexible silicone rubber |
| **Weight** | Approx. 20 g |
| **Isolation** | Input to output: ≥ 4000 VACrms |
| **Insulation resistance** | $10^{10}$ Ω |
| **Insulation capacitance** | 8 pF |

## Dimensions




Dimensions in mm unless otherwise noted.
Tolerances +/- 0.5 mm.



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# Performance

## Mains supply

| | RP1..23.. | RP1..40.. | RP1..48.. |
|---|---|---|---|
| **Operational voltage range**<br>**RP1A**<br>**RP1B** | <br>12 - 265 VACrms<br>12 - 265 VACrms | <br>20 - 440 VACrms<br>12 - 440 VACrms | <br>20 - 530 VACrms<br>12 - 530 VACrms |
| **Operational frequency range** | 45 - 65 Hz | | |
| **Blocking voltage** | 650 Vp | 850 Vp | 1000 Vp |
| **Zero voltage turn-on** | < 10 V | | |

## Outputs

| | RP1..3 | RP1..5 | RP1..6 |
|---|---|---|---|
| **Rated operational current**<br>**AC 51 @ $T_a$ = 25°C**<br>**AC 53a @ $T_a$ = 25°C** | <br>3 A<br>2 A | <br>5 A<br>3 A | <br>5.5 A<br>5 A |
| **Minimum operational current** | 20 mA | | |
| **Power factor** | > 0.5 | | |
| **Rep. overload current t=1 s** | 10 AACrms | 12 AACrms | 16 AACrms |
| **Non-repetitive surge current ($I_{TSM}$), t=20 ms** | 65 Ap | 80 Ap | 250 Ap |
| **Off-state leakage current** | < 1 mA | | |
| **$I^2t$ for fusing (t=10 ms)** | 20 $A^2s$ | 50 $A^2s$ | 340 $A^2s$ |
| **Critical dV/dt off state min.** | 250 V/µs | 500 V/µs | |
| **On-state voltage drop @ rated current** | < 1.2 Vrms | | |

