IDEC

*Think Automation and beyond...*

# Circuit Protectors


IDEC CORPORATION

# Circuit Protector Selection Guide

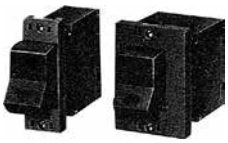
| Model | | NC1V | NH1S | NH1Y | NH1L (w/indicator) | NH1V |
|---|---|---|---|---|---|---|
| Shape | |  Retractable Actuator |  Lever |  Rocker |  Rocker |  Lever |
| Tripping Method | | Hydraulic-magnetic tripping | | | | |
| No. of Poles | | 1 to 3 poles | 1 to 3 poles (Dual-coil: 1-pole, 2-pole) | 1, 2 poles | 1, 2 poles | 1 to 3 poles |
| Internal Circuit | Series Trip/Current Trip | Yes | Yes | Yes | Yes | Yes |
| | Relay Trip/Voltage Trip | Yes | Yes | Yes | Yes | Yes |
| | Dual-coil | – | Yes | – | – | – |
| Rating | Rated Voltage | 250V AC, 50/60 Hz 65 to 125V DC (3 types are for AC only) | 250V AC 50/60 Hz, 65V DC | | | |
| | Rated Current (Current Trip) | 0.1A to 30A | Current trip: 0.5A to 30A Dual-coil: 2A to 15A | | | |
| | Trip Voltage (Voltage Trip) | 24 to 48V DC | 100V AC, 24V DC (Dual-coil: 24V DC, 100V AC) | | | |
| | Rated Interrupting Current | 250V AC/2500A 65 to 125V DC/2500A | 250V AC/65V DC 1000A (UL/CSA rating), 220V AC 50/60Hz 1000A ( ) | | | |
| Time Delay Curves | | 3 types | 2 types for DC, 3 types for AC | | | |
| Auxiliary Contacts/Alarm Contacts | | Yes | With | With auxiliary contact | With auxiliary contact | With |
| Inertia Delay | | Yes | With | With | With | With |
| Mounting Style | | Screw mounting, DIN35mm Rail | Panel cut-out (Screw mounting) | Panel cut-out (Snap-on mounting) | | DIN rail mounting, Surface mounting |
| Dimensions (H × W × D mm, 1-pole) | | 78.8 × 17.5 × 72.6 | 42 × 16 × 45 | 55 × 22 × 60 | | 58.7 × 16 × 56 |
| Certification | | UL, CSA, TUV, CE, , | UL, c-UL, VDE, , | UL, c-UL, VDE, CE, , | UL, c-UL, VDE, CE, , | UL, c-UL, VDE, CE, , |
| Page | | 5 | 16 | 16 | 16 | 16 |

Note: See the following pages for further information about the certified products.

| Model | | NRLT | NRLY | NRLY (w/indicator) | NRLR | NRLR (w/indicator) |
|---|---|---|---|---|---|---|
| Shape | |  Lever |  Rocker |  (LED/Neon) Rocker |  Rocker |  (LED/Neon) Rocker |
| Tripping Method | | Hydraulic-magnetic tripping | | | | |
| No. of Poles | | 1, 2 poles (1-lever) | 1, 2 poles (1-rocker) | 1, 2 poles (1-rocker) | 1, 2 poles (1-rocker) | 1, 2 poles (1-rocker) |
| Internal Circuit | Series Trip/Current Trip | Yes | Yes | Yes | Yes | Yes |
| | Relay Trip/Voltage Trip | Yes | Yes | Yes | Yes | Yes |
| | Switch Type | Yes | Yes | Yes | Yes | Yes |
| Rating | Rated Voltage | 250V AC 50/60Hz, 50V DC | | | | |
| | Rated Current (Current Trip) | 0.5A to 20A | | | Current trip: For 0.5A to 20A | |
| | Trip Voltage (Voltage Trip) | 100V AC, 24V DC | | | | |
| | Rated Interrupting Current | 250V AC/750A (UL rating: 1000A), 50V DC/500A (UL rating: 1000A) | | | | |
| Time Delay Curves | | 3 types for DC, 3 types for AC | | | | |
| Auxiliary Contacts/Alarm Contacts | | With auxiliary contact | With auxiliary contact | With auxiliary contact | With auxiliary contact | With auxiliary contact |
| Inertia Delay | | With | With | With | With | With |
| Mounting Style | | Panel cut-out (Ring mounting) | Panel cut-out (Snap-on mounting) | Panel cut-out (Snap-on mounting) | Panel cut-out (Screw mounting) | Panel cut-out (Screw mounting) |
| Dimensions (H × W × D mm, 1-pole) | | 36.6 × 16.8 × 42 | 50.8 × 22 × 46 | 50.8 × 22 × 46 | 44 × 16.8 × 46 | 44 × 16.8 × 46 |
| Certification | | UL, CSA, VDE,CE, * , | UL, CSA, VDE,CE, * , | UL, CSA, VDE,CE, * , | UL, CSA, VDE, CE, * , | UL, CSA, VDE, CE, * , |
| Page | | 40 | 40 | 40 | 40 | 40 |

Note: See the following pages for further information about the certified products.
* Protectors indicated with are for the relay trip type.
Also, the series trip and relay trip types of NRL series are excluded from .

| | NRAS | NRAN | NRAR | NRAR (w/indicator) |
|---|---|---|---|---|
| |  Lever |  Lever |  Rocker |  (LED) (Neon Lamp) Rocker |
| | Hydraulic-magnetic tripping | | | |
| | 1 to 3 poles | 1 to 3 poles | 1 pole | 1 pole |
| | Yes | Yes | Yes | Yes |
| | Yes | Yes | – | – |
| | – | – | – | – |
| | 250V AC 50/60 Hz, 65V DC | | | |
| | 0.3A to 30A | | | |
| | 24V DC | | | |
| | 250V AC/65V DC, 1000A | | | |
| | 2 types for DC, 3 types for AC | | | |
| | With | With | With | With |
| | With | With | With | With |
| | Panel cut-out (Screw mounting, snap-on mounting), Surface mounting (Plug-in base), DIN rail mounting (Width: 35 mm) | | | Panel cut-out (Screw mounting), Panel cut-out (Snap-on mounting) |
| | 50.7 × 19.1 × 54.5 | 50.7 × 19.1 × 50.5 | 52 × 19 × 65.5 | 52 × 19 × 65.5 |
| | UL, c-UL, VDE, CE, | UL, c-UL, VDE, CE, | UL, c-UL, VDE, CE, | UL, c-UL, VDE, CE, |
| | 28 | 28 | 28 | 28 |

| | NRLK | NRLP | NRBM |
|---|---|---|---|
| |  Large Rocker |  Lever |  Lever |
| | Hydraulic-magnetic tripping | | |
| | 1, 2 poles (1-rocker) | 1 pole | 1 to 3 poles |
| | Yes | Yes | Yes |
| | Yes | – | – |
| | Yes | – | – |
| | 250V AC 50/60Hz, 50V DC | | 250V AC, 50/60Hz, 65V DC |
| | Current trip: For 0.5A to 20A | 0.5A to 20A | 1A to 50A |
| | 100V AC, 24V DC | 100V AC, 24V DC | – |
| | 250V AC/750A (UL rating: 1000A), 50V DC/500A (UL rating: 1000A) | | 250V AC/65V DC 1000A |
| | 3 types for DC, 3 types for AC | | 2 types for DC, 3 types for AC |
| | With auxiliary contact | With auxiliary contact | With |
| | With | With | With |
| | Panel cut-out (Screw mounting) | PC board | Panel cut-out (Screw mounting) |
| | 44 × 16.8 × 44 | 36.6 × 16.8 × 46 | 63 × 19.1 × 63.5 |
| | UL, CSA, VDE, CE, * | UL, CSA, VDE,CE, | UL, c-UL, VDE, CE, |
| | 40 | 40 | 52 |

Note: UL and CSA ratings may differ. See the following pages for details.

(Continued on the next page)

# Circuit Protector Selection Guide

| Series | | NRF1 | NRF2 | NRPS | NRPF |
|---|---|---|---|---|---|
| Shape | |  | With manual OFF mechanism  | Slim  | Flat  |
| Tripping method | | Thermal tripping | | | |
| No. of Poles | | 1 pole | | 1 pole (SPST-NC, SPDT) | |
| Internal Circuit (Current Trip) | | Series Trip | | Series trip | |
| Rating | Maximum Circuit Voltage | 32V DC, 250V AC | | 32V DC, 250V AC | |
| | Rated Current | 300, 500mA<br>1, 2, 3, 5, 8, 10, 15A | | 1, 1.6, 2, 3.15, 4, 5, 6A | |
| | Rated Interrupting Current | 300 mA to 5A: Rated current × 6 (resistive load)<br>10, 15A: Rated current × 10 (resistive load) | | 1A to 4A: Rated current × 10 (resistive load)<br>5A, 6A: 250V AC/40A, 32V DC/40A (resistive load) | |
| | Tripping Time | No trip at the rated current<br>Within 1 hour at 135% the rated current | | No trip at the rated current<br>Within 2 min at 175% the rated current | |
| | Reset Time | 1 min minimum (at 135% the rated current) (*1) | | 1 min minimum (at 200% the rated current) (*1) | |
| Time Delay Curves | | 1 type | | 1 type | |
| Auxiliary Contacts | | With | | – | |
| Mounting Style | | Panel cut-out (Snap-on mounting) | | PC board mounting | |
| Certification | | UL, CSA, TÜV (*2), | UL, | UL, CSA | |
| Page | | 56 | | 59 | |

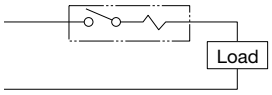
*1: Reset time is the value at the reference ambient temperature of 25°C.
*2: TÜV certification: for 8A, 10A and 15A only.

## Common Description of Circuit Protectors

## Internal Circuit Overview and Application Examples

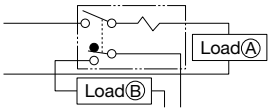
**Series Trip**

This is the most common circuit protector, providing excellent overload and short circuit protection. It can also be used as ON/OFF switch, except NRF and NRP series.



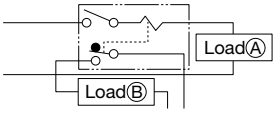

**Series Trip with Auxiliary Contacts**

As the auxiliary contact operation is interlocked with the ON/OFF of the main contactor, circuit protector operation can be monitored by a lamp. The auxiliary contact can also be used to control auxiliary circuits.



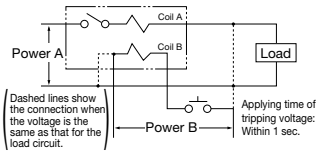

**Series Trip with Alarm Contacts**

The alarm contact is electrically independent of the ON/OFF of the main contactor, but actuates when the protective element operates. Therefore, the alarm contact can be used with a lamp or buzzer to indicate trip operation and control alarm circuits. After the alarm contact has tripped, turn the lever ON to set the alarm contact.



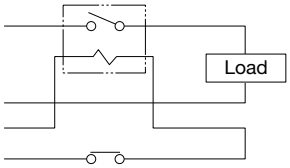

**Dual-coil**

The dual coil circuit protector is provided with both a series trip (current trip) and relay trip (voltage trip). In the following example circuit, Coil A (current coil) performs overload and short circuit protection, while Coil B (voltage coil) serves to shut down the circuit when the alarm contact detects an abnormal condition.




**Relay Trip/Voltage Trip**

The internal structure is identical to the current tripping protector, but the protective element has no time-delay function and the load circuit is cut off by the instantaneous tripping of the protector. Suitable for purposes, such as cutting off the power supply by using the alarm signal of the secondary circuit of the transformer.




• Applications by Time Delay Curve

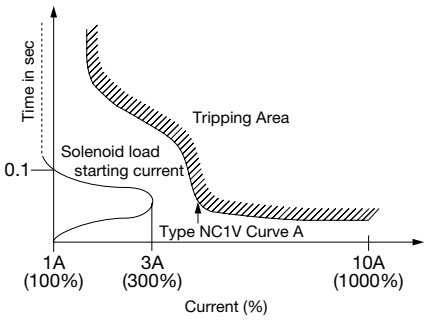
| Time Delay Curves | Applications |
|---|---|
| Curve AD<br>Curve AA | The most common curves used for circuit breakers. |
| Curve MD<br>Curve MA | Suited for motor loads that draw high inrush currents lasting for a rather long period of time. |
| With inertia delay<br>(Inertia delay mechanism) | Suited for transformer and lamp loads that draw steep inrush currents. |

## Selection Guide

Select an appropriate circuit protector with a required delay curve and rated current in consideration of the characteristics of the circuit or equipment to be protected.

• When starting an inductive load, the inrush current reaches up to over ten times the rated current. Select the rated current to prevent tripping at starting current.

Example
Solenoid rating
Rated current: 0.7A
Inrush current: 3A max.
Inrush time: Approx.0.1 sec




For solenoid protection such as the above example, NC1V circuit protector for the rated current 1A is suited.

• For semiconductor element, the joint-use of short delay fuse for semiconductor protection is more effective.

# NC1V Circuit Protectors

## IDEC's original spring-up, fingersafe terminals enhance reliability and safety.

- Integrated electric shock protection structure (IP20).
- Auxiliary/alarm contact terminals and voltage coil terminals on the relay trip types are equipped with terminal covers.
- Spring-up, fingersafe terminals reduce wiring time.
- Ring terminals can be installed. Captive terminal screws.
- Available with inertial delay
- Available with auxiliary or alarm contacts
- Rated short-circuit capacity: 2500A
- Slim, space-saving housing
  1-pole: 17.5mm wide
  2-pole: 35.0mm wide
  3-pole: 52.5mm wide
- Retractable actuator
- The trip-free mechanism maintains the circuit open even when the operator is turned on after tripping.

| Applicable Standards | Mark | Certification Organization / File No. |
|---|---|---|
| UL1077 | | UL recognized File No. E68029 |
| CSA C22.2 No. 235 | | CSA file No. LR83454 |
| EN60934 | | TÜV SÜD |
| EN60947-2 | | European Commission's EU Low Voltage Directive |
| GB17701 | | CCC No. 2008010307265840 |
| Electrical Applicance and Material Safety Law Technical Standard | Series Trip | JET |
| | Relay Trip | |

Note: TÜV, CE, and CCC marks are applicable for series trip type only.

## Specifications

| | | | | |
|---|---|---|---|---|
| Operator Style | | Retractable actuator | | |
| Internal Circuit | | Series trip (current trip), Relay trip (voltage trip) | | |
| Protection Method | | Hydraulic magnetic tripping system, Magnetic tripping system (voltage trip) | | |
| No. of Poles | | 1-pole | 2-pole | 3-pole |
| Rated Voltage (AC/DC) (Note 1) | | 250V AC 50/60Hz, 65V DC | 250V AC 50/60Hz, 125V DC | 250V AC, 50/60Hz |
| Series Trip (Current Trip) | Rated Short-circuit Capacity | 250V AC, 2500A<br>65V DC, 2500A | 250V AC, 2500A<br>125V DC, 2500A | 250V AC, 2500A |
| | Rated Current | 0.1A, 0.3A, 0.5A, 1A, 2A, 3A, 5A, 7A, 10A, 15A, 20A, 25A, 30A | | |
| | Trip Characteristics (Note 2) | Time delay curve curve M (slow), curve A (medium), S (instantaneous)<br>Curves M and A are avilable with inertial delay. | | |
| Relay Trip (Voltage Trip) (Note 3) | Rated Current | 30A | | |
| | Trip Voltage | 24 to 48V DC (at 25°C)<br>Voltage application duration 10 sec maximum, tripping time 0.1 sec maximum (at rated voltage) | | |
| Auxiliary Contact/ Alarm Contact | Contact Rating | 125V AC 3A (resistive load), 30V DC 2A (resistive load) | | |
| | Minimum Applicable Load | 24V DC 1mA (resistive load, reference value) | | |
| Insulation Resistance | | 100 MΩ minimum (500V DC megger) | | |
| Dielectric Strength | | 2000V AC, 1 minute (between terminals when main contacts are open, between live parts of different poles, between live and dead parts)<br>600V AC (between terminals when auxiliary circuits are open) | | |
| Vibration Resistance (with rated current applied) | | Damage limits: 147 m/s$^2$ (10 to 55 Hz) (1-pole, 2-pole), 78 m/s$^2$ (3-pole)<br>Operating extremes: 98 m/s$^2$ (1-pole, 2-pole), 78 m/s$^2$ (3-pole) | | |
| Shock Resistance (S time delay curve: 80% rated current, A, M time delay curve: 100% rated current) | | Damage limits: 490 m/s$^2$ (1-pole, 2-pole), 297 m/s$^2$ (3-pole)<br>Operating extremes: 196 m/s$^2$ | | |
| Electrical Life | | 10,000 cyles minimum (at rated curent), 10 operations per minute | | |
| Reference Temperature | | 40°C | | |
| Operating Tempperature | | −10 to +60°C (no freezing)<br>Rated current is based on an ambient temperature of 40°C. When the operating temperature exceeds 40°C, derate the rated current by using the factors shown below. | | |
| Storage Temperature | | −40 to +60°C (no freezing) | | |
| Operating Humidity | | 45 to 85% RH (no condensation) | | |
| Storage Humidity | | 45 to 85% RH (no condensation) | | |
| Terminal Style | Main Circuit Terminal | Spring-up, fingersafe terminal: M4 screw (up to 20A), M5 screw (25A and 30A) | | |
| | Auxiliary/Alarm Contacts, Voltage Coil Terminal | M3.5 screw | | |
| Weight (approx.) | | 1-pole: 90g, 2-pole: 170g, 3-pole: 260g | | |

Note 1: 3-pole type is for AC voltage only.

Note 2: For S (instantaneous) tripping curve, humming sound may be caused when used in an AC sinusoidal-wave current circuit around 80% of the rated current, however, the performance of the circuit protector will not be affected.
To avoid unnecessary tripping, do not use in circuits where inrush currents may be present.

