



Precautions for use

SPD (Surge Protective Device)



This document provides specific explanations and precautions for the use of the products. Before use, please be sure to carefully read this document together with the individual technical documents and delivery specifications, and use the products correctly.

Improper use of the product may lead to accidents that could cause injury or fire. Furthermore, such misuse may result in secondary harm to the user, including bodily injury or property damage.

In addition, if you intend to use our products in equipment or systems such as automobiles, railway vehicles, ships, aircraft, aerospace equipment, medical devices, or any other applications where a failure or malfunction could directly endanger human life or adversely affect the human body, please contact us in advance.

1. Surge Protectors and Surge Absorbers

This product is designed to be connected to the power line or signal line input section of equipment, in order to suppress induced lightning surges entering through the power or signal lines.

2. Failure Modes

- Cracks or breakage may occur if the product is dropped or subjected to a strong impact, which may result in insufficient performance characteristics.
- For surge protectors without built-in indication or disconnection functions, such as the R·A·V Series, R·C·M Series, RSPD Series, and R·A·M Series, cracks, breakage, or burning may occur if lightning surge currents, overvoltage, or overcurrent exceeding the specified limits are applied.
- For surge protectors with built-in indication or disconnection functions, such as the LV Series and SV Series, the disconnection function will operate in the event of a failure, resulting in an

open mode.

- For gas discharge tubes (RA Series and RHCA Series), rupture may occur if lightning surge currents, overvoltage, or overcurrent exceeding the specified limits are applied.
- The failure mode of silicon surge absorbers is mostly a short mode. However, in rare cases, an open mode failure may also occur.

3. Precautions

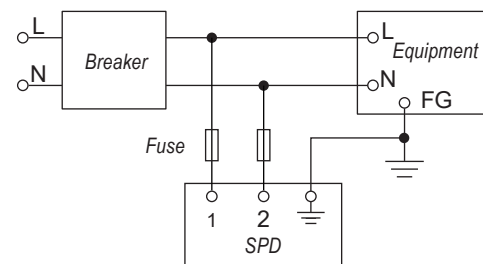
3.1 During Circuit Design

3.1.1 Common to Surge Protection Products

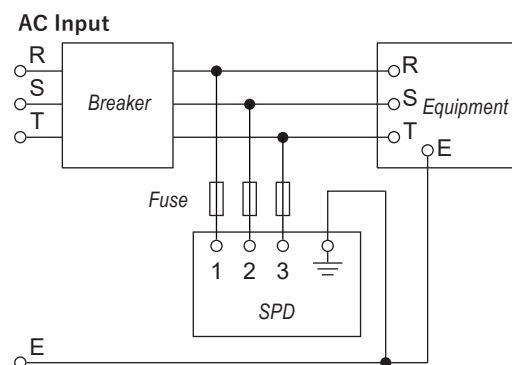
- Do not use the product at voltages exceeding the maximum allowable circuit voltage (maximum operating voltage or maximum rating).
- Do not use the product for purposes other than lightning surge protection.

3.1.2 Surge Protectors (SPD)

- To prevent accidents caused by SPD failure, connect an SPD disconnect device (such as a circuit breaker or fuse) in series with the SPD to isolate it from the power supply system.



(Figure A) Example of Use in Single-Phase AC Circuits



(Figure B) Example of Use in Three-Phase AC Circuits



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SPD (Surge Protective Device)

