

# NRP Series PC Board Circuit Protectors

## Higher economic efficiency than a fuse

SIL type subminiature circuit protectors adopting IC terminal arrangements, and mountable directly on PC boards. Simple construction and high performance applying a positive load reversing mechanism by IDEC's original design. Unlike fuses, the thermal trip mode (bimetal type) eliminates erroneous interruption due to inrush currents.

Rated current can be selected to meet the load. Circuits with high inrush currents can be protected against overloads (unlike fuses).

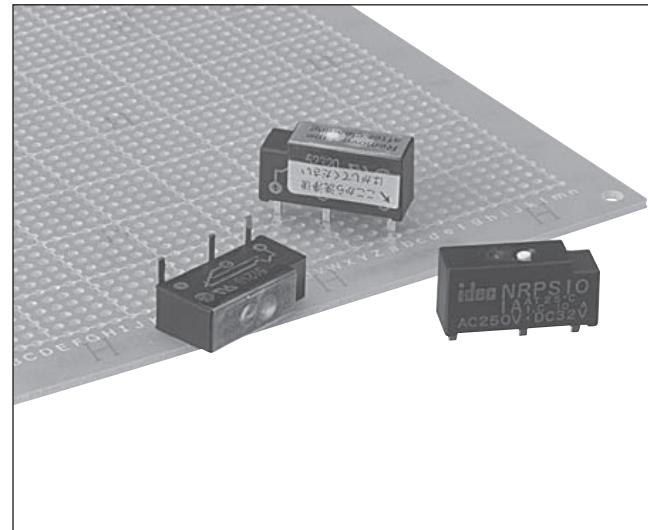
Reusable 200 operations (tripping at 200% the rated current) with higher economic efficiency, and less maintenance than fuses.

Available in slim and flat types. Slim types (can be mounted on PC boards by using pick and place machines)

Available in non-sealed and sealed types. With the sealed type, cleaning after soldering is possible.

With a manual OFF mechanism, convenient for circuit checkups

This product is recognized by Underwriters Laboratories under UL1077 as a "Supplementary Protector."



Applicable Standard	Certification Mark	Certification Organization File No.
UL1077		UL File No. E68029
CSA C22.2 No. 235		No. LR65560

For details, see the list of standard certified products in the back of this catalog.

## Types

Specify a rated current in place of .

Type	Appearance	Type No.	Ordering Type No.	<input type="checkbox"/> Rated Current	Contact	Internal Circuit (Note)	Package Quantity	
NRPS (Slim Type)	Non-sealed		NRPS10- <input type="checkbox"/>	NRPS10- <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	1NC		10
	Sealed (Tape-sealed)		NRPS10-G <input type="checkbox"/>	NRPS10-G <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	1NC		
NRPF (Flat Type)	Non-sealed		NRPF10- <input type="checkbox"/>	NRPF10- <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	1NC		10
	Sealed (Tape-sealed)		NRPF10-G <input type="checkbox"/>	NRPF10-G <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	1NC		
NRPS (Slim Type)	Non-sealed		NRPS11- <input type="checkbox"/>	NRPS11- <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	SPDT		10
	Sealed (Tape-sealed)		NRPS11-G <input type="checkbox"/>	NRPS11-G <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	SPDT		
NRPF (Flat Type)	Non-sealed		NRPF11- <input type="checkbox"/>	NRPF11- <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	SPDT		10
	Sealed (Tape-sealed)		NRPF11-G <input type="checkbox"/>	NRPF11-G <input type="checkbox"/> PN10	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A	SPDT		

Note: Terminal ③ on 1NC contact type is provided for firm mounting on printed-circuit boards, without internal connections.

## Ordering Information

When ordering, select appropriate circuit protectors in consideration of the soldering method and necessity of cleaning.

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**Selection Guide** - Select appropriate circuit protectors (marked with X in the table below) according to your application.

Applications	Slim Type		Flat Type	
	Non-sealed	Sealed	Non-sealed	Sealed
	NRPS10-□	NRPS10-G □	NRPF10-□	NRPF10-G □
NRPS11-□		NRPS11-G □	NRPF11-□	NRPF11-G □
Manual soldering	X	X	X	X
Dip soldering	—	X	—	X
Cleaning after soldering	—	X	—	X
Automatic mounting on PC boards	X	X	—	—

Note: The sealed type is provided with epoxy-seal on the base and a tape seal on the actuator side. After cleaning, be sure to remove the tape seal.