Note 3: Relay trip (voltage trip) type is not equipped with an overcurrent trip function.

| Operating Temp. | Derating Factor |
|---|---|
| 50°C | 0.9 |
| 55°C | 0.8 |
| 60°C | 0.7 |

- Do not use the NC1V circuit protectors in environments where they are exposed to extreme temperature, humidity, dust, corrosive gases, vibration, shock, or in a circuit where inrush current may be present, otherwise unnecessary operations and damage may occur.

## Part No. Development

NC1V - 2 1 00 F - 30A A DC24V

1 **Model**
NC1V: Flap actuator type
DIN rail and panel mounting

2 **No. of Poles**
1: 1-pole
2: 2-pole
3: 3-pole

3 **Internal Circuit**
1: Series trip (current trip)
5: Relay trip (voltage trip)

4 **Auxiliary/Alarm Contacts**
00: None
11: With one auxiliary contact
12: With two auxiliary contacts
13: With three auxiliary contacts
21: With one alarm contact
31: With one auxiliary contact and one alarm contact
32: With two auxiliary contacts and one alarm contact

5 **Inertial Delay**
Blank: Without
F: With
∗ Inertial delay is for AC voltage only.
∗ Available with medium and slow types (not applicable with relay trip).

6 **Rated Current**
0.1A, 0.3A, 0.5A, 1A, 2A, 3A, 5A, 7A, 10A 15A, 20A, 25A, 30A
∗ Specified for series trip only.

7 **Time Delay Curve**
M: Slow
A: Medium
S: Instantaneous
∗ For both AC/DC.
∗ Specified for series trip only.

8 **Voltage Trip Coil Voltage**
DC24V: 24-48V DC
∗ Specified for relay trip only.

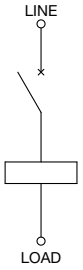
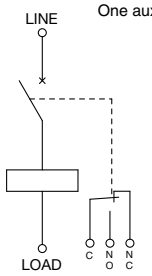
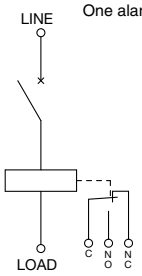
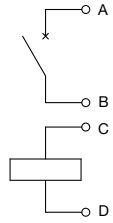
Specity rated current, time delay curve, or voltage trip coil voltage in place of 6 7 8 in the Part No.

| Internal Circuit | No. of Poles | Inertial Delay | Auxiliary Contact Alarm Contact | Part No. | Code | | |
|---|---|---|---|---|---|---|---|
| | | | | | 6 Rated Current | 7 Time Delay Curve | 8 Voltage Trip Coil Voltage |
| Series Trip (Current Trip) | 1-pole | – | — | NC1V-1100-6 7 | 0.1A<br>0.3A<br>0.5A<br>1A<br>2A<br>3A<br>5A<br>7A<br>10A<br>15A<br>20A<br>25A<br>30A | M (slow)<br>A (medium)<br>S (instantaneous) | — |
| | | | One Auxiliary Contact | NC1V-1111-6 7 | | | |
| | | | One Alarm Contact | NC1V-1121-6 7 | | | |
| | | With | — | NC1V-1100F-6 7 | | | |
| | | | One Auxiliary Contact | NC1V-1111F-6 7 | | | |
| | | | One Alarm Contact | NC1V-1121F-6 7 | | | |
| | 2-pole | — | — | NC1V-2100-6 7 | | | |
| | | | One Auxiliary Contact | NC1V-2111-6 7 | | | |
| | | | Two Auxiliary Contacts | NC1V-2112-6 7 | | | |
| | | | One Alarm Contact | NC1V-2121-6 7 | | | |
| | | | One Auxiliary Contact and One Alarm Contact | NC1V-2131-6 7 | | | |
| | | With | — | NC1V-2100F-6 7 | | | |
| | | | One Auxiliary Contact | NC1V-2111F-6 7 | | | |
| | | | Two Auxiliary Contacts | NC1V-2112F-6 7 | | | |
| | | | One Alarm Contact | NC1V-2121F-6 7 | | | |
| | | | One Auxiliary Contact and One Alarm Contact | NC1V-2131F-6 7 | | | |
| | 3-pole | — | — | NC1V-3100-6 7 | | | |
| | | | One Auxiliary Contact | NC1V-3111-6 7 | | | |
| | | | Two Auxiliary Contacts | NC1V-3112-6 7 | | | |
| | | | Three Auxiliary Contacts | NC1V-3113-6 7 | | | |
| | | | One Alarm Contact | NC1V-3121-6 7 | | | |
| | | | One Auxiliary Contact and One Alarm Contact | NC1V-3131-6 7 | | | |
| | | | Two Auxiliary Contacts and One Alarm Contact | NC1V-3132-6 7 | | | |
| | | With | — | NC1V-3100F-6 7 | | | |
| | | | One Auxiliary Contact | NC1V-3111F-6 7 | | | |
| | | | Two Auxiliary Contacts | NC1V-3112F-6 7 | | | |
| | | | Three Auxiliary Contacts | NC1V-3113F-6 7 | | | |
| | | | One Alarm Contact | NC1V-3121F-6 7 | | | |
| | | | One Auxiliary Contact and One Alarm Contact | NC1V-3131F-6 7 | | | |
| | | | Two Auxiliary Contacts and One Alarm Contact | NC1V-3132F-6 7 | | | |
| Relay Trip (Voltage Trip) | 1-pole | — | — | NC1V-1500-8 | — | — | 24V DC |
| | 2-pole | | | NC1V-2500-8 | | | |
| | 3-pole | | | NC1V-3500-8 | | | |

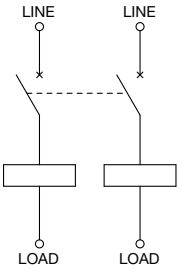
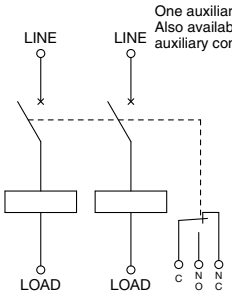
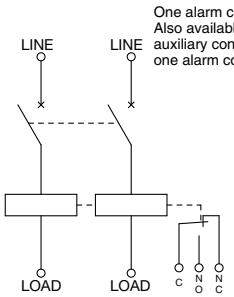
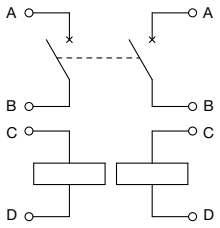
Note: Inertial delay is for AC circuit. Also, time delay curve of S (instantaneous) is not available with inertial delay.

## Internal Circuit

### 1-pole

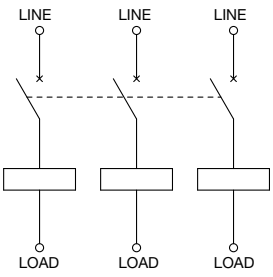
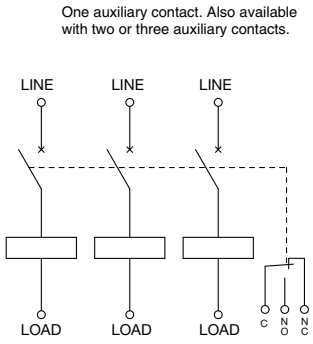
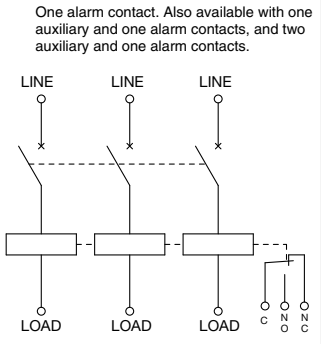
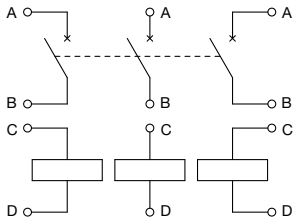
| NC1V-1100<br>(Without auxiliary/alarm contacts) | NC1V-1111<br>(With auxiliary contact) | NC1V-1121<br>(With alarm contact) | NC1V-1500<br>(Relay Trip) |
|---|---|---|---|
|  |  |  |  |

### 2-pole

| NC1V-2100<br>(Without auxiliary/alarm contacts) | NC1V-2111<br>(With auxiliary contact) | NC1V-2121<br>(With alarm contact) | NC1V-2500<br>(Relay Trip) |
|---|---|---|---|
|  |  |  |  |

Note: Those with two auxiliary contacts and with one auxiliary contact and one alarm contact have been applied for UL and CCC.

### 3-pole

| NC1V-3100<br>(Without auxiliary/alarm contacts) | NC1V-3111<br>(With auxiliary contact) | NC1V-3121<br>(With alarm contact) | NC1V-3500<br>(Relay Trip) |
|---|---|---|---|
|  |  |  |  |

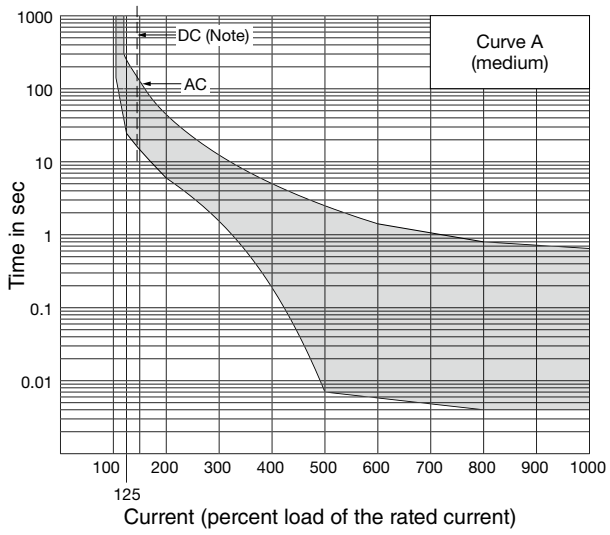
Note: Those with two or three auxiliary contacts, with one auxiliary contact and one alarm contact, and with two auxiliary contacts and one alarm contacts have been applied for UL and CCC.

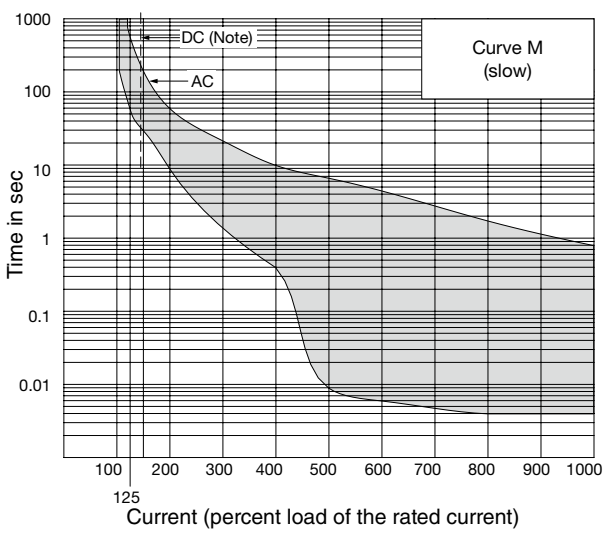
## Overcurrent-Time Delay Characteristics (sec at 40°C) [vertical mounting]

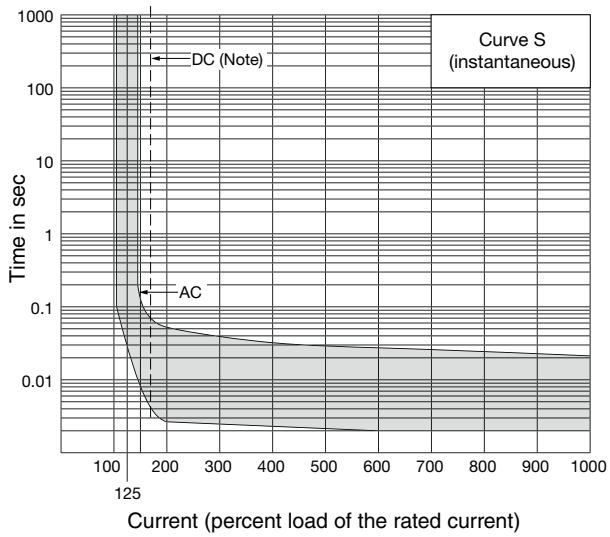
| Item | Time Delay Curve | Percent of Rated Current | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 100% | 125% | 150% | 175% | 200% | 400% | 600% | 800% | 1000% |
| AC (50/60 Hz)/DC | S (instantaneous) | NO TRIP | — | ∗0.005 to 0.1 | 0.003 to 0.06 | 0.0027 to 0.05 | 0.002 to 0.03 | 0.002 to 0.028 | 0.002 to 0.025 | 0.002 to 0.022 |
| | A (medium) | NO TRIP | ∗25 to 240 | 16 to 140 | — | 6 to 32 | 0.4 to 4 | 0.0055 to 1.5 | 0.004 to 0.8 | 0.004 to 0.65 |
| | M (slow) | NO TRIP | ∗60 to 600 | 30 to 200 | — | 9 to 60 | 0.4 to 10 | 0.006 to 4.5 | 0.004 to 1.8 | 0.004 to 0.8 |
| AC (50/60 Hz) | With Inertial Delay A (medium) | NO TRIP | 25 to 240 | — | — | 6 to 32 | 0.8 to 6 | 0.09 to 3.5 | 0.02 to 1.8 | 0.01 to 1.0 |
| | With Inertial Delay M (slow) | NO TRIP | 60 to 600 | — | — | 10 to 60 | 0.8 to 10 | 0.06 to 4.5 | 0.02 to 3 | 0.01 to 1.75 |

∗: MAY TRIP on DC

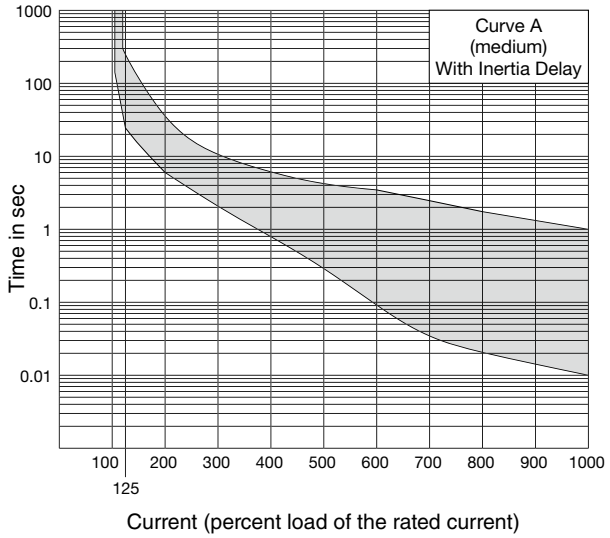
## Time Delay Curves at 40°C

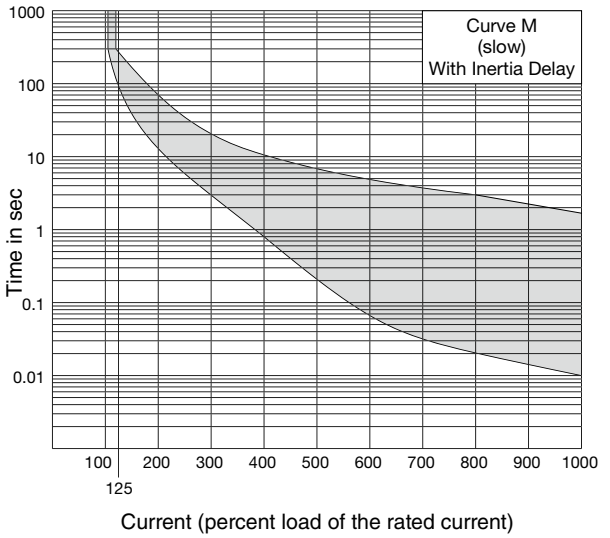



Note: The entire shaded area applies to AC.
For DC, the shaded area on the right of the dashed line applies.



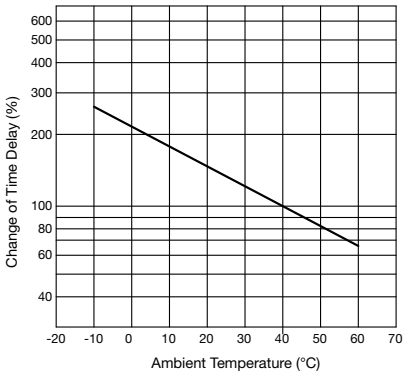



## Time Delay Curve and Ambient Temperature

NC1V circuit protectors employ an electromagnetic tripping system, where the rated current (trip current) is not affected by ambient temperatures. But the time delay may vary with the oil viscosity in the oil dash pot. Lower oil viscosity at higher temperatures results in a shorter delay, whereas at lower temperatures the delay will be longer.

## Temperature Correction Curve

The time delay curves on the preceding page are measured at 40°C. With reference to the following curves, time delays can be corrected according to ambient temperature.



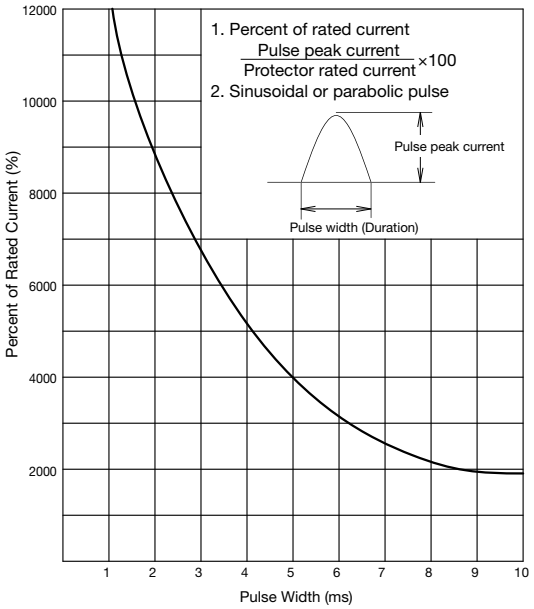

The time delay is based on an ambient temperature of 40°C. Time delays at other temperatures are corrected according to the temperature correction curve. The time delay of the instantaneous time delay curve (S) is not affected by the ambient temperature.