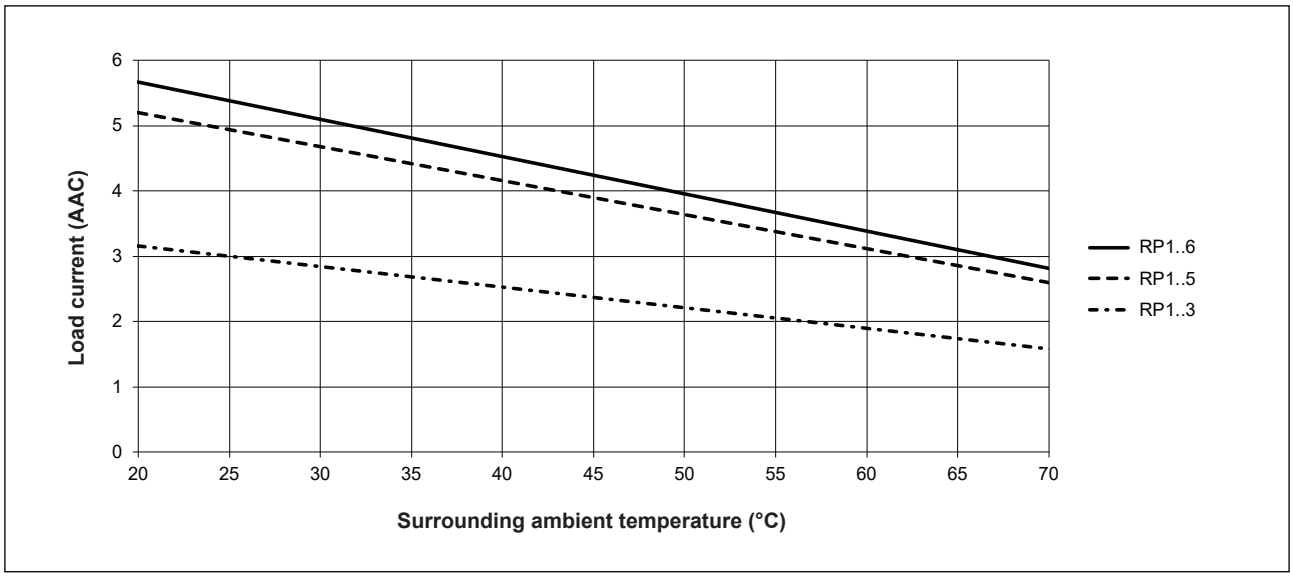


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## Inputs

| | RP1..D.. | RP1..D..M.. | RP1A23A6 |
|---|---|---|---|
| **Control voltage**<br>**RP1..23.. RP1A40..**<br>**RP1B40.. RP1..48..** | <br>3-32 VDC<br>4-32 VDC | <br>5-34 VDC<br>6-34 VDC | 16 - 32 VAC<br>-<br>- |
| **Pick-up voltage**<br>**RP1..23.. RP1A40..**<br>**RP1B40.. RP1..48..** | <br>2.8 VDC<br>3.8 VDC | <br>4.8 VDC<br>5.8 VDC | 10 VAC<br>-<br>- |
| **Drop-out voltage** | 1.2 VDC | | 5 VAC |
| **Max. input curent**<br>**RP1A**<br>**RP1B** | <br>10 mADC<br>15 mADC | | 13 mAAC<br>-<br>- |
| **Max. reverse voltage** | 32 VDC | 34 VDC | - |
| **Response time pick-up**<br>**RP1A**<br>**RP1B** | <br>< 10 ms<br>< 160 µs (12 VDC / 50 Hz)<br>< 320 µs (5 VDC / 50 Hz) | | <br>< 20 ms<br>-<br>- |
| **Response time drop-out**<br>**RP1A**<br>**RP1B** | <br>< 10 ms<br>< 10 ms | | < 20 ms<br>-<br>- |

## Current derating

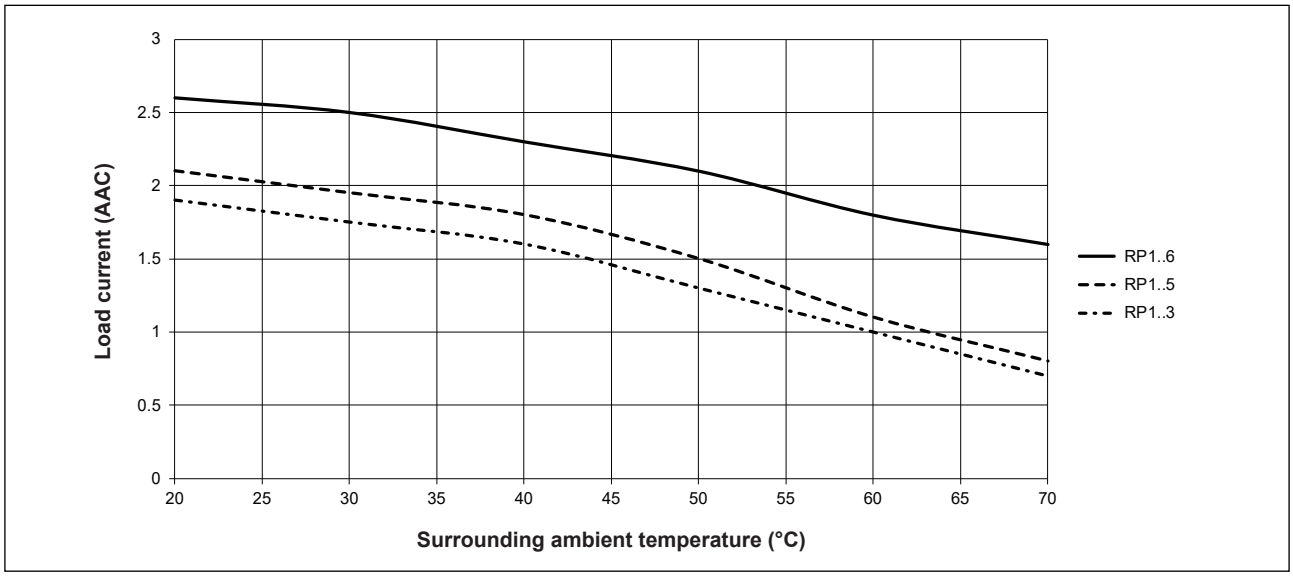



When used at full load current, the relays must be placed vertically. If more than one relay is mounted, please allow a minimum distance of 20 mm in between for sufficient air cooling.

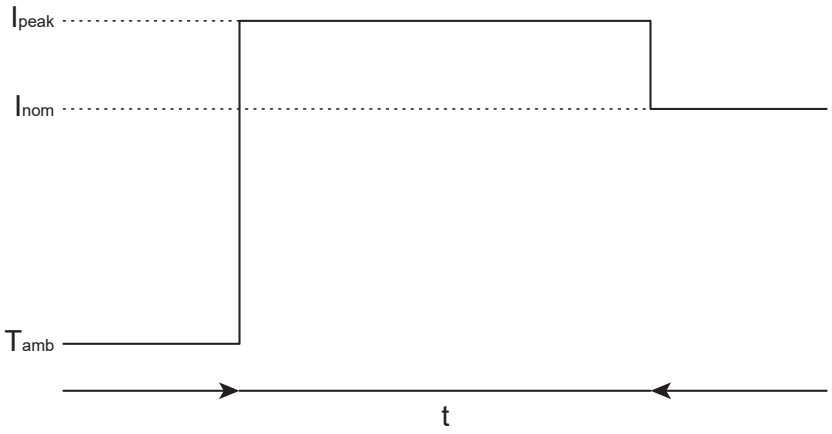


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## Current derating with 0 mm spacing