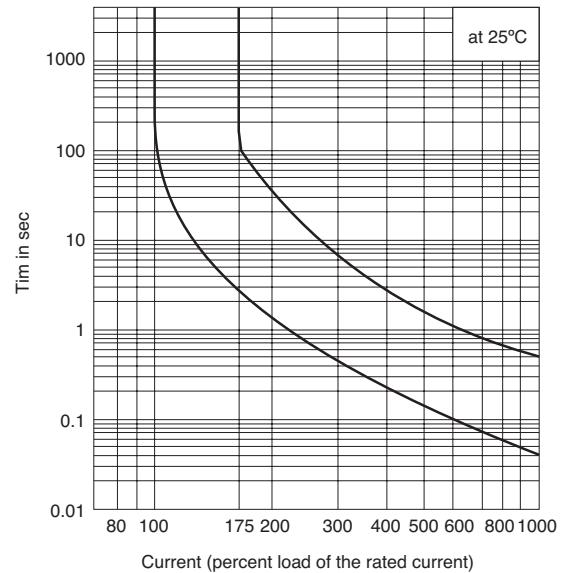
When using flux, use rosin flux. Select the sealed type irrespective of cleaning necessity.

## Specifications

Protection Method	Thermal tripping
Internal Circuit	Series Trip
No. of Poles	1 pole
Rated Voltage	250V AC (50/60Hz), 32V DC
Rated Current	1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A
Rated Interrupting Capacity	1 to 4A: Rated current x 10 (resistive load) 5 and 6A: 250V AC/40A, 32V DC/40A (resistive load)
Minimum Applicable Load	5V AC/DC 100 mA (reference value)
Reference Temperature	25°C
Operating Temperature (Note)	-10 to +50°C (no freezing)
Operating Humidity	45 to 85% RH (no condensation)
Storage Ambient Temperature	-30°C to +70°C (no freezing)
Storage Ambient Humidity	45 to 85% RH (no condensation)
Vibration Resistance	100 m/sec <sup>2</sup> (10 to 55 Hz)
Shock Resistance	Damage limits: 1000 m/s <sup>2</sup> Operating extremes: 500 m/s <sup>2</sup>
Life	200 operations (tripping at 200% the rated current)
Insulation Resistance	100 MΩ minimum (500V DC megger)
Dielectric Strength	1500V AC (50/60Hz), 1 minute (between terminals of the same pole when main contacts are open, and between live parts and ground)
Initial contact	Between terminals ① and ②: 200 mΩ maximum (5V DC • 1A) Between terminals ② and ③: 100 mΩ maximum (5V DC • 100mA)
Weight (Approx.)	2g

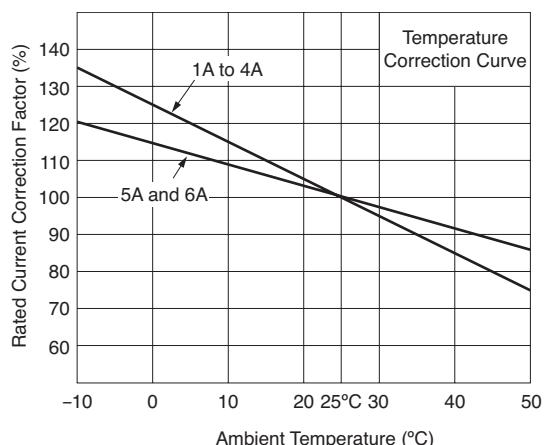
Note: The rated current is the value at the reference ambient temperature of 25°C, and varies with operating temperature. The rated current can be corrected according to the Temperature Correction Curve.

## Time Delay Curves



## Temperature Correction Curve

The rated current is based on an ambient temperature of 25°C. Since a thermal tripping method is employed, the rated current should be corrected according to the ambient temperature with reference to the curve shown below.



## Overcurrent - Time Delay Characteristics (sec at 25°C)

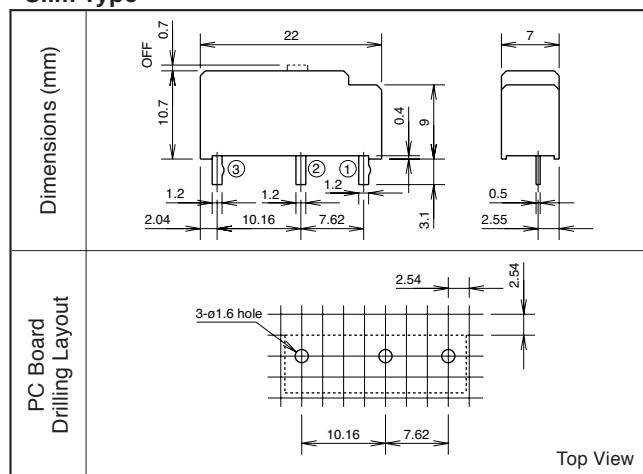
Percent of Rated Current	100%	175%	200%	400%	600%	800%	1000%
Time Delay	No Trip	2.2-120	1.2-40	0.24-2.2	0.1-1	0.06-0.7	0.04-0.5