When operating temperature exceeds 40°C, derate the rated current by multiplying the derating factor shown on the right.

| Operating Temp. | Derating Factor |
|---|---|
| 50°C | 0.9 |
| 55°C | 0.8 |
| 60°C | 0.7 |

## Inertial Delay

Inertial delay is designed not to trip on a non-repeating single pulse of 20 times the rated current (peak value) for a duration of 8 ms. In addition, circuit protectors equipped with inertial delay do not respond to high inrush currents caused by transformer or lamp loads, but perform the specified interruption on the subsequent overcurrents. Inertial delay is available on AC circuits, and is not available with the series trip curve S (instantaneous).




## Impedance and Coil Resistance

### Series Trip (Current Trip) (initial value)

at 25°C

| Rated Current | For AC 50/60 Hz Impedance (Ω) | | For DC Resistance (Ω) | |
|---|---|---|---|---|
| | Curve S | Curves A, M | Curve S | Curves A, M |
| 0.1A | 66.0 | 116.0 | 43.0 | 106.0 |
| 0.3A | 6.6 | 11.0 | 4.1 | 10.0 |
| 0.5A | 1.92 | 3.65 | 0.86 | 3.40 |
| 1A | 0.50 | 0.93 | 0.25 | 0.90 |
| 2A | 0.16 | 0.27 | 0.11 | 0.25 |
| 3A | 0.07 | 0.12 | 0.050 | 0.11 |
| 5A | 0.025 | 0.050 | 0.015 | 0.045 |
| 7A | 0.014 | 0.027 | 0.011 | 0.025 |
| 10A | 0.007 | 0.021 | 0.005 | 0.020 |
| 15A | 0.006 | 0.010 | 0.005 | 0.009 |
| 20A | 0.005 | 0.006 | 0.004 | 0.005 |
| 25A | 0.004 | 0.005 | 0.004 | 0.005 |
| 30A | 0.003 | 0.004 | 0.003 | 0.004 |

Tolerance: ±25% (up to 20A),
±50% (25A and 30A)

### Relay Trip (Voltage Trip)

at 25°C

| Tripping Voltage | For DC Resistance (Ω) |
|---|---|
| 24-48V | 100.0 |

Tolerance: ±25%

### Voltage Drop Due to Coil Resistance or Impedance

The internal resistance or impedance of a circuit protector tends to be larger for a smaller rated current. Therefore, when circuit protectors of a small rated current are used, voltage drop should be taken into consideration. Internal resistance also varies with time delay curves, which should also be considered during installation.

### Main Contact - Auxiliary/Alarm Contact

[Auxiliary Contact]

| Main Contact | NO ontact | NC Contact |
|---|---|---|
| ON | closed | open |
| Tripped | open | closed |
| OFF | open | closed |

[Alarm Contact]

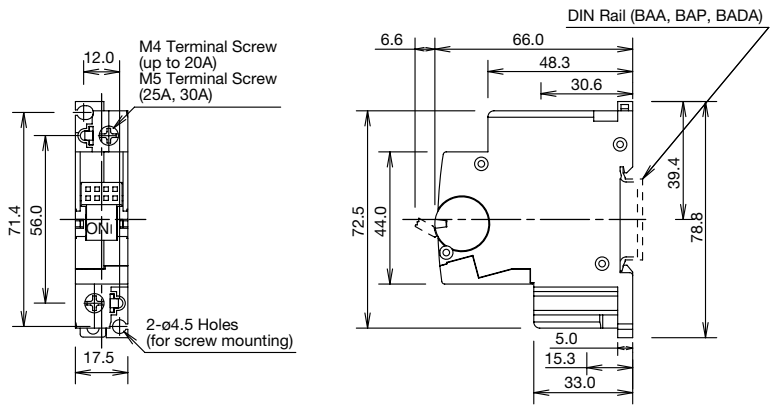
| Main Contact | NO ontact | NC Contact |
|---|---|---|
| ON | open | closed |
| Tripped | closed | open |
| OFF | open | closed |

## Dimensions

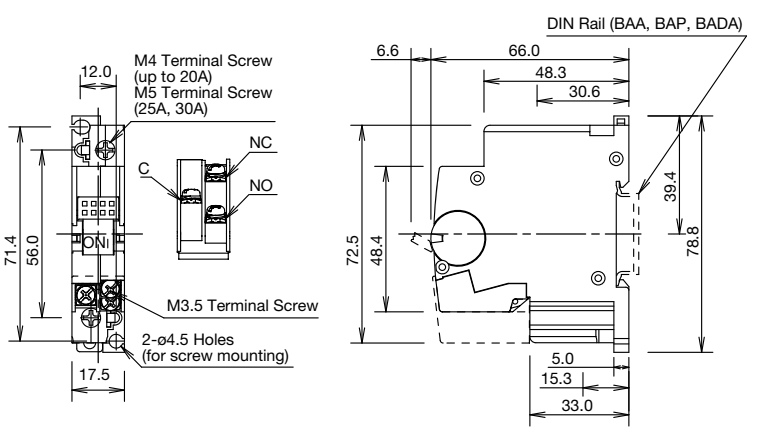
### 1-pole

All dimensions in mm.

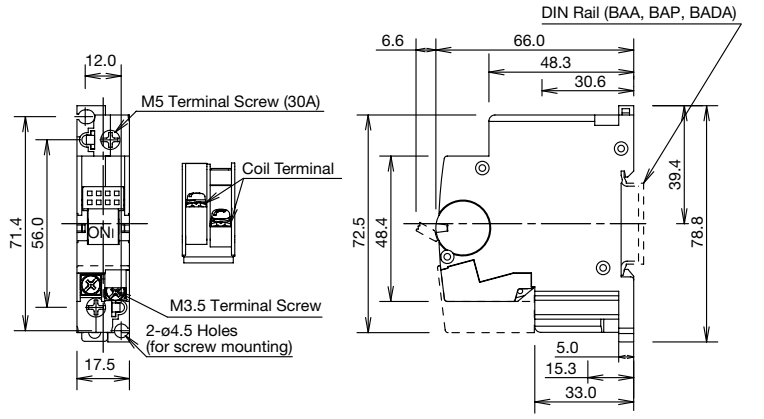
NC1V-1100



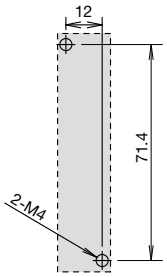

NC1V-1111
(Auxiliary Contact)
NC1V-1121
(Alarm Contact)




NC1V-1500
(Relay Trip)

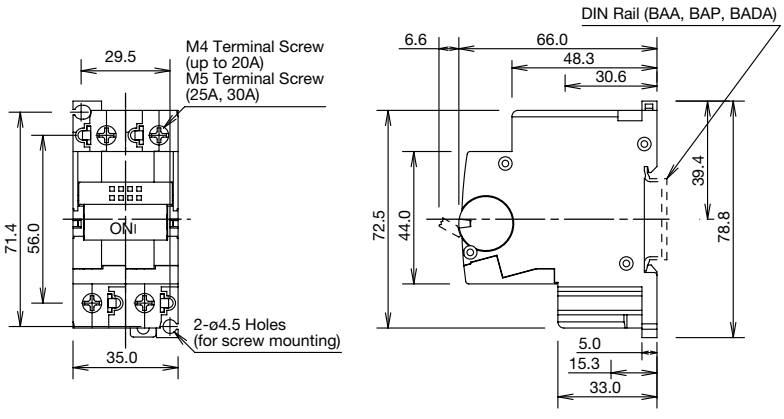



Mounting Hole Layout
(M4 Mounting Screws)

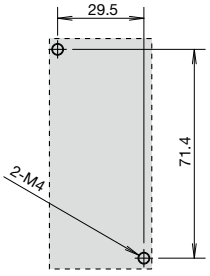



### 2-pole

NC1V-2100

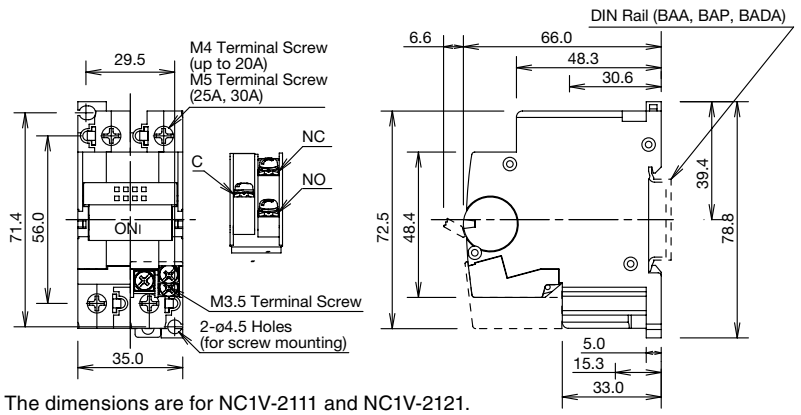



Mounting Hole Layout
(M4 Mounting Screws)



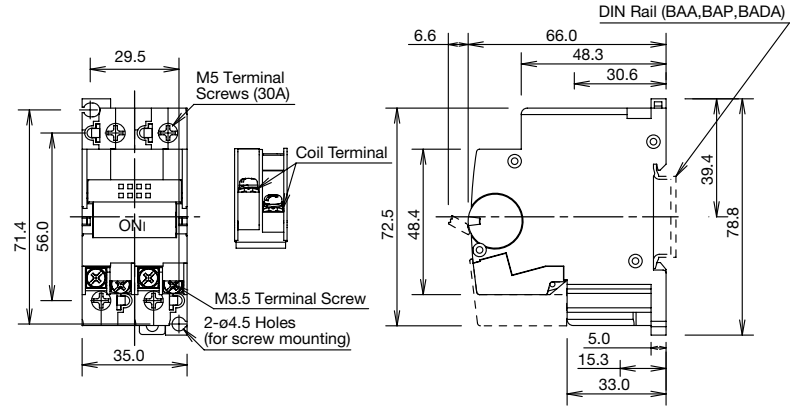
## 2-pole

NC1V-2111
(one auxiliary contact)
NC1V-2112
(two auxiliary contacts)
NC1V-2121
(one alarm contact)
NC1V-2131
(one auxiliary contact
and one alarm contact)

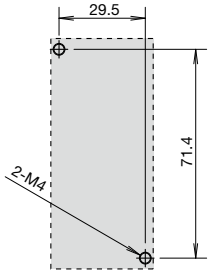



The dimensions are for NC1V-2111 and NC1V-2121.

NC1V-2500
(Relay Trip)

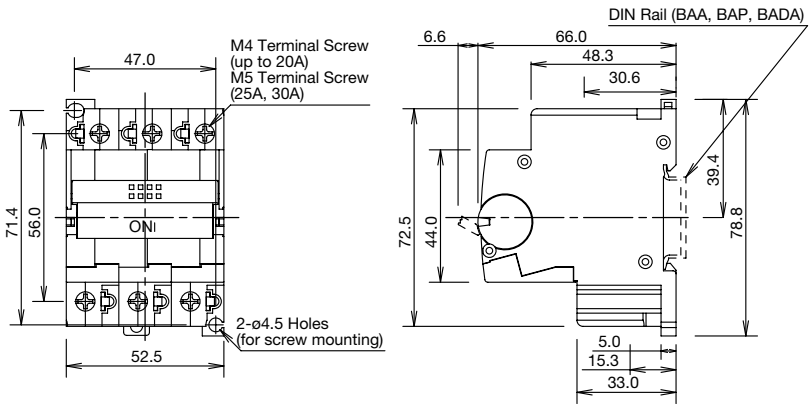



Mounting Hole Layout
(M4 Mounting Screws)

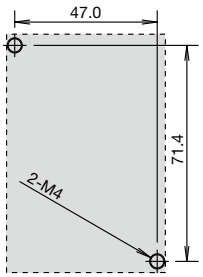



## 3-pole

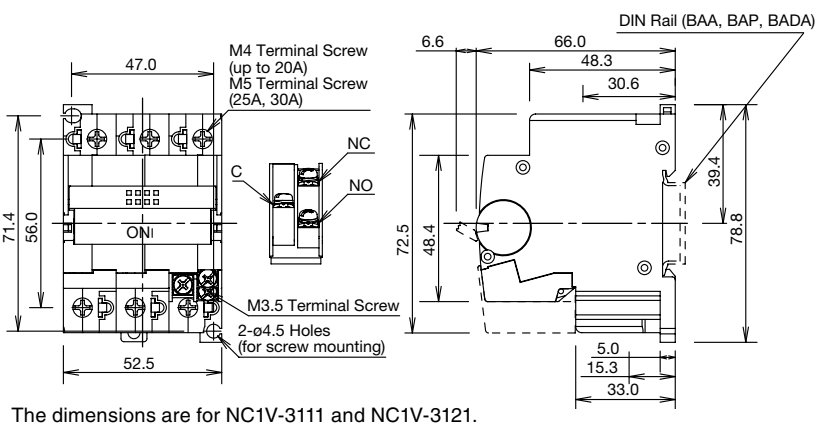
NC1V-3100




Mounting Hole Layout
(M4 Mounting Screws)




NC1V-3111
(one auxiliary contact)
NC1V-3112
(two auxiliary contacts)
NC1V-3113
(three auxiliary contacts)
NC1V-3121
(one alarm Contact)
NC1V-3131
(one auxiliary contact
and one alarm contact)
NC1V-3132
(two auxiliary contacts
and one alarm contact)



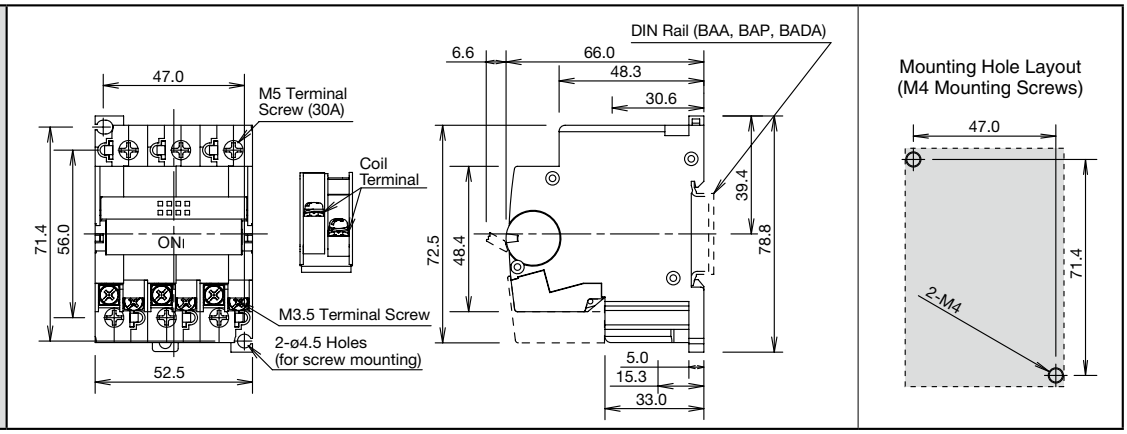

The dimensions are for NC1V-3111 and NC1V-3121.

# NC1V Circuit Protectors (Accessories)

## 3-pole

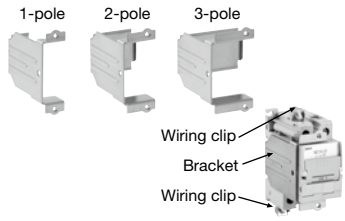
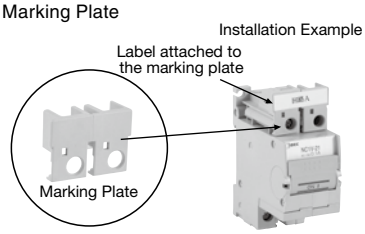
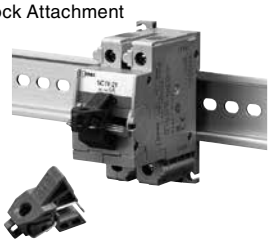
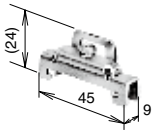
All dimensions in mm.

NC1V-3500
(Relay Trip)




## Accessories

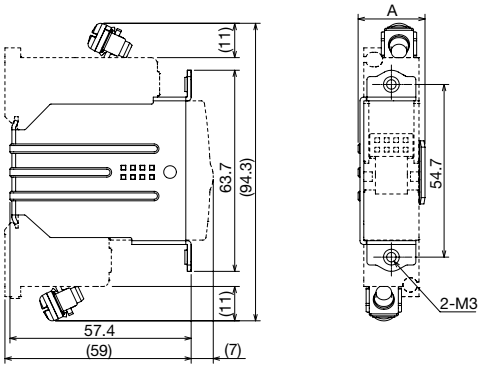
All dimensions in mm.

| Shape | | Material | Part No. | Ordering No. | Package Quantity | Remarks |
|---|---|---|---|---|---|---|
| Panel Mounting Bracket (Note)<br>  | 1-pole | Bracket: Steel<br>Wiring clip: brass (terminal), steel (screw, washer) | **NC9Z-MA11** | **NC9Z-MA11** | 1 | • Used for mounting NC1V circuit protectors in a panel cut-out.<br>• Supplied with two wiring clips for each pole, used for wiring from the rear.<br>For 1-pole: 2 wiring clips<br>For 2-pole: 4 wiring clips<br>For 3-pole: 6 wiring clips |
| | 2-pole | | **NC9Z-MA21** | **NC9Z-MA21** | | |
| | 3-pole | | **NC9Z-MA31** | **NC9Z-MA31** | | |
| Marking Plate<br>  | | PBT | **NC9Z-PW1** | **NC9Z-PW1PN10** | 10 | • Available for 2-pole circuit only. For use on 1-pole circuit protectors, break the marking plate into two halves.<br>• Label is supplied by the user. |
| Padlock Attachment<br>  | | Polyamide body with stainless steel pin | **NC9Z-LK1** | **NC9Z-LK1** | 1 | • Locks the retractable actuator in the off position to prevent NC1V from being switched on inadvertently.<br>• Can be used on 1-, 2-, and 3-pole. |
| DIN Rail (35mm-wide)<br>  | Length: 1000mm | Aluminum | **BAA1000** | **BAA1000PN10** | 10 | Weight: approx. 200g |
| | | Steel | **BAP1000** | **BAP1000PN10** | | Weight: approx. 320g |
| | | Aluminum | **BADA1000** | **BADA1000PN10** | | Weight: approx. 280g |
| End Clip<br>  | | Steel (trivalent chromate) | **BNL6** | **BNL6PN10** | 10 | • Applicable rail: BAA, BAP, BADA<br>Weight: approx. 15g |

Note: Cannot be used with NC1V with auxiliary or alarm contact.