## Increased current options




| $I_{peak}$ (Amps) | 6 | 8 | 10 |
|---|---|---|---|
| D5 : t (minutes) | 15 | 5 | 3 |
| D6 : t (minutes) | | | |

Note: even though the D3 can withstand a slight increase in current for a limited time, it is not recommended for this purpose.



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## Compatibility and conformance

| | |
|---|---|
| **Approvals** | |
| **Standards compliance** | LVD: EN 60947-4-3<br>EMCD: EN 60947-4-3<br>EE: EN 60947-4-3<br>EMC: EN 60947-4-3<br>cURus: UL508 Recognized (E80573), NRNT2, NRNT8<br>CSA: C22.2 No. 14 (204075)<br>VDE: VDE 0600-100, VDE 0600-109 (excluding RP1A23A6) |

| **Electromagnetic compatibility (EMC) - Immunity** | |
|---|---|
| **Electrostatic discharge (ESD)** | EN/IEC 61000-4-2<br>8 kV air discharge, 4 kV contact (PC1) |
| **Radiated radio frequency** | EN/IEC 61000-4-3<br>10 V/m, from 80 MHz to 1 GHz (PC1)<br>10 V/m, from 1.4 to 2 GHz (PC1)<br>10 V/m, from 2 to 2.7 GHz (PC1) |
| **Electrical fast transient (burst)** | EN/IEC 61000-4-4<br>Output: 2 kV, 5 kHz (PC2)<br>Input: 1 kV, 5 kHz (PC2) |
| **Conducted radio frequency** | EN/IEC 61000-4-6<br>10 V/m, from 0.15 to 80 MHz (PC1) |
| **Electrical surge** | EN/IEC 61000-4-5<br>Output, line to line: 1 kV (PC2)<br>Output, line to earth: 1 kV (PC2)[1]<br>Input, line to line: 500 V (PC2)[2]<br>Input, line to earth: 500 V (PC2)[2] |
| **Voltage dips** | EN/IEC 61000-4-11<br>0% for 0.5, 1 cycle (PC2)<br>40% for 10 cycles (PC2)<br>70% for 25 cycles (PC2) |
| **Voltage interruptions** | EN/IEC 61000-4-11<br>0% for 5000 ms (PC2) |

1. A suppression device, such as a varistor, needs to be connected across the output terminals L1, T1 for immunity against higher voltage levels.
2. A suppression device, such as a transil, needs to be connected across the control terminals A1, A2 for immunity against higher voltage levels.

| **Electromagnetic compatibility (EMC) - Emissions** | |
|---|---|
| **Radio interference field emission (radiated)** | EN/IEC 55011<br>Class A: from 30 to 1000 MHz |
| **Radio interference voltage emissions (conducted)** | EN/IEC 55011<br>Class A: from 0.15 to 30 MHz, with filter capacitor across the mains supply.* |

* For conformance to EN/IEC 55011, an external capacitor class X1, 100 nF is to be connected across the output terminals 1-2.

Note:

- Control input lines must be installed together to maintain products' susceptability to Radio Frequency interference.
- Use of AC solid state relays may, according to the application and the load current, cause conducted radio interferences.
- Use of mains filters may be necessary for cases where the user must meet E.M.C requirements.
- Performance Criteria 1 (PC1): No degradation of performance or loss of function is allowed when the product is operated as intended.
- Performance Criteria 2 (PC2): During the test, degradation of performance or partial loss of function is allowed. However when the test is complete the product should return operating as intended by itself.
- Performance Criteria 3 (PC3): Temporary loss of function is allowed, provided the function can be restored by manual operation of the controls.



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## Environmental specifications

| | |
|---|---|
| **Operating temperature** | -20°C to +70°C (-4°F to +158°F) |
| **Storage temperature** | -40°C to +100°C (-40°F to +212°F) |
| **Pollution degree** | 2 |
| **EU RoHS compliant** | Yes |
| **China RoHS** |  |

The declaration in this section is prepared in compliance with People's Republic of China Electronic Industry Standard SJ/T11364-2014: Marking for the Restricted Use of Hazardous Substances in Electronic and Electrical Products.

| **Part Name** | **Toxic or Hazardous Substances and Elements** | | | | | |
|---|---|---|---|---|---|---|
| | Lead (Pb) | Mercury (Hg) | Cadmium (Cd) | Hexavalent Chromium (Cr(VI)) | Polybrominated biphenyls (PBB) | Polybrominated diphenyl ethers (PBDE) |
| **Power Unit Assembly** | x | O | O | O | O | O |

O: Indicates that said hazardous substance contained in homogeneous materials fot this part are below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.