- Flush Silhouette
- Control Units
- Display Lights
- Display Units
- Safety Products
- Terminal Blocks
- Comm. Terminals
- AS-Interface
- Relays & Timers
- Sockets
- Circuit Protectors**
- Power Supplies
- PLCs & SmartRelay
- Operator Interfaces
- Sensors
- Control Stations
- Explosion Protection
- References

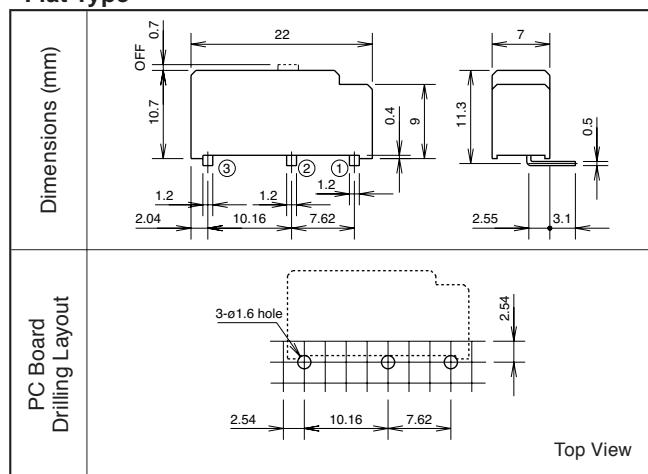
# NRP Series PC Board Circuit Protectors

## Dimensions and PC Board Drilling Layout

### Slim Type

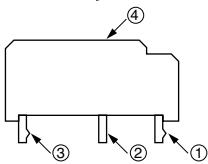


### Flat Type

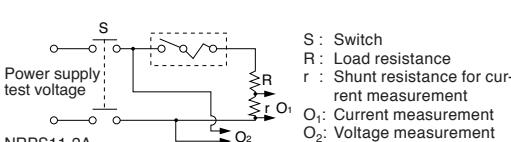


### Dielectric Strength Test

NRPS11 } 100 units  
NRPF11 } in total



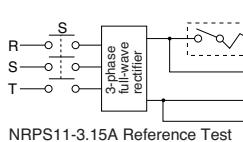
### Short-circuit Test (AC)



#### Data

- Power voltage: 220V AC, Frequency: 60Hz
- Short-circuit current (effective value): 20A
- Power factor:  $\cos\phi = 1$  (4 cycles after power is applied)

### Short-circuit Test (DC)

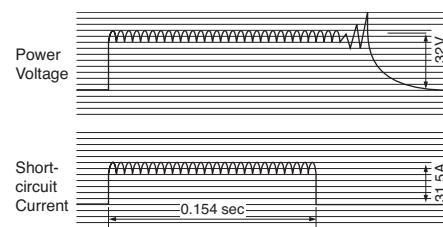
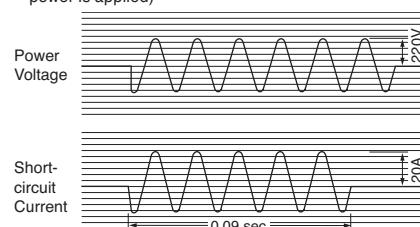


S : Power switch (Solenoid switch)  
R : Load resistance  
r : Shunt resistance for current measurement (30A / 100mV)  
O<sub>1</sub> : Current measurement  
O<sub>2</sub> : Voltage measurement

#### Data

- Power voltage: 32V DC
- Short-circuit current: 31.5A

Item	1500V AC 1 minute	Critical Values		
		X	MIN	MAX
Between terminals (Open) ① - ② & ③	Normal	2800	1700	3400
Between terminals (Open) ② - ③ & ①	Normal	2740	2700	3400
Between housing and terminal ④ - ① & ② & ③	Normal	3600	3300	3800



## Applications of NRPS/NRPF Circuit Protectors

The NRPS/NRPF series circuit protectors are ideal for use on printed-circuit boards in small electric appliances to protect power transformers, rectifiers, small-motors, solenoid valves, and solenoids from overloads.

In addition to higher economic efficiency than that of fuses, the capability of over 200 repeated uses will find a wide range of applications in place of various fuses.