## Dimensions

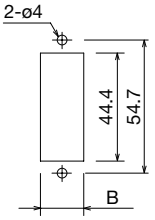
### NC9Z-MA Panel Mounting Bracket



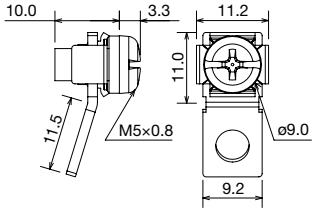

### Dimensions A and B

| Dimension | A | B |
|---|---|---|
| 1-pole | 21.2 | 17.8 |
| 2-pole | 38.7 | 35.3 |
| 3-pole | 56.2 | 52.8 |

### Mounting Hole Layout




### NC9Z-TA1 Wiring Clip




### Insulation Sleeve

When using wiring clips on 2- or 3-pole circuit protectors, install UL/CSA-rated insulation sleeves on the crimping terminals to ensure the air gap required by UL1077.
Applicable Insulation Sleeves (Example)

- Nissei Eco (V-38)
- Tokyo Dip (TP-038)
- Nichifu (TIC38)

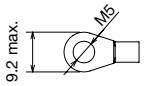
### Panel Mounting Screw Length (Dimension C in mm)

Applicable Panel Thickness: 0.8 to 3.2 mm
The outside diameter of the M3 screw (including washer) must be 7 mm maximum.

| Panel thickness (mm) | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.3 | 2.6 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Without washer | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 8 | 8 | 8 |
| With plain washer (0.5 thick) | 6 | 6 | 6 | 6 | 6 | 6 | 8 | 8 | 8 | 8 |
| With spring washer (0.7 thick) | 6 | 6 | 6 | 6 | 6 | 8 | 8 | 8 | 8 | 8 |
| With plain washer (0.5 thick) and spring washer (0.7 thick) | 6 | 6 | 6 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Countersunk head screw | — | — | — | — | — | — | 6 | 6 | 8 | 8 |

Tightening torque: 0.5 to 0.8 N·m
The screw length behind the panel must be 9 mm maximum.

### Applicable Crimping Terminal

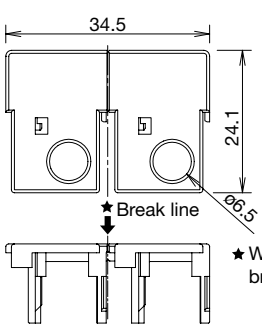


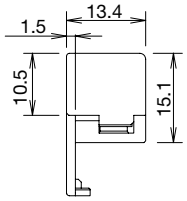

Tightening torque: 1.8 to 2.2 N·m

### Materials

- Panel Mounting Bracket: Steel
- Wiring Clip: Brass (terminal strip)
  Steel (screw, washer)

### NC9Z-PW1 Marking Plate



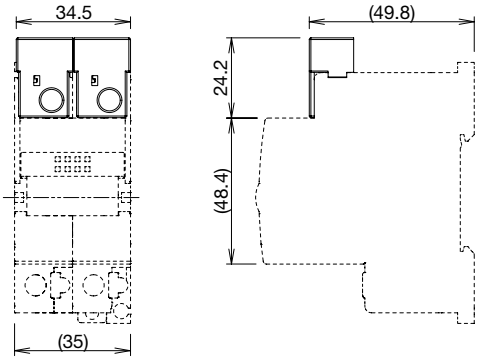




★When used on a 1-pole circuit protector, break the marking plate along this line.

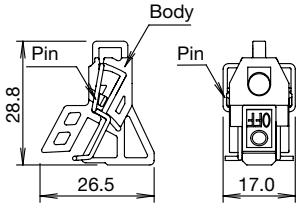
Material: PBT

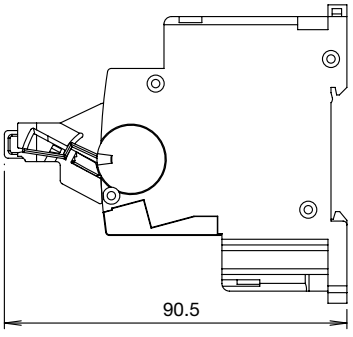
### Marking Plate Installed on the Circuit Protector

When installed on a 2-pole circuit protector




### NC9Z-LK1 Padlock Attachment

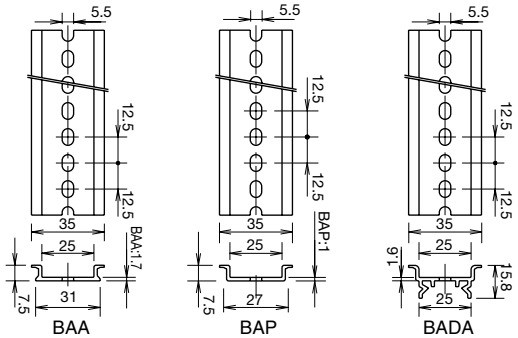



Padlock Attachment Installed

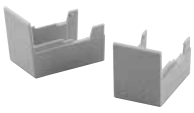
### Rail

35-mm-wide DIN rail and IDEC channel base



## Replacement Parts

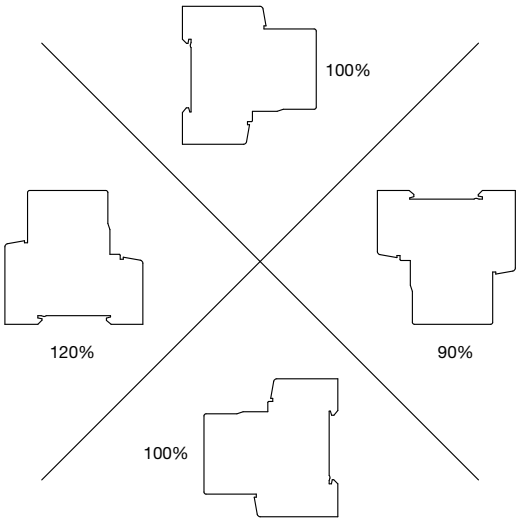
All dimensions in mm.

| Shape | Material | Part No. | Ordering No. | Package Quantity | Remarks |
|---|---|---|---|---|---|
| Terminal Cover  | PA66 | NC1V-AUX-CV | NC1V-AUX-CV | 1 | |
| Wiring Clip | Terminal: Brass Screw/washer: Steel | NC9Z-TA1 | NC9Z-TA1PN10 | 10 | |

## Instructions

### Installation Angle

Tripping method is hydraulic magnetic. Minimum operating current varies with installation angle. Operating currents are influenced by the weight of movable iron core. With reference to the following figures, correct the rated current.

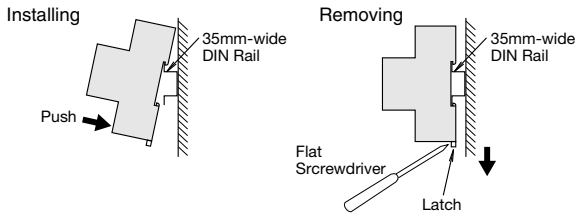



Minimum operating current is calculated from the following formula:
(Minimum operating current) = (Rated current) ×
(Correction factor by installation angle) ×
(Reference minimum tripping current rate)

### DIN Rails

[Installation on DIN Rail]
1. Fasten the DIN rail securely.
2. With the latch facing downward, install the NC1V circuit protector on the DIN rail as shown below.

[Removal from DIN Rail]
Using a flat screwdriver, pull the latch on the circuit protector to remove from the DIN rail.




### Applicable Wire and Crimp Terminal

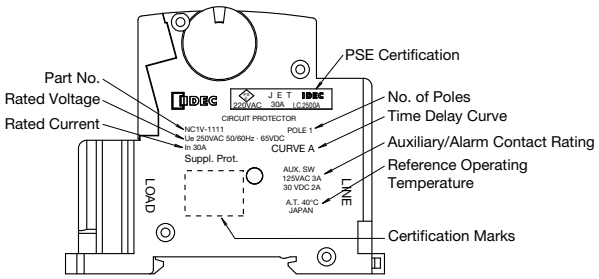
| Terminal | Terminal Screw | Connectable Wire Size ($mm^2$) | Applicable Crimping Terminal | Tightening Torque (N·m) |
|---|---|---|---|---|
| Main Circuit Terminals | Spring-up, fingersafe, slotted Phillips screw with square washer (up to 20A) | 0.25 to 1.65 | R1.25-4 | 1 to 1.4 |
| | | 1.04 to 2.63 | R2-4 | |
| | | 2.63 to 6.64 | R5.5-4 | |
| | Spring-up fingersafe terminal (25A and 30A) | 0.25 to 1.65 | R1.25-5 | 1.8 to 2.2 |
| | | 1.04 to 2.63 | R2-5 | |
| | | 2.63 to 6.64 | R5.5-5 | |
| Auxiliary Contact Alarm Contact Voltage Coil Terminals | Slotted Phillips screw with square washer | 0.25 to 1.65 | R1.25-3.5 | 0.7 to 0.9 |
| | | 1.04 to 2.63 | R2-3.5 | |

- For wiring the main circuit terminal, use the applicable crimp terminals and tighten to the recommended tightening torque.
- When using the NC1V circuit protector as CSA-certified product, use with CSA-certified crimp terminal.
- When using the NC1V circuit protector as UL-listed product, use with UL-listed crimp terminal.

### Panel Mounting Screw (not supplied)

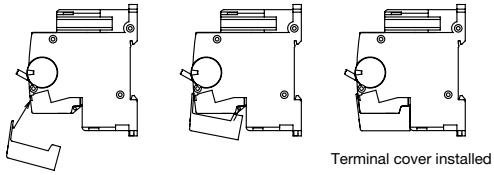
| Screw Size | Tightening Torque | Shape |
|---|---|---|
| M4 | 0.8 to 1.0 N·m | Spring Washer, Plain Washer |

### Product Markings (Example: NC1V-1111-30AA)




### Installation of Auxiliary/Alarm Terminal Cover

After wiring the terminals, install the terminal cover by aligning the terminal cover with the circuit protector as shown below.



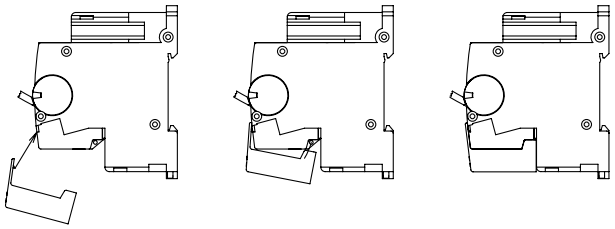
## Instructions

### Installing Auxiliary/Alarm Terminal Cover

Connect the terminal before installing the terminal cover.

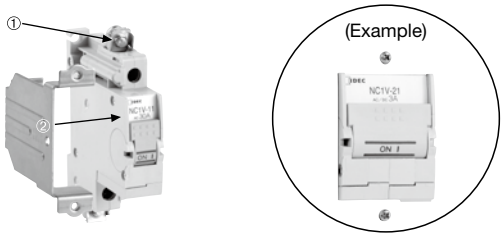
**Installing**

Attach the latch on TOP side and install the terminal cover as shown below.



### Installing NC9Z-MA Panel Mounting Brackets

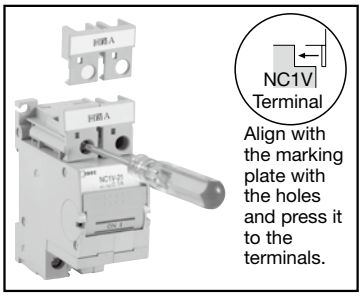
1. Insert the wiring clip into the terminal of the circuit protector, and tighten.
- Tightening torque to the main circuit terminal
  20A max. (M4): 1 to 1.4 N·m
  25A, 30A (M5): 1.8 to 2.2 N·m
2. Insert the panel mounting bracket to the circuit protector.
3. Install the rear of the panel mounting bracket into the DIN rail recess on the circuit protector and push in the clamp.



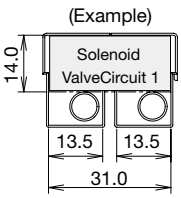

Note: NC1V circuit protectors with auxiliary/alarm contacts cannot be used with mounting brackets.

### Installing the NC9Z-PW1 Marking Plate

Available for 2-pole circuit protectors only.
For use on 1-pole circuit protectors, break the marking plate into two halves.

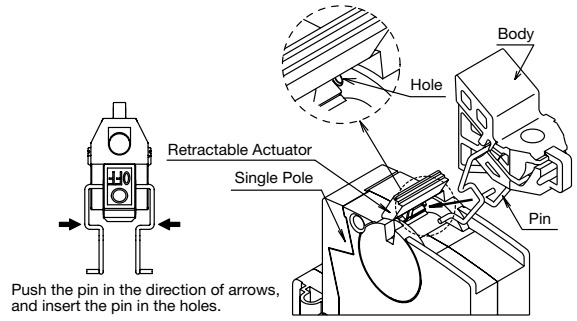



**Marking Range**




### Installing the NC9Z-LK1 Padlock Attachment

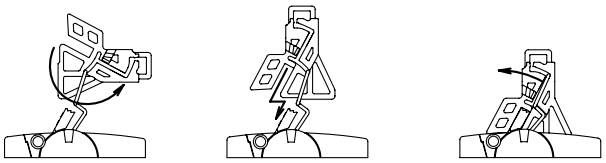
① Pull down the retractable actuator, and install the padlock attachment on the circuit protector.
- 1-pole: Insert the pin into the holes under the retractable actuator.
- 2- or 3-pole: Insert the pin into the holes in the center of the circuit protector.




②Turn the body.

③Install the body on the retractable actuator as shown below.

④Slide the pin to the lock position.

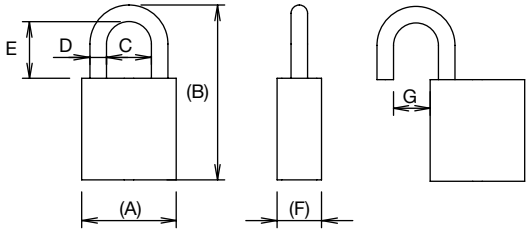


### Padlock

- The padlock is not supplied with the padlock attachment and must be supplied by the user.
- The total weight of the padlock can be a maximum of 45g. Make sure the padlock weight does not exceed 45g, otherwise the NC1V circuit protector may be damaged.
- Applicable Padlock Size

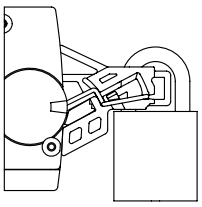
| (A) | (B) | C | D | E | (F) | G |
|---|---|---|---|---|---|---|
| 19 to 25 | 35 to 42 | 9 to 11.5 | 4 to 4.5 | 11 to 15 | 8 to 10 | 7.5 to 9.0 |

Note: (A) (B) (F) are for reference only.




Recommended Padlock

| Manufacturer | Part No. |
|---|---|
| Alpha | 1000-25 |
| Master Lock | 4120 |



### Safety Precautions

- When using the padlock, do not use the NC1V circuit protector where it is subject to vibration or shock, otherwise failure or damage may result.
- Do not apply a force of more than 50N on the retractable actuator, otherwise the actuator will be damaged.
- When using three or more 1-pole NC1V circuit protectors adjacently, facilitate installing the padlock attachment by providing a clearance of 6mm minimum between the protectors, or by using the tweezers or flat screwdriver.

# NH1 Series Circuit Protectors

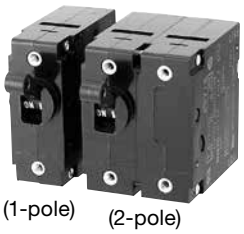
## Wide Range of Applications from Office Automation and Consumer Use to Factory Automation.

- Compact, lightweight, and high-performance circuit protectors.
- Rocker type snaps into a panel.
- Rated voltage: 250V AC and 65V DC
- 35mm-wide DIN rail mounting (NH1V)
- Available with dual-coil
- Available with auxiliary contact or alarm contacts.
- Available with inertia delay
- Hydraulic-magnetic tripping system
- Safe trip-free mechanism
- Available in tab terminal and screw-terminal.