这份申明根据中华人民共和国电子工业标准
SJ/T11364-2014：标注在电子电气产品中限定使用的有害物质

| 零件名称 | 有毒或有害物质与元素 | | | | | |
|---|---|---|---|---|---|---|
| | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | 多溴化联苯 (PBB) | 多溴联苯醚 (PBDE) |
| 功率单元 | x | O | O | O | O | O |

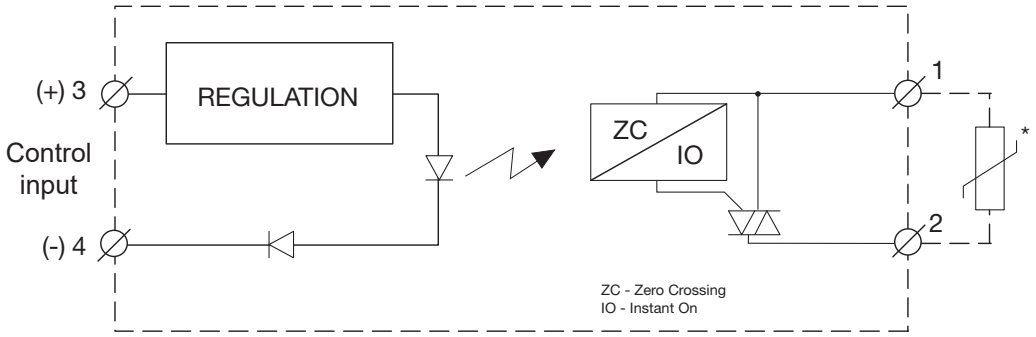
O:此零件所有材料中含有的该有害物低于GB/T 26572的限定。

X: 此零件某种材料中含有的该有害物高于GB/T 26572的限定。

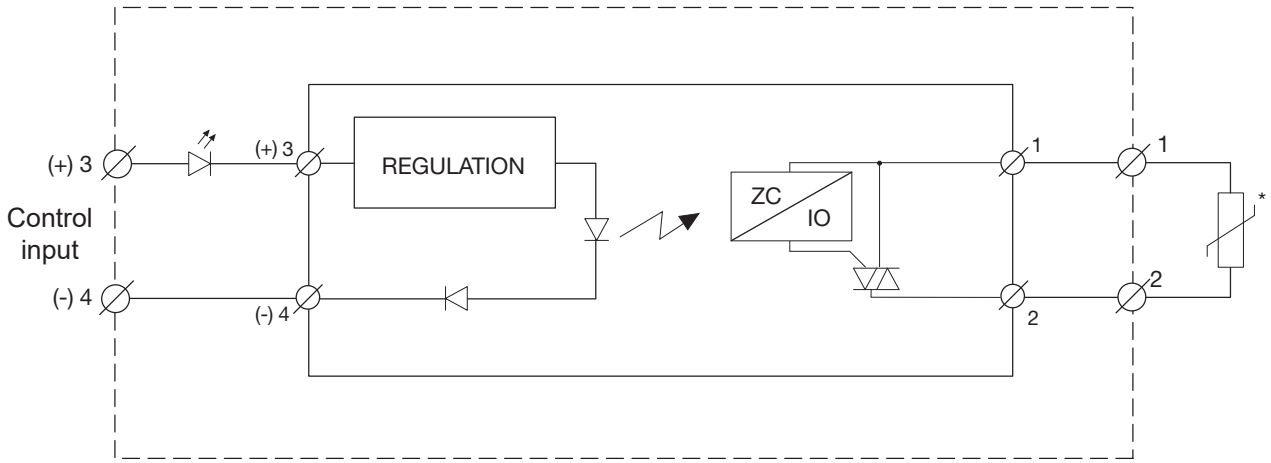


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## Functional diagram: RP1..




## Functional diagram: RP1..Mx




* The varistor is not included in the solid state relay. Connecting a varistor across terminals 1-2 helps protect the solid state relay against damages by over-voltage.

## Connection specifications

| | |
|---|---|
| **Terminals** | Copper alloy, tin-plated |
| **Terminals soldering temperature** | Max. 300°C for 5 seconds |



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