## Applications Examples

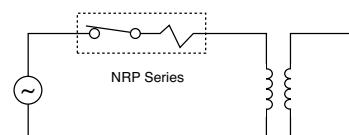
**Office Automation Equipment:** Copiers, Shredders, Fax machines, Tools: Machine tools, Hydraulic devices, Robots, etc.

**Measuring equipment:** Testers, Oscilloscopes, etc. **Communication Equipment:** Transmitter/Receiver, Telephone Exchanger

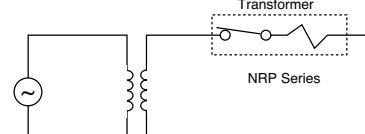
**Power Supplies:** Switching Power Supplies, Small Generators

## Application Circuits Example

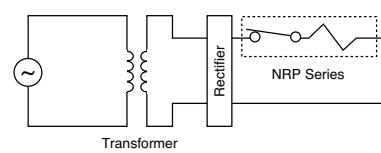
### Transformer Protection Example



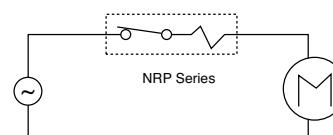
### Transformer Secondary Protection



### Rectifier Protection Example



### Motor Coil Protection



## Safety Precautions

Flush Silhouette
Control Units
Display Lights
Display Units
Safety Products
Terminal Blocks
Comm. Terminals
AS-Interface
Relays & Timers
Sockets
Circuit Protectors
Power Supplies
PLCs & SmartRelay
Operator Interfaces
Sensors
Control Stations
Explosion Protection
References

### 1. Soldering

#### (1) • Soldering to the printed-circuit boards

Soldering should be done quickly referring to the conditions below. If the terminals are heated excessively, the bimetal may trip.

#### • Manual soldering

For manual soldering, complete soldering with a 60W soldering iron (soldering tip temp.: 350°C) quickly within 3 seconds. (When lead-free soldering is used, Sn-Ag-Cu is recommended.)

During soldering, keep the soldering iron away from the plastic housing of the circuit protector, and apply no external force by bending the terminal or pulling the wires.

(Check your actual soldering conditions before soldering.)

#### • Dip soldering

Dipping temperature: 260°C

Dipping duration: 5 seconds maximum

#### (2) Do not solder the sealed type in a flow soldering bath.

Since preheating process weakens the viscosity of the tape seal on the actuator due to the air expansion inside NRPS and the NRPF, air-tightness is possibly lowered.

#### (3) For the non-sealed type, perform manual soldering. Do not use the water-soluble flux because it runs into the unit and it causes malfunctions.

#### (4) Non-corrosive rosin flux is recommended because washing is not required.

### 2. Washing

#### (1) When there is a possibility of washing, select the seal type.

#### (2) Washing should be done at 60°C maximum within 30 seconds (and 50mm depth for full washing). Avoid steam washing. Use pure water as a cleaning solvent. When an organic solvent is used, use of alcohol is recommended. Before using other organic solvents, make sure that after actual washing, the tape seal is not removed and sealant or housing material is not affected.

#### (3) The base of sealed type is provided with epoxy resin sealing and a tape seal covers the actuator. After cleaning, be sure to remove the tape from the actuator before use.

### 3. Notes for Bimetal

#### (1) Storage temperature should not exceed 70°C. If storage temperature exceeds 70°C, the bimetal may trip.

#### (2) Applied current should be under the rated current for the normal use. The rated current should be corrected according to the ambient temperature chart due to bimetal characteristics.

#### (3) Since the NRPS and NRPF are designed for protection against overloads, they should be used within the rated interrupting capacity. An excessive overcurrent may affect the bimetal characteristics or damage the internal mechanism.

#### (4) Note that the NRPS and NRPF do not respond to overcurrent for a period of few tens to few hundreds msec.

### 4. Manual OFF Mechanism

Manual OFF mechanism is performed by slightly pulling the white pin at the top of the unit with tweezers.

### 5. Other Notes

#### (1) Make sure that no load (current) is applied before resetting manually turning the circuit OFF with actuator operation. In addition, avoid frequent opening and closing of the actuator at no load (current is not applied).

#### (2) Turn power off and allow at least 60 seconds before rethrowing (at reference ambient temperature of 25°C). Reset the protector with no load. Do not press the actuator with something sharp, otherwise the internal part may be damaged.

#### (3) Do not hold the actuator depressed while an overcurrent is present, because the overcurrent may damage the circuit protectors.