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

Rocker
NH1Y

Rocker
NH1L
(w/indicator)



(1-pole) (2-pole)

Lever
NH1S

Lever
NH1V
(Direct DIN rail mounting )

| Applicable Standards | Mark | Certification Organization / File No. |
|---|---|---|
| UL1077<br>CSA C22.2 No. 235 (Note 1) | c UL us | UL/c-UL recognized<br>File No. E68029 |
| EN60934<br>(VDE0642) (Note 2) | VDE | No. 107852 |
| EN60932 (Note 2) | CE | EU Low Voltage Directive |
| GB17701 | CCC | CCC No. 2005010307152360 |
| Electrical Appliance and Material Safety Law Technical Standard | PSE | JET |

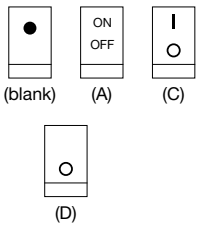
For details, see the list of standard certified products in the back of this catalog.
Note 1: Series trip, relay trip, dual coil (for AC)
Note 2: Series trip

## Specifications

| Model | NH1S | NH1Y | NH1L | NH1V | Dual-coil<br>NH1S |
|---|---|---|---|---|---|
| Operator Style | Lever | Rocker | Rocker (w/indicator) | Lever | Lever |
| Protection Method | Hydraulic-magnetic tripping system | | | | Hydraulic-magnetic tripping system |
| Internal Circuit | Series trip (Current trip) Series trip with auxiliary contacts Series trip with alarm contacts (NH1S and NH1V only)<br>Relay trip (Voltage trip) | | | | Series trip (Current trip) + Relay trip (Voltage trip) |
| No. of Poles | 1, 2, 3 poles | 1, 2 poles | 1, 2 poles | 1, 2, 3 poles | 1, 2 poles |
| Rated Voltage | 250V AC 50/60Hz, 65V DC | | | | 250V AC 50/60Hz, 65V DC |
| Minimum Applicable Load | 24V AC/DC, 100mA (reference value) | | | | |
| Rated Current | Current trip: 0.5A, 0.75A, 1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A | | | | Current trip: 2A, 3A, 5A, 7.5A, 10A, 15A |
| Trip Voltage | 100V AC 50/60Hz, 24V DC (operating at 90% of the rated voltage or higher, at 25°C)<br>Voltage application duration: 1 sec maximum<br>Trip time: 0.05 sec maximum (at the rated voltage) | | | | Trip coil voltage:<br>24V DC, 100V AC (operating at 90% of the rated voltage or higher, at 25°C)<br>Voltage application duration: 1 sec - max. Trip time: 0.05 sec max. (at the rated voltage) |
| Rated Interrupting Current | 250V AC 50/60Hz 1000A, 65V DC 1000A (UL/C-UL ratings)<br>220V AC 50/60Hz 1000A (VDE) | | | | |
| Auxiliary Contact<br>Alarm Contact | SPDT microswitch 250V AC, 3A (resistive load) | | | | – |
| Reference Temperature | +25°C | | | | |
| Operating Temperature | −40 to +85°C (no freezing) | | | | |
| Storage Temperature | −40 to +85°C (no freezing) | | | | |
| Operating Humidity | 45 to 85% RH (no condensation) | | | | |
| Storage Humidity | 45 to 85% RH (no condensation) | | | | |
| Insulation Resistance | 100 MΩ minimum (500V DC megger) | | | | |
| Dielectric Strength | Between operator and live part, between terminals when main contacts are open, between live parts of different poles, and between main terminal and auxiliary contact terminal: 3750V AC, 1 min (NH1V: 1500V AC, 1 min)<br>Between terminals when auxiliary contacts are open: 600V AC, 1 min | | | | Between operator and live part, between terminals when main contacts are open, between live parts of different poles, between voltage trip terminal and main terminal: 1500V AC, 1 min. |
| Vibration Resistance | Damage limits: 10 too 55 Hz, 100 m/s$^2$ (1, 2, 3 pole)<br>Operating extremes: 10 to 55 Hz, 98 m/s$^2$ (1, 2, 3 pole) (with the rated current applied) | | | | |
| Shock Resistance | Damage limits: 1000 m/s$^2$, Operating extremes: 500 m/s$^2$ with the rated current applied. (Auxiliary/alarm contact: 300 m/s$^2$) | | | | |
| Life | 10,000 cycles min. (Electrically 6,000 cycles: 6 operations per minute at the rated current, mechanically 4,000 cycles: 6 operations per minute) | | | | |
| Terminal Style | Main terminal: Tab terminal #250, M4 screw terminal<br>Auxiliary terminal: Tab terminal #110 | | | Main terminal:<br>M4 screw terminal (20A max.)<br>M5 screw terminal (25, 30A)<br>Auxiliary terminal: M3.5 screw terminal | Main terminal: Tab terminal #250<br>Auxiliary terminal: Tab terminal #187 |
| Mounting Style | Screw mounting | Snap mounting | | Screw mounting, DIN rail mounting | Screw mounting |
| Weight (Approx.) | 1-pole: 45g<br>2-pole: 90g<br>3-pole: 135g | 1-pole: 50g<br>2-pole: 100g | | 1-pole: 65g<br>2-pole: 130g<br>3-pole: 195g | 1-pole: 45g<br>2-pole: 90g |

- Do not use the NH1 series circuit protectors in environments where they are exposed to extreme temperature, humidity, dust, corrosive gases, vibration, shock, or in a circuit where inrush current may be present, otherwise unnecessary operations and damage may occur.

### Rocker Color, Rocker Indication (NH1Y/NH1L)

| Rocker Color (Code) | Rocker Indication (Code) |
|---|---|
| Black (blank)<br>Red (R),<br>Green (G),<br>White (W) |  |

Note: Rocker indication is white (black when rocker color is white).

### Operating Voltage of Indicator (NH1L)

| Indicator | Rated Voltage | | Code |
|---|---|---|---|
| Neon (Red) | 125V AC, 50/60Hz (operating voltage: 100 to 125V AC) | | 1 |
| LED (Red) [Note] | For AC/DC (operating voltage: within +10% of the rated voltage) | 6V | 3 |
| | | 12V | 4 |
| | | 24V | 5 |
| | | 48V | 6 |

Note: Both indicators contain a current limiting resistor.

### Lever Color (NH1S, NH1V): Black

### Operation of Auxiliary Contacts

Since auxiliary contact operations are interlocked with ON/OFF positions of main terminal, operating status of the circuit protector can be monitored using a lamp. Auxiliary contacts also serve as a control of auxiliary circuits.

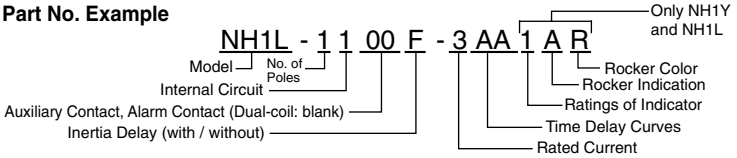
| Operator Position | NO Contact | NC Contact |
|---|---|---|
| ON | Closed | Open |
| Tripped | Open | Closed |
| OFF | Open | Closed |

### Operation of Alarm Contacts

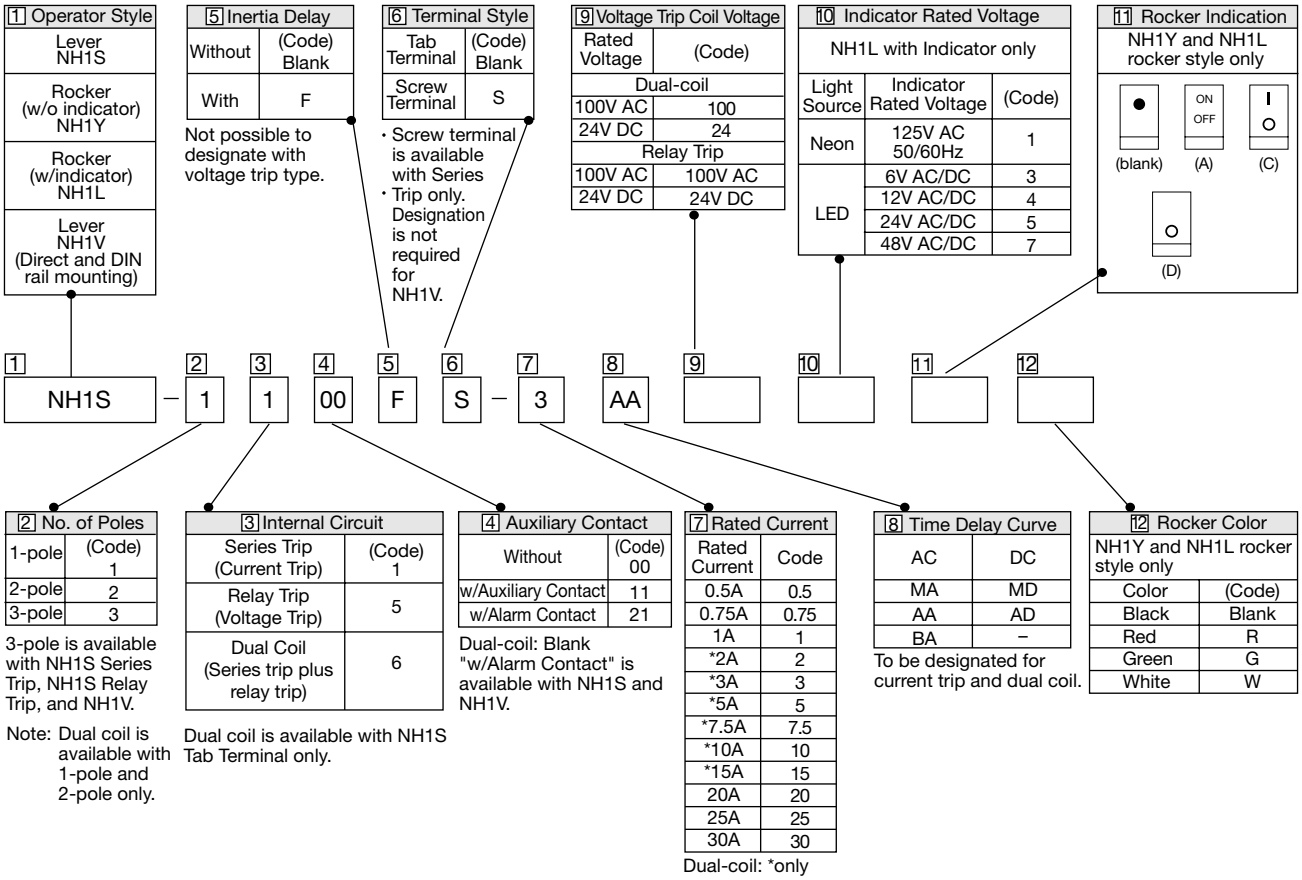
Alarm contacts are not interlocked with main contacts and operate only when an overcurrent occurs.

| Operator Position | NO Contact | NC Contact |
|---|---|---|
| ON | Open | Closed |
| Tripped | Closed | Open |
| OFF | Open | Closed |

**Part No. Example**




## Part No. Development



## NH1S (Lever )

Specify a rated current, time delay curve, and rated voltage in place of 7 8 9.

Package Quantity: 1

| Internal Circuit | No. of Poles | Terminal Style | Inertia Delay | Auxiliary Contact Alarm Contact | Part No. | Designation Code | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 7 Rated Current | 8 Time Delay Curve | 9 Rated Voltage |
| Series Trip Current Trip | 1 | Tab Terminal | Without | Without | **NH1S-1100-** 7 8 | 0.5A 0.75A 1A 2A 3A 5A 7.5A 10A 15A 20A 25A 30A | AA BA MA AD MD | – |
| | | | | w/Auxiliary Contact | **NH1S-1111-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-1121-** 7 8 | | | |
| | | | With | Without | **NH1S-1100F-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-1111F-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-1121F-** 7 8 | | | |
| | | Screw Terminal | Without | Without | **NH1S-1100S-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-1111S-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-1121S-** 7 8 | | | |
| | | | With | Without | **NH1S-1100FS-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-1111FS-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-1121FS-** 7 8 | | | |
| Series Trip Current Trip | 2 | Tab Terminal | Without | Without | **NH1S-2100-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-2111-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-2121-** 7 8 | | | |
| | | | With | Without | **NH1S-2100F-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-2111F-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-2121F-** 7 8 | | | |
| | | Screw Terminal | Without | Without | **NH1S-2100S-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-2111S-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-2121S-** 7 8 | | | |
| | | | With | Without | **NH1S-2100FS-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-2111FS-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-2121FS-** 7 8 | | | |
| Series Trip Current Trip | 3 | Tab Terminal | Without | Without | **NH1S-3100-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-3111-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-3121-** 7 8 | | | |
| | | | With | Without | **NH1S-3100F-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-3111F-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-3121F-** 7 8 | | | |
| | | Screw Terminal | Without | Without | **NH1S-3100S-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-3111S-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-3121S-** 7 8 | | | |
| | | | With | Without | **NH1S-3100FS-** 7 8 | | | |
| | | | | w/Auxiliary Contact | **NH1S-3111FS-** 7 8 | | | |
| | | | | w/Alarm Contact | **NH1S-3121FS-** 7 8 | | | |
| Relay Trip Voltage Trip | 1 | Tab Terminal | Without | Without | **NH1S-1500-** 9 | – | – | 100V AC 24V DC |
| | 2 | | | Without | **NH1S-2500-** 9 | | | |
| | 3 | | | Without | **NH1S-3500-** 9 | | | |
| Dual-coil | 1 | Tab Terminal | Without | Without | **NH1S-16-** 7 8 9 | 2A 3A 5A 7.5A 10A 15A | AA BA MA AD MD | 100V AC 24V DC |
| | | | With | | **NH1S-16F-** 7 8 9 | | | |
| | 2 | Tab Terminal | Without | Without | **NH1S-26-** 7 8 9 | | | |
| | | | With | | **NH1S-26F-** 7 8 9 | | | |

## NH1Y (Rocker)

Specify a rated current, time delay curve, rated voltage, rocker indication, and rocker color in place of 7 8 9 11 12.

Package Quantity: 1

| Internal Circuit | No. of Poles | Terminal Style | Inertia Delay | Auxiliary Contact Alarm Contact | Part No. | Designation Code | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 7 Rated Current | 8 Time Delay Curve | 9 Rated Voltage | 11 Rocker Indication | 12 Rocker Color |
| Series Trip Current Trip | 1 | Tab Terminal | Without | Without | **NH1Y-1100-** 7 8 11 12 | 0.5A 0.75A 1A 2A 3A 5A 7.5A 10A 15A 20A 25A 30A | AA BA MA AD MD | – | Blank, A, C, D | Blank, R, G, W |
| | | | | w/Auxiliary Contact | **NH1Y-1111-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| | | | With | Without | **NH1Y-1100F-** 7 8 11 12 | | | | | |
| | | | | w/Auxiliary Contact | **NH1Y-1111F-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| | | Screw Terminal | Without | Without | **NH1Y-1100S-** 7 8 11 12 | | | | | |
| | | | | w/Auxiliary Contact | **NH1Y-1111S-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| | | | With | Without | **NH1Y-1100FS-** 7 8 11 12 | | | | | |
| | | | | w/Auxiliary Contact | **NH1Y-1111FS-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| Series Trip Current Trip | 2 | Tab Terminal | Without | Without | **NH1Y-2100-** 7 8 11 12 | | | | | |
| | | | | w/Auxiliary Contact | **NH1Y-2111-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| | | | With | Without | **NH1Y-2100F-** 7 8 11 12 | | | | | |
| | | | | w/Auxiliary Contact | **NH1Y-2111F-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| | | Screw Terminal | Without | Without | **NH1Y-2100S-** 7 8 11 12 | | | | | |
| | | | | w/Auxiliary Contact | **NH1Y-2111S-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| | | | With | Without | **NH1Y-2100FS-** 7 8 11 12 | | | | | |
| | | | | w/Auxiliary Contact | **NH1Y-2111FS-** 7 8 11 12 | | | | | |
| | | | | w/Alarm Contact | – | | | | | |
| Relay Trip Voltage Trip | 1 | Tab Terminal | Without | Without | **NH1Y-1500-** 9 11 12 | – | – | 100V AC 24V DC | Blank, A, C, D | Blank, R, G, W |
| | 2 | | | Without | **NH1Y-2500-** 9 11 12 | | | | | |
| | – | | | – | – | | | | | |

## NH1L (Rocker w/indicator)

Specify a rated current, time delay curve, rated voltage, indicator, rocker indicator, and rocker color in place of [7] [8] [9] [10] [11] [12].

Package Quantity: 1

| Internal Circuit | No. of Poles | Terminal Style | Inertia Delay | Auxiliary Contact Alarm Contact | Part No. | Designation Code | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | [7] Rated Current | [8] Time Delay Curve | [9] Rated Voltage | [10] Indicator | [11] Rocker Indication | [12] Rocker Color |
| Series Trip Current Trip | 1 | Tab Terminal | Without | Without | **NH1L-1100-** [7] [8] [10] [11] [12] | 0.5A 0.75A 1A 2A 3A 5A 7.5A 10A 15A 20A 25A 30A | AA BA MA AD MD | – | 1: Neon 125V AC 50/60Hz 3: LED 6V AC/DC 4: LED 12V AC/DC 5: LED 24V AC/DC 7: LED 48V AC/DC | Blank, A, C, D | Blank, R, G, W |
| | | | | w/Auxiliary Contact | **NH1L-1111-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| | | | With | Without | **NH1L-1100F-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Auxiliary Contact | **NH1L-1111F-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| | | Screw Terminal | Without | Without | **NH1L-1100S-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Auxiliary Contact | **NH1L-1111S-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| | | | With | Without | **NH1L-1100FS-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Auxiliary Contact | **NH1L-1111FS-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| Series Trip Current Trip | 2 | Tab Terminal | Without | Without | **NH1L-2100-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Auxiliary Contact | **NH1L-2111-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| | | | With | Without | **NH1L-2100F-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Auxiliary Contact | **NH1L-2111F-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| | | Screw Terminal | Without | Without | **NH1L-2100S-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Auxiliary Contact | **NH1L-2111S-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| | | | With | Without | **NH1L-2100FS-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Auxiliary Contact | **NH1L-2111FS-** [7] [8] [10] [11] [12] | | | | | | |
| | | | | w/Alarm Contact | – | | | | | | |
| Relay Trip Voltage Trip | 1 | Tab Terminal | Without | Without | **NH1L-1500-** [9] [10] [11] [12] | – | – | 100V AC 24V DC | 1: Neon 125V AC 50/60Hz 3: LED 6V AC/DC 4: LED 12V AC/DC 5: LED 24V AC/DC 7: LED 48V AC/DC | Blank, A, C, D | Blank, R, G, W |
| | 2 | | | Without | **NH1L-2500-** [9] [10] [11] [12] | | | | | | |
| | – | | | – | – | | | | | | |

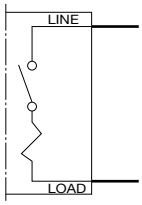
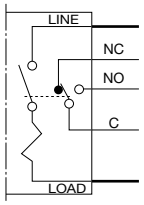
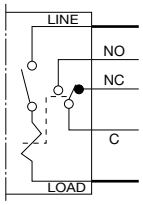
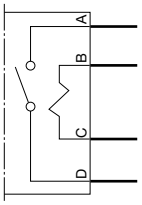
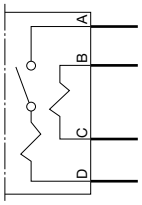
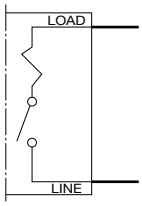
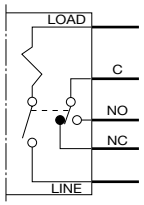
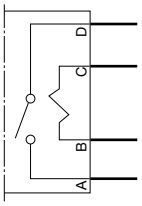
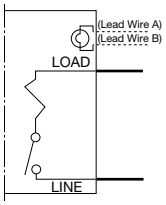
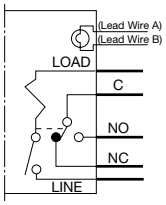
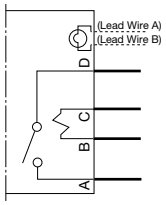
## NH1V (Lever)

Specify a rated current, time delay curve, and rated voltage in place of 7 8 9.