- * Do not perform a dielectric strength test on a surge protector that is installed in an unprotected circuit. If this test is to be conducted, disconnect the \perp line of the surge protector from the \perp , G or FG line.
- When using the R·A·V, R·C·M, RSPD, or R·A·M Series, connect a fuse (preferably conforming to IEC 60127-2) in series with the SPD after the breaker, as shown in Figure A (or Figure B for three-phase circuits).
- The SPD grounding and the grounding of the protected equipment should be connected together at the shortest possible distance, and a single point connection to earth is recommended.
- When selecting a fuse, evaluate and verify the melting characteristics and impulse withstand current, and choose a fuse rated at 5A or below.
- Install the SPD as close as possible to the incoming power line entry point.
- When performing insulation resistance or AC dielectric strength tests, disconnect the SPD earth wire before the test. Performing insulation resistance or AC dielectric strength tests with the SPD installed may cause the SPD to operate, resulting in insulation failure or dielectric breakdown.
- * The following SPDs are compatible with AC dielectric strength testing and can be tested without disconnecting the earth wire:
R·A·M-242BWZ(LED), R·A·M-302BWZ(LED),
R·A·M-362BWZ(LED), R·A·M-362BXZ(LED),
R·A·M-302BUZ-N(LED).
- When used for communication, signal, or telephone lines, select from the R·A·V-LD Series or RA-C6 Series.

(Example of Selection Method)

- ① When the line voltage is 48 VDC:
For R·A·V-L-A, LD, the clamping voltage can be determined as follows:

$$48V \times 1.2 \times 1.1 = 63.36V$$

Margin ↓ ↓ Clamping voltage tolerance

Select a clamping voltage higher than this value.

Therefore, in the case of R·A·V-LD, select R·A·V-221LD.

- ② When the line voltage is 50VDC, and the bell ringing voltage of AC120V is superimposed at 50V:

$$50V + 120V \times \sqrt{2} \div 2 \div 220V$$

$$220V \times 1.2 \times 1.15 \div 304V$$

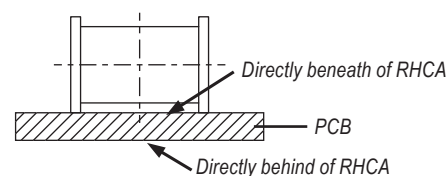
Margin ↓ ↓ Breakdown voltage tolerance

Therefore, in the case of RA-C6, select RA-311P-C6.

- When used for AC power lines, select from the Surge Protector series. Individual units such as R·A·V-LD cannot be used directly on power lines. Please use these products:
LV-Q4, LV-U4, SV-U4, RSPD-Q4/5, RSPD-U4/5
R·A·V-BWZ-3C, R·A·V-BXZ-3C, R·A·V-LDEZ
In addition, even greater effectiveness can be achieved when used together with our noise suppression capacitors.

3.1.3 Gas Discharge Tubes

- When using gas discharge tubes for surge protection between lines and to ground in AC or DC power circuits, a follow current may occur if used alone. Therefore, always connect them in series with a varistor.
- When using the RHCA5039 and RHCA5039(335) series, note that if there are wiring patterns directly beneath or directly behind (on the back side of the PCB) the RHCA5039, the AC dielectric strength may decrease. Please take this into consideration during PCB design.





3.1.4 Silicon Surge Absorbers

- Do not use near heat-generating components.
- Do not use as a substitute for a Zener diode.

3.2 During Equipment Mounting and Assembly

3.2.1 Surge Protectors (SPD)

- Keep the connection conductors of the SPD as short as possible. If the SPD leads are too long, the suppression effect may decrease, and the protected equipment may not be sufficiently protected.
- Do not apply stress to the root of the leads. Bending the leads at the root may cause the injected resin and leads to separate.

3.2.2 Gas Discharge Tubes and Silicon Surge Absorbers

- Use according to the soldering conditions specified in the product specifications.

3.3 Storage and Handling

3.3.1 Common to Surge Protection Products

- Do not use in locations where dust, salt, or corrosive gases are present. For storage, avoid direct sunlight, rapid temperature changes, dusty environments, and corrosive atmospheres; store the products in their original packaging.
- Do not use in outdoor environments, in non-waterproof power equipment or enclosures where condensation may occur, or in conditions exceeding the specified temperature and humidity ranges.
- Do not clean with solvents (e.g., thinner, acetone) or chemicals that may dissolve or degrade the external resin.

3.3.2 Gas Discharge Tubes

- For glass RA-type tubes, note that strong shocks or drops during transportation may cause breakage.