Package Quantity: 1

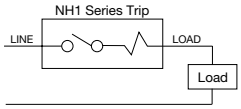
| Internal Circuit | No. of Poles | Inertia Delay | Auxiliary Contact Alarm Contact | Part No. | Code for Ordering | | |
|---|---|---|---|---|---|---|---|
| | | | | | 7 Rated Current | 8 Time Delay Curve | 9 Rated Voltage |
| Series Trip Current Trip | 1 | Without | Without | **NH1V-1100-** 7 8 | 0.5A<br>0.75A<br>1A<br>2A<br>3A<br>5A<br>7.5A<br>10A<br>15A<br>20A<br>25A<br>30A | AA<br>BA<br>MA<br>AD<br>MD | – |
| | | | w/Auxiliary Contact | **NH1V-1111-** 7 8 | | | |
| | | | w/Alarm Contact | **NH1V-1121-** 7 8 | | | |
| | | With | Without | **NH1V-1100F-** 7 8 | | | |
| | | | w/Auxiliary Contact | **NH1V-1111F-** 7 8 | | | |
| | | | w/Alarm Contact | **NH1V-1121F-** 7 8 | | | |
| | 2 | Without | Without | **NH1V-2100-** 7 8 | | | |
| | | | w/Auxiliary Contact | **NH1V-2111-** 7 8 | | | |
| | | | w/Alarm Contact | **NH1V-2121-** 7 8 | | | |
| | | With | Without | **NH1V-2100F-** 7 8 | | | |
| | | | w/Auxiliary Contact | **NH1V-2111F-** 7 8 | | | |
| | | | w/Alarm Contact | **NH1V-2121F-** 7 8 | | | |
| | 3 | Without | Without | **NH1V-3100-** 7 8 | | | |
| | | | w/Auxiliary Contact | **NH1V-3111-** 7 8 | | | |
| | | | w/Alarm Contact | **NH1V-3121-** 7 8 | | | |
| | | With | Without | **NH1V-3100F-** 7 8 | | | |
| | | | w/Auxiliary Contact | **NH1V-3111F-** 7 8 | | | |
| | | | w/Alarm Contact | **NH1V-3121F-** 7 8 | | | |
| Relay Trip Voltage Trip | 1 | Without | Without | **NH1V-1500-** 9 | – | – | 100V AC<br>24V DC |
| | 2 | | Without | **NH1V-2500-** 9 | | | |
| | 3 | | Without | **NH1V-3500-** 9 | | | |

## Internal Circuits and Terminal Arrangements

| Internal Circuit / Model | Series Trip (Current Trip) | Series Trip (w/auxiliary contact) | Series Trip (w/alarm contact) | Relay Trip (Voltage Trip) | Dual Coil Series Trip + Relay Trip (Voltage Trip) |
|---|---|---|---|---|---|
| NH1S |  |  |  |  |  |
| NH1Y |  |  | – |  | – |
| NH1L w/indicator |  |  | – |  | – |
| Shape (Rear View) |  (Photo: NH1S) | | | | |

Note: The 2-pole with auxiliary or alarm contact has the contacts on the left side as viewed from the front.
The 3-pole with auxiliary and alarm contacts has the contacts on the center.
See the dimensional drawings for the terminal arrangement.

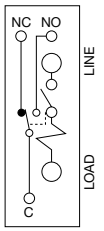
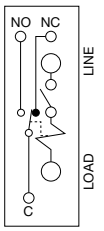
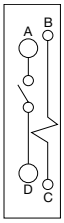
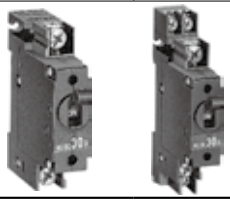
• Wiring Example




• Lead Wires for Neon and LED Indicators:

| Lead Wire | Color | Neon | LED |
|---|---|---|---|
| Lead wire A | Red | AC | Positive |
| Lead wire B | Black | AC | Negative |

### NH1V

| Internal Circuit / Model | Series Trip (Current Trip) | Series Trip (w/auxiliary contact) | Series Trip (w/alarm contact) | Relay Trip (Voltage Trip) |
|---|---|---|---|---|
| NH1V |  |  |  |  |
| Shape |  | | | |

Note: See the dimensional drawings for the terminal arrangement.

## Overcurrent - Time Delay Characteristics (sec at 25°C) [at vertical mounting]

| For | Time Delay Curve | Percent of Rated Current | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 100% | 125% | 150% | 200% | 400% | 600% | 800% | 1000% |
| AC 50/60Hz | AA | No Trip | 12-180 | 6-70 | 2-25 | 0.15-3.5 | 0.005-0.3 | 0.004-0.13 | 0.004-0.04 |
| | BA | No Trip | 0.7-15 | 0.3-4 | 0.1-1.3 | 0.02-0.25 | 0.006-0.13 | 0.003-0.07 | 0.003-0.04 |
| | MA | No Trip | 50-800 | 20-300 | 5.5-110 | 0.3-17 | 0.008-2.5 | 0.004-0.5 | 0.004-0.1 |
| DC | AD | No Trip | 10-180 | 6-75 | 2.6-30 | 0.5-7 | 0.015-3 | 0.004-0.8 | 0.003-0.1 |
| | MD | No Trip | 70-800 | 25-300 | 10-100 | 1.2-20 | 0.02-5 | 0.004-0.65 | 0.003-0.1 |

Note: Circuit protectors with inertia delay may have a slightly longer time delay at 400% or higher.

**Dual Coil**

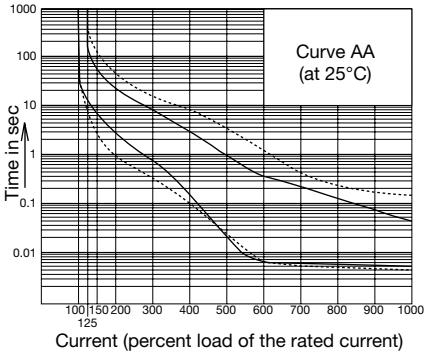
| For | Time Delay Curve | Percent of Rated Current | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 100% | 125% | 150% | 200% | 400% | 600% | 800% | 1000% |
| AC 50/60Hz | AA | No trip | 6-500 | 2-150 | 0.7-40 | 0.1-8 | 0.005-1.2 | 0.003-0.2 | 0.003-0.15 |
| | BA | No trip | 0.7-60 | 0.25-20 | 0.07-6 | 0.013-1.2 | 0.004-0.4 | 0.003-0.2 | 0.003-0.15 |
| | MA | No trip | 50-800 | 15-600 | 6-250 | 0.4-40 | 0.06-3 | 0.003-0.2 | 0.003-0.15 |
| DC | AD | No trip | 10-180 | 1.5-100 | 0.6-30 | 0.1-7 | 0.015-3 | 0.004-0.8 | 0.003-0.1 |
| | MD | No trip | 70-800 | 14-600 | 5-200 | 0.8-40 | 0.007-20 | 0.003-4 | 0.003-0.1 |

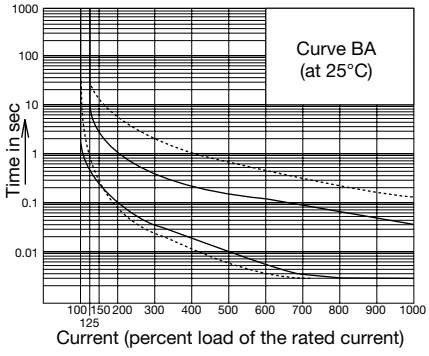
Note: Circuit protectors with inertia delay may have a slightly longer time delay at 400% or higher.

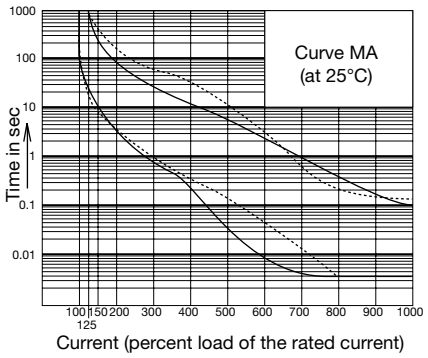
## Time Delay Curves

Note: The dashed lines show dual coil.

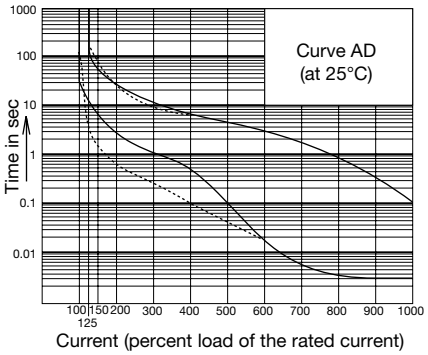
**For AC**

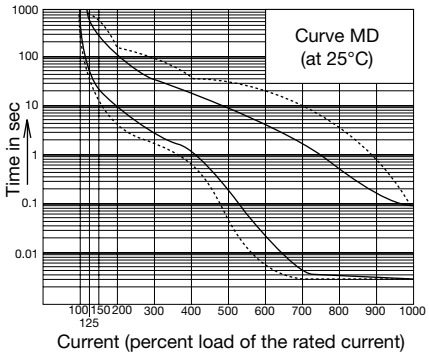



**For DC**



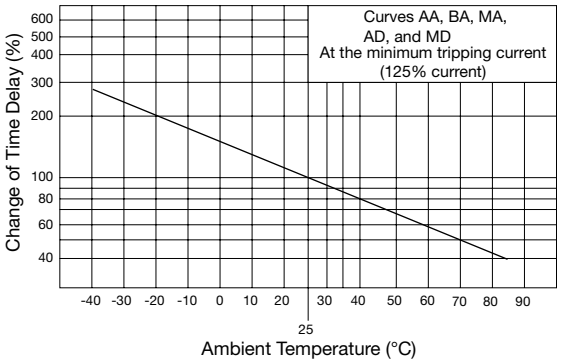



## Time Delay Curve and Ambient Temperature

Since NH1 series circuit protectors employ an electromagnetic tripping system, the rated current (trip current) is not affected by ambient temperatures but the time delay varies with the oil viscosity in the oil dash pot. Lower oil viscosity at higher temperatures results in shorter delay, whereas at lower temperatures the delay will be prolonged. The time delay curves on the preceding are at 25°C. With reference to these curves, time delays can be corrected.

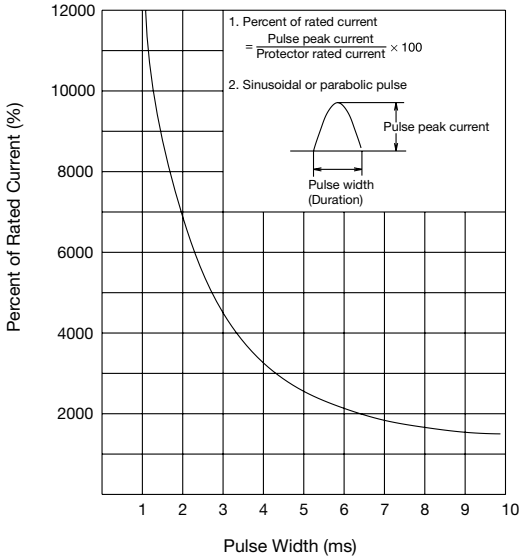
## Temperature Correction Curve

The time delay curves are at 25°C. With reference to the following figure, time delays can be corrected.




## Circuit Protector with Inertia Delay

1. Circuit protectors equipped with inertia delay do not respond to high inrush currents caused by transformer or lamp loads, but perform the specified interruption on the subsequent overcurrents.
2. Inertia delay is designed not to trip on a pulse of 1500% the rated current for a duration of 10 ms.




## Impedance and Coil Resistance

### Series Trip
### [Current Trip]

| Rated Current | For AC 50/60Hz Impedance (Ω) | For DC Resistance (Ω) | Rated Current | For AC 50/60Hz Impedance (Ω) | For DC Resistance (Ω) |
|---|---|---|---|---|---|
| | Curves AA, BA, and MA | Curves AD and MD | | Curves AA, BA, and MA | Curves AD and MD |
| 0.5A | 3.36 | 3.24 | 7.5A | 0.018 | 0.017 |
| 0.75A | 1.49 | 1.45 | 10A | 0.012 | 0.012 |
| 1A | 0.92 | 0.90 | 15A | 0.0068 | 0.0066 |
| 2A | 0.21 | 0.21 | 20A | 0.0048 | 0.0048 |
| 2.5A | 0.13 | 0.13 | 25A | 0.0043 | 0.0043 |
| 3A | 0.092 | 0.09 | 30A | 0.0041 | 0.0036 |
| 5A | 0.036 | 0.036 | | | |

Note: Tolerance: ±25% (up to 5A), ±50% (7.5A or higher)

### Relay Trip
### [Voltage Trip]

| Rated Voltage | For AC 50/60Hz Impedance (Ω) | For DC Resistance (Ω) |
|---|---|---|
| 100V AC | 1350 | – |
| 24V DC | – | 248 |

### Dual Coil
### [Current Trip]

| Rated Current | For AC 50/60Hz Impedance (Ω) | For DC Resistance (Ω) |
|---|---|---|
| | Curves AA, BA, and MA | Curves AD and MD |
| 2A | 0.308 | 0.307 |
| 3A | 0.129 | 0.127 |
| 5A | 0.0509 | 0.0518 |
| 7.5A | 0.0249 | 0.0245 |
| 10A | 0.0150 | 0.0150 |
| 15A | 0.0084 | 0.0080 |

Note: Tolerance: ±25% (up to 5A), ±50% (7.5A or higher)

### [Voltage Trip]

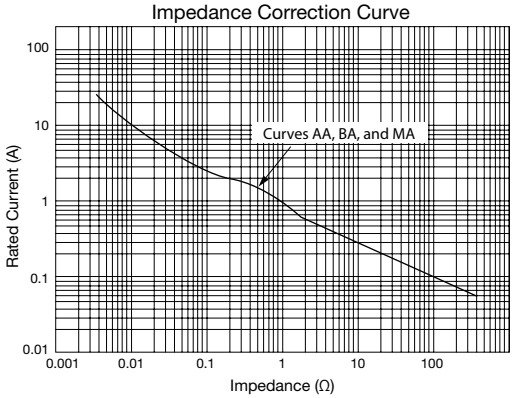
| Rated Voltage | For AC 50/60Hz Impedance (Ω) | For DC Resistance (Ω) |
|---|---|---|
| 100V AC | 321 | – |
| 24V DC | – | 15.7 |

Note: Tolerance: ±25%

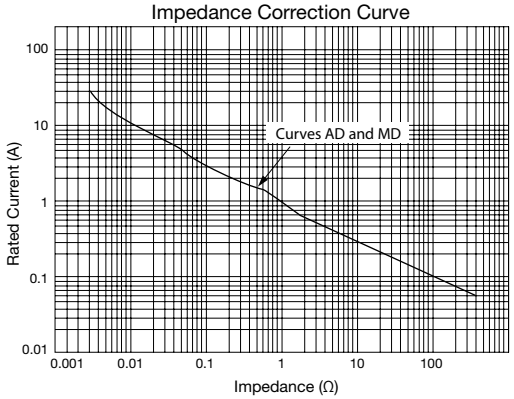
### Voltage Drop Due to Coil Resistance or Impedance

The internal resistance or impedance of a circuit protector tends to be larger for a smaller rated current. Therefore, when circuit protectors of a small rated current are used, voltage drop should be taken into consideration. Internal resistance also varies with time delay curves in spite of the same rated current, which should also be considered during installation.

Impedance Correction Curve



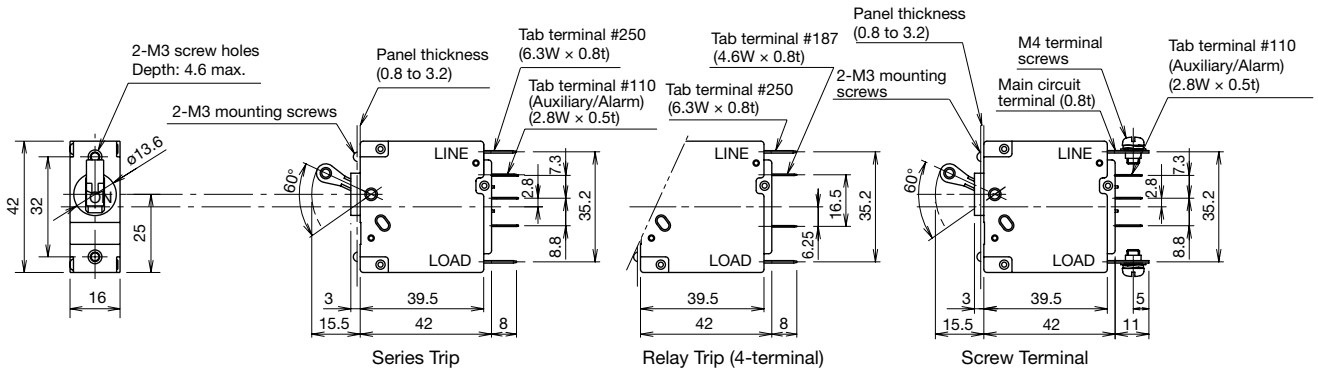

Impedance Correction Curve



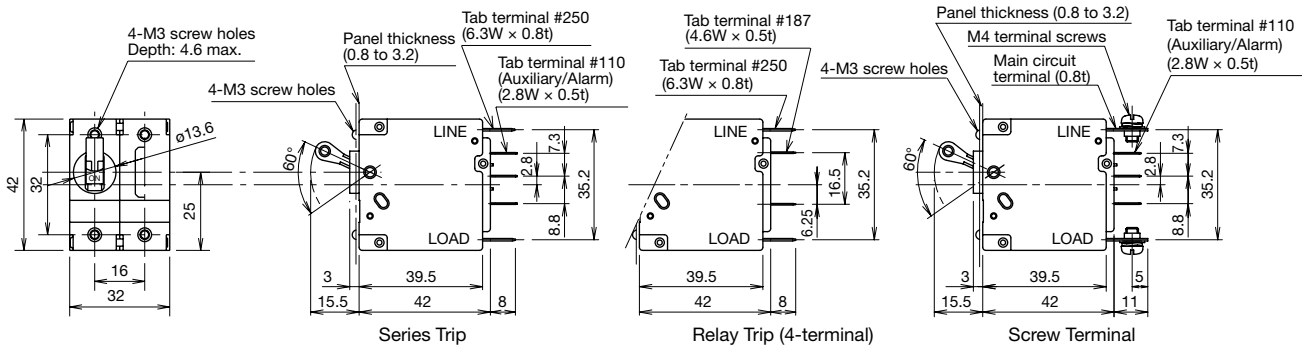
# Dimensions

## NH1S

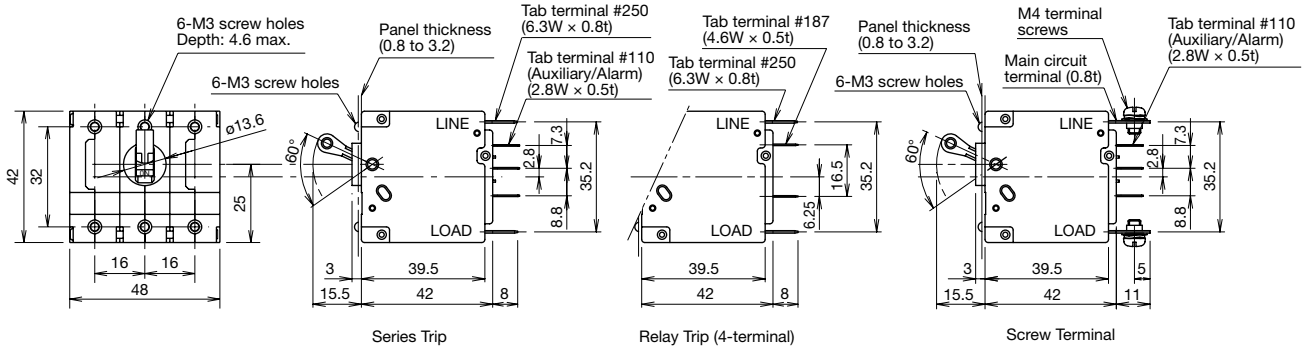
### 1-pole



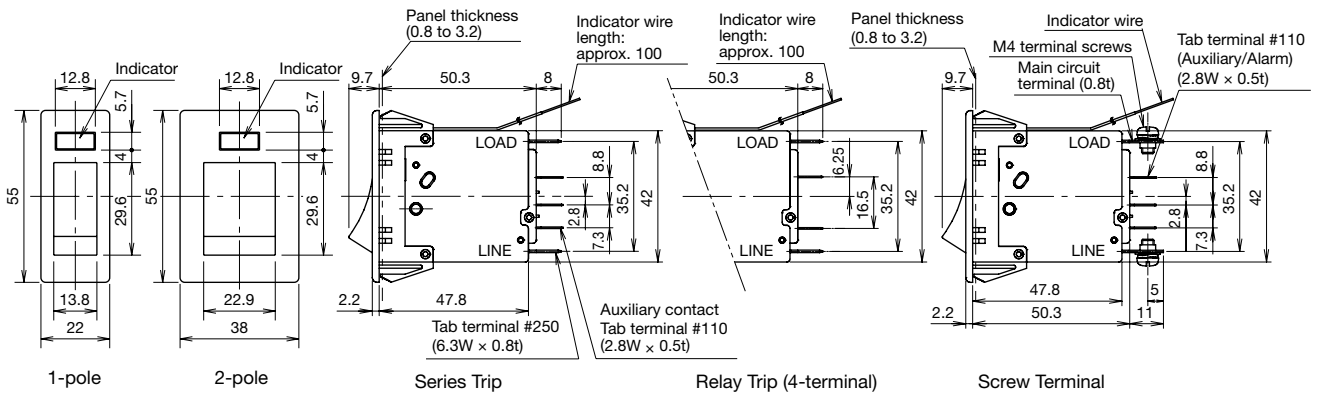

### 2-pole

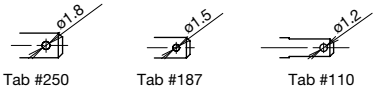



### 3-pole




## NH1Y • NH1L



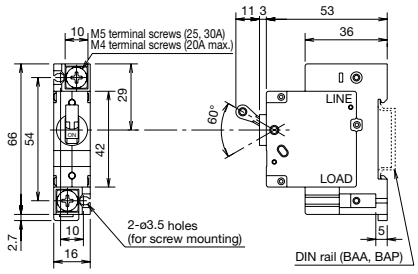




All dimensions in mm.

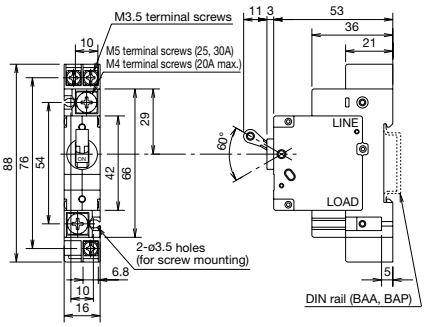
## Dimensions

### NH1V

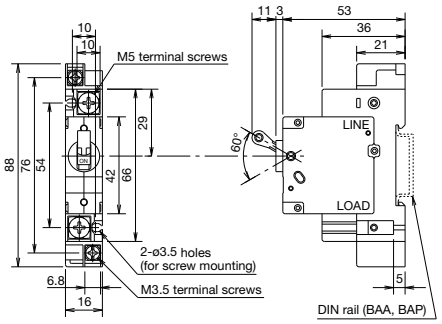
### 1-pole




Series Trip

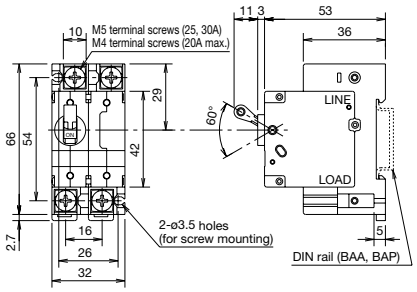



Series Trip (Auxiliary/Alarm Contacts)

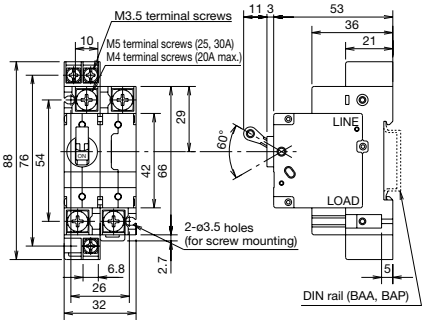



Relay Trip

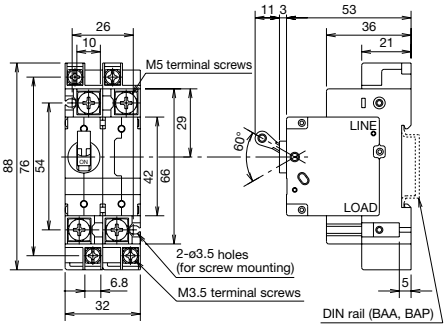
### 2-pole




Series Trip

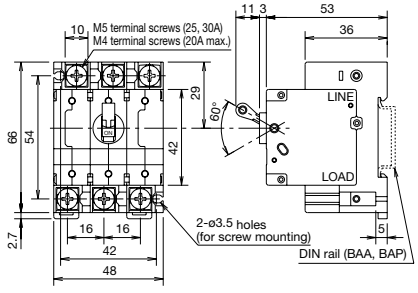



Series Trip (Auxiliary/Alarm Contacts)

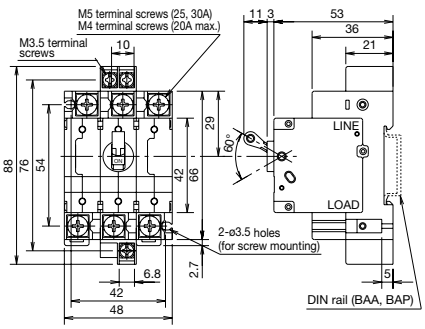



Relay Trip

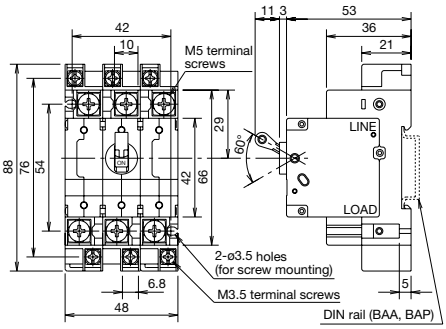
### 3-pole




Series Trip

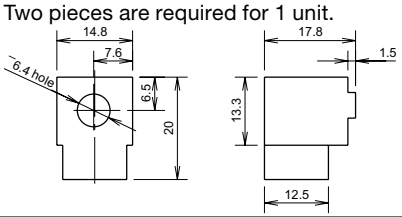
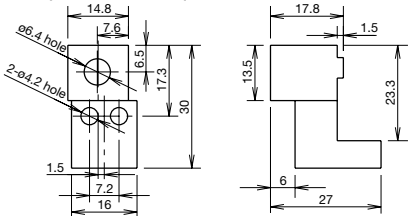



Series Trip (Auxiliary/Alarm Contacts)




Relay Trip

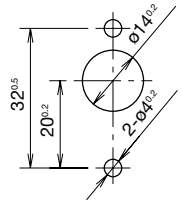
## Accessories

| Product / Shape | Part No. | Ordering No. | Package Quantity | Description / Dimensions |
|---|---|---|---|---|
| Terminal Cover (for main terminals) for NH1V<br>  <br>  <br>Material: Polyamide | NH9Z-A | NH9Z-APN02 | 2 | Two pieces are required for 1 unit.<br>  |
| Terminal Cover (for main/auxiliary terminals) for NH1V<br>  <br>  <br>Material: Polyamide | NH9Z-B | NH9Z-BPN02 | 2 | Two pieces are required for 1 unit.<br>  |

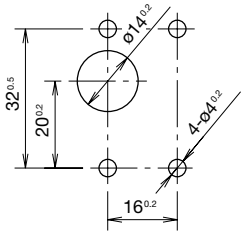
## Mounting Hole Layout

### NH1S

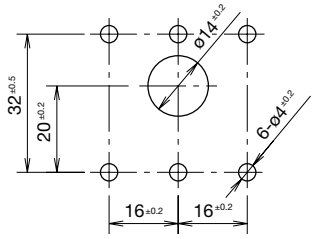
1-pole




2-pole

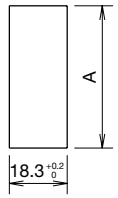



3-pole

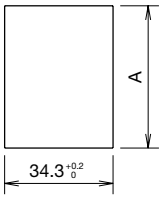



### NH1Y • NH1L

1-pole



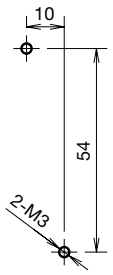

2-pole



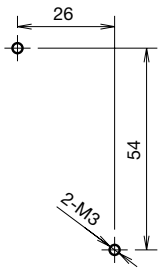

- Determine the dimension A within the panel thickness using the following formula:
  Dimension A (mm) = 50.4+(Panel thickness - 0.8) × 0.87
  Applicable panel thickness: 0.8 to 3.2 mm

### NH1V

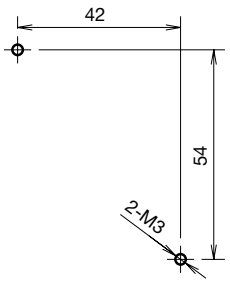
1-pole




2-pole




3-pole




### Panel Mounting Screw Length

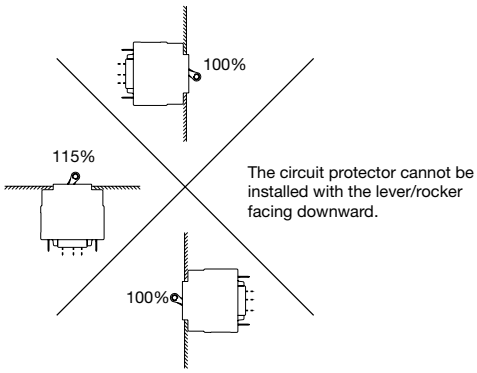
Select the screw length with reference to the following table.

| Panel thickness (mm) | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.3 | 2.6 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Without washer | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 7 | 7 |
| With plain washer (0.5 mm thick) | 5 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 8 |
| With spring washer (0.7 mm thick) | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 |
| With plain washer (0.5 mm thick) and spring washer (0.7 mm thick) | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 |

M3 screw mounting
Tightening torque: 0.5 to 0.8 N·m minimum

### Installation Angle

Tripping method is hydraulic magnetic. Minimum operating current varies with installation angle because operating currents are influenced by the weight of movable iron core. With reference to the following figure, correct the rated current.




Note 1: The rated current does not change depending on the installation angle.
Note 2: The minimum operating current is calculated from the following formula:
(Minimum operating current) = (Rated current) × 125% × (Correction factor by installation angle)

## Instructions

One-pole circuit protectors cannot be combined to make 2- or 3-pole units due to their characteristics. Order multi-poles from IDEC.

### Recommended Soldering Conditions

Solder the main terminal at a temperature of 390°C within 10 seconds using a 60W soldering iron.
Solder the auxiliary/alarm terminal at a temperature of 350°C within 3 seconds using a 60W soldering iron. (Sn-Ag-Cu lead-free solder is recommended.)
When soldering, do not touch the circuit protector housing, auxiliary and alarm contacts with the soldering iron, and do not bend the terminals or pull the wires.
Check your actual soldering conditions before soldering.

### Main Circuit Terminal: Screw terminal

| | |
|---|---|
| Applicable wire size | 1.25 to 5.5 $mm^2$ |
| Applicable crimping terminal | R1.25-4 to R5.5-4 |
| No.of crimping terminal | 1 |
| Tightening torque | 1.0 to 1.2 N·m |

Thrust force (screw pressing load) in screw tightening should be 29N or less. The screw driver may slip out depending on the shape and conditions. In this case, hold the terminal with a tool and tighten the screw by applying a thrust force of about 50N without deforming the terminal.

# NRA Series Circuit Protectors

## Best Selling Circuit Protectors
## Wide selection of applications ranging from computers to office and factory automation

- Available with inertia delay
- Available with auxiliary contact or alarm contact
- Hydraulic-magnetic tripping system
- Safe trip-free mechanism
- Vibration-proof design
- Variety of mounting methods
- IEC (IEC 60934) compliant
- Available in tab-terminal and screw-terminal suited for crimping-terminal wiring.


| Applicable Standards | Mark | Certification Organization / File No. |
|---|---|---|
| UL1077<br>CSA C22.2 No. 235 (Note 1) | c UL us | UL/c-UL recognized<br>File No. E68029 |
| EN60934<br>(VDE0642) (Note 2) | | VDE No. 116381 |
| EN60934 | CE | EU Low Voltage Directive<br>(Note 3) |
| GB17701 | | CCC No. 2005010309151792 |
| Electrical Appliance and Material Safety Law Technical Standard | PS E | JET |

For details, see the list of standard certified products in the back of this catalog.
Note 1: All standard models Note 2: All models Note 3: Series trip only

## Specifications

| Model | NRAS | NRAN | NRAR |
|---|---|---|---|
| Operator Style | Lever | Lever | Rocker (Non-illuminated, Illuminated) |
| Protection Method | Hydraulic-magnetic tripping system | | |
| Internal Circuit | Series trip (current trip) Relay trip (voltage trip)<br>Series trip (current trip) with auxiliary contacts<br>Series trip (current trip) with alarm contacts | | |
| No. of poles | 1, 2, 3 poles | | 1 pole |
| Rated Voltage | 250V AC 50/60Hz, 65V DC | | |
| Minimum Applicable Load | 24V AC/DC, 100 mA (reference value) | | |
| Rated Current | Current trip: 0.3A, 0.5A, 0.75A, 1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A | | |
| Trip Voltage<br>(Voltage trip) | Rated voltage: 24V DC (operating at 90% of the rated voltage or higher, at 25°C)<br>Voltage application duration: 1 sec maximum<br>Trip time: 0.05 sec maximum (at the rated voltage) | | |
| Rated Interrupting Current | 250V AC 50/60Hz 1000A, 65V DC 1000A | | |
| Auxiliary Contact<br>Alarm Contact | SPDT microswitch 250V AC 5A (resistive load), 50V DC 1A (resistive load) | | |
| Reference Temperature | +25°C | | |
| Operating Temperature | −40 to +85°C (no freezing) | | |
| Storage Temperature | −40 to +90°C (no freezing) | | |
| Operating Humidity | 45 to 85% RH (no condensation) | | |
| Storage Humidity | 45 to 85% RH (no condensation) | | |
| Insulation Resistance | 100 MΩ minimum (500V DC megger) | | |
| Dielectric Strength | 2000V AC for 1 minute (between live part and ground, between terminals of different poles, between terminals of the same poles when main contacts are open, between main circuit and auxiliary contact) | | |
| Vibration Resistance | 100 m/s² (10 to 100Hz) | | |
| Shock Resistance | 1000 m/s² | | |
| Life | Over 10,000 operations (6 operations per minute) | | |
| Terminal Style | Main terminal: Tab terminal #250, M4 screw terminal<br>Auxiliary contact/Alarm contact: Tab terminal #110 | | |
| Weight (Approx.) (NRAS series trip) | 1-pole: 60g, 2-pole: 125g, 3-pole: 190g | | |

- Do not use the NRA circuit protectors in environments where they are exposed to extreme temperature, humidity, dust, corrosive gases, vibration, shock, or in a circuit where inrush current may be present, otherwise unnecessary operations and damage may occur.

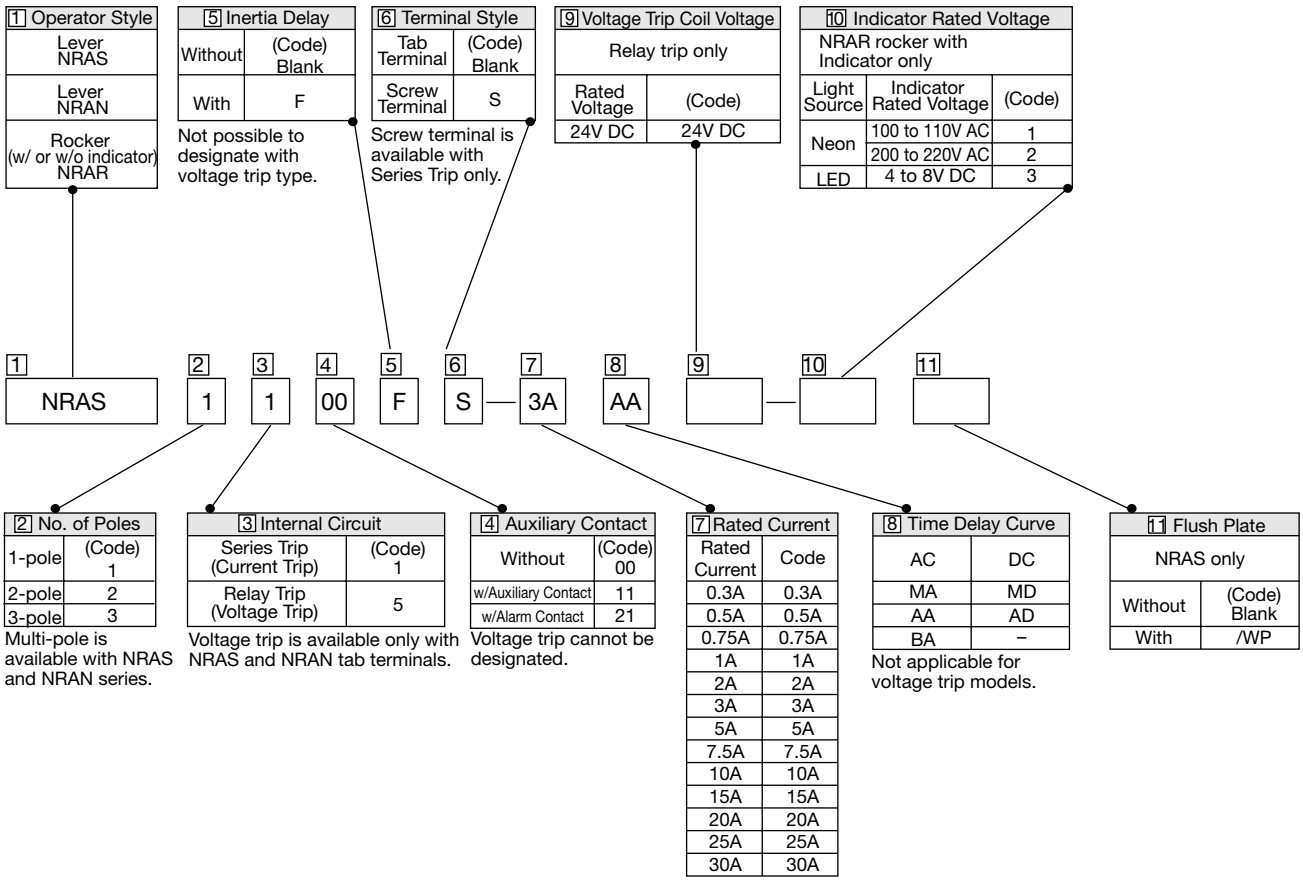
### Indicator Ratings (Illuminated rocker unit)

| Indicator | Rated Voltage |
|---|---|
| Neon | 100 to 110V AC, 50/60Hz<br>200 to 220V AC, 50/60Hz |
| LED | 4 to 8V DC |

### Standard Color

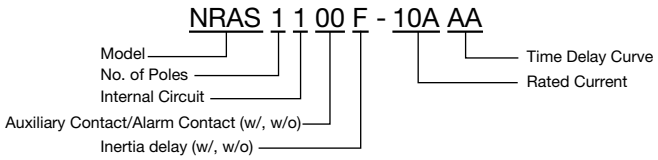
| | | | |
|---|---|---|---|
| Housing | | Black | |
| Lever (NRAS-, NRAN) | | Black with white letters, ON-OFF, I/O | |
| Rocker Color, Indicator Color (NRAR) | | Rocker Color | Indicator Color |
| | Non-illuminated | Opaque white | – |
| | with Neon lamp | Transparent red | Red |

## Part No. Development

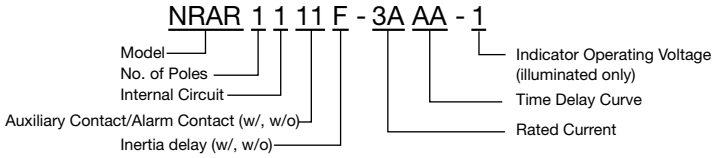



## Part No. Examples

(1) Circuit protector: Lever




(2) Circuit Protector: Illuminated rocker



## NRAS (Lever)

Specify a rated current, time delay curve, and rated voltage in place of 7 8 9.

Package Quantity: 1

| Internal Circuit | No. of Poles | Terminal Style | Inertia Delay | Flush Plate | Auxiliary Contact Alarm Contact | Part No. | Designation Code | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 7 Rated Current | 8 Time Delay Curve | 9 Rated Voltage |
| Series Trip Current Trip | 1 | Tab Terminal | Without | Without | Without | NRAS1100- 7 8 | 0.3A 0.5A 0.75A 1A 2A 3A 5A 7.5A 10A 15A 20A 25A 30A | AA BA MA AD MD | – |
| | | | | | w/Auxiliary Contact | NRAS1111- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS1121- 7 8 | | | |
| | | | | With | Without | NRAS1100- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS1111- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS1121- 7 8 /WP | | | |
| | | | With | Without | Without | NRAS1100F- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS1111F- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS1121F- 7 8 | | | |
| | | | | With | Without | NRAS1100F- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS1111F- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS1121F- 7 8 /WP | | | |
| | | Screw Terminal | Without | Without | Without | NRAS1100S- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS1111S- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS1121S- 7 8 | | | |
| | | | | With | Without | NRAS1100S- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS1111S- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS1121S- 7 8 /WP | | | |
| | | | With | Without | Without | NRAS1100FS- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS1111FS- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS1121FS- 7 8 | | | |
| | | | | With | Without | NRAS1100FS- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS1111FS- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS1121FS- 7 8 /WP | | | |
| Series Trip Current Trip | 2 | Tab Terminal | Without | Without | Without | NRAS2100- 7 8 | 0.3A 0.5A 0.75A 1A 2A 3A 5A 7.5A 10A 15A 20A 25A 30A | AA BA MA AD MD | – |
| | | | | | w/Auxiliary Contact | NRAS2111- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS2121- 7 8 | | | |
| | | | | With | Without | NRAS2100- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS2111- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS2121- 7 8 /WP | | | |
| | | | With | Without | Without | NRAS2100F- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS2111F- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS2121F- 7 8 | | | |
| | | | | With | Without | NRAS2100F- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS2111F- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS2121F- 7 8 /WP | | | |
| | | Screw Terminal | Without | Without | Without | NRAS2100S- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS2111S- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS2121S- 7 8 | | | |
| | | | | With | Without | NRAS2100S- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS2111S- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS2121S- 7 8 /WP | | | |
| | | | With | Without | Without | NRAS2100FS- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS2111FS- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS2121FS- 7 8 | | | |
| | | | | With | Without | NRAS2100FS- 7 8 /WP | | | |
| | | | | | w/Auxiliary Contact | NRAS2111FS- 7 8 /WP | | | |
| | | | | | w/Alarm Contact | NRAS2121FS- 7 8 /WP | | | |

## NRAS (Lever)

Specify a rated current, time delay curve, and rated voltage in place of 7 8 9.

Package Quantity: 1

| Internal Circuit | No. of Poles | Terminal Style | Inertia Delay | Flush Plate | Auxiliary Contact Alarm Contact | Part No. | Designation Code | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 7 Rated Current | 8 Time Delay Curve | 9 Rated Voltage |
| Series Trip Current Trip | 3 | Tab Terminal | Without | Without | Without | NRAS3100- 7 8 | 0.3A<br>0.5A<br>0.75A<br>1A<br>2A<br>3A<br>5A<br>7.5A<br>10A<br>15A<br>20A<br>25A<br>30A | AA<br>BA<br>MA<br>AD<br>MD | – |
| | | | | | w/Auxiliary Contact | NRAS3111- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS3121- 7 8 | | | |
| | | | With | Without | Without | NRAS3100F- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS3111F- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS3121F- 7 8 | | | |
| | | Screw Terminal | Without | Without | Without | NRAS3100S- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS3111S- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS3121S- 7 8 | | | |
| | | | With | Without | Without | NRAS3100FS- 7 8 | | | |
| | | | | | w/Auxiliary Contact | NRAS3111FS- 7 8 | | | |
| | | | | | w/Alarm Contact | NRAS3121FS- 7 8 | | | |
| Relay Trip Voltage Trip | 1 | Tab Terminal | Without | Without | Without | NRAS1500- 9 | – | – | 24V DC |
| | 2 | | | | Without | NRAS2500- 9 | | | |
| | 3 | | | | Without | NRAS3500- 9 | | | |

## NRAN (Lever)

Specify a rated current, time delay curve, and rated voltage in place of 7 8 9.

Package Quantity: 1

| Internal Circuit | No. of Poles | Terminal Style | Inertia Delay | Auxiliary Contact Alarm Contact | Part No. | Designation Code | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 7 Rated Current | 8 Time Delay Curve | 9 Rated Voltage |
| Series Trip Current Trip | 1 | Tab Terminal | Without | Without | NRAN1100- 7 8 | 0.3A<br>0.5A<br>0.75A<br>1A<br>2A<br>3A<br>5A<br>7.5A<br>10A<br>15A<br>20A<br>25A<br>30A | AA<br>BA<br>MA<br>AD<br>MD | – |
| | | | | w/Auxiliary Contact | NRAN1111- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN1121- 7 8 | | | |
| | | | With | Without | NRAN1100F- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN1111F- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN1121F- 7 8 | | | |
| | | Screw Terminal | Without | Without | NRAN1100S- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN1111S- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN1121S- 7 8 | | | |
| | | | With | Without | NRAN1100FS- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN1111FS- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN1121FS- 7 8 | | | |
| Series Trip Current Trip | 2 | Tab Terminal | Without | Without | NRAN2100- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN2111- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN2121- 7 8 | | | |
| | | | With | Without | NRAN2100F- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN2111F- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN2121F- 7 8 | | | |
| | | Screw terminal | Without | Without | NRAN2100S- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN2111S- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN2121S- 7 8 | | | |
| | | | With | Without | NRAN2100FS- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN2111FS- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN2121FS- 7 8 | | | |
| Series Trip Current Trip | 3 | Tab terminal | Without | Without | NRAN3100- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN3111- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN3121- 7 8 | | | |
| | | | With | Without | NRAN3100F- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN3111F- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN3121F- 7 8 | | | |
| | | Screw Terminal | Without | Without | NRAN3100S- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN3111S- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN3121S- 7 8 | | | |
| | | | With | Without | NRAN3100FS- 7 8 | | | |
| | | | | w/Auxiliary Contact | NRAN3111FS- 7 8 | | | |
| | | | | w/Alarm Contact | NRAN3121FS- 7 8 | | | |
| Relay Trip Voltage Trip | 1 | Tab Terminal | Without | Without | NRAN1500- 9 | – | – | 24V DC |
| | 2 | | | Without | NRAN2500- 9 | | | |
| | 3 | | | Without | NRAN3500- 9 | | | |

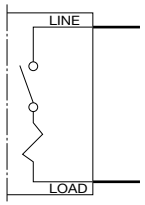
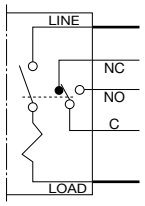
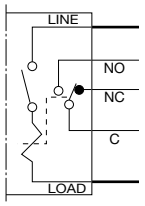
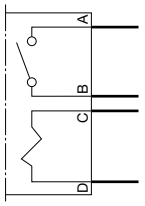
## NRAR (Rocker)

Specify a rated current, time delay curve, and indicator rated voltage in place of 7 8 10. Package Quantity: 1

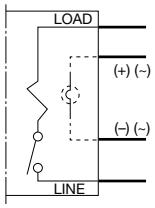
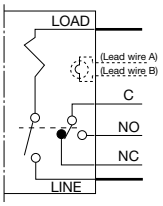
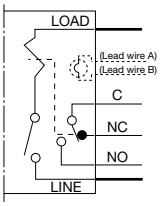
| Illuminated | Internal Circuit | No. of Poles | Terminal Style | Inertia Delay | Auxiliary Contact Alarm Contact | Part No. | Designation Code | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 7 Rated Current | 8 Time Delay Curve | 10 Indicator Rated Voltage |
| Illuminated | Series Trip Current Trip | 1 | Tab Terminal | Without | Without | **NRAR1000-** 7 8 - 10 | 0.3A<br>0.5A<br>0.75A<br>1A<br>2A<br>3A<br>5A<br>7.5A<br>10A<br>15A<br>20A<br>25A<br>30A | AA<br>BA<br>MA<br>AD<br>MD | 1: Neon 100 to 110V AC<br>2: Neon 200 to 220V AC<br>3: LED 4 to 8V DC |
| | | | | | w/Auxiliary Contact | **NRAR1111-** 7 8 - 10 | | | |
| | | | | | w/Alarm Contact | **NRAR1121-** 7 8 - 10 | | | |
| | | | | With | Without | **NRAR1100F-** 7 8 - 10 | | | |
| | | | | | w/Auxiliary Contact | **NRAR1111F-** 7 8 - 10 | | | |
| | | | | | w/Alarm Contact | **NRAR1121F-** 7 8 - 10 | | | |
| | | | Screw Terminal | Without | Without | **NRAR1100S-** 7 8 - 10 | | | |
| | | | | | w/Auxiliary Contact | **NRAR1111S-** 7 8 - 10 | | | |
| | | | | | w/Alarm Contact | **NRAR1121S-** 7 8 - 10 | | | |
| | | | | With | Without | **NRAR1100FS-** 7 8 - 10 | | | |
| | | | | | w/Auxiliary Contact | **NRAR1111FS-** 7 8 - 10 | | | |
| | | | | | w/Alarm Contact | **NRAR1121FS-** 7 8 - 10 | | | |
| Non-illuminated | Series Trip Current Trip | 1 | Tab Terminal | Without | Without | **NRAR1100-** 7 8 | 0.3A<br>0.5A<br>0.75A<br>1A<br>2A<br>3A<br>5A<br>7.5A<br>10A<br>15A<br>20A<br>25A<br>30A | AA<br>BA<br>MA<br>AD<br>MD | – |
| | | | | | w/Auxiliary Contact | **NRAR1111-** 7 8 | | | |
| | | | | | w/Alarm Contact | **NRAR1121-** 7 8 | | | |
| | | | | With | Without | **NRAR1100F-** 7 8 | | | |
| | | | | | w/Auxiliary Contact | **NRAR1111F-** 7 8 | | | |
| | | | | | w/Alarm Contact | **NRAR1121F-** 7 8 | | | |
| | | | Screw Terminal | Without | Without | **NRAR1100S-** 7 8 | | | |
| | | | | | w/Auxiliary Contact | **NRAR1111S-** 7 8 | | | |
| | | | | | w/Alarm Contact | **NRAR1121S-** 7 8 | | | |
| | | | | With | Without | **NRAR1100FS-** 7 8 | | | |
| | | | | | w/Auxiliary Contact | **NRAR1111FS-** 7 8 | | | |
| | | | | | w/Alarm Contact | **NRAR1121FS-** 7 8 | | | |

## Internal Circuits

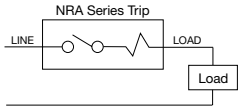
### NRAS and NRAN

| Series Trip (Current Trip) | Series Trip (Current Trip) With Auxiliary Contact | Series Trip (Current Trip) With Alarm Contact | Relay Trip (Voltage Trip) | |
|---|---|---|---|---|
|  |  |  |  |  |

**NRAR** • Dashed lines show the illuminated rocker type.

| Series Trip (Current Trip) | Series Trip (Current Trip) With Auxiliary Contact | Series Trip (Current Trip) With Alarm Contact | – | |
|---|---|---|---|---|
|  |  |  | – |  |

- Indicator terminals on the illuminated rocker type
  Indicator terminals are available only on the series trip type without auxiliary and alarm contacts.
  Auxiliary and alarm contacts are provided with color-coded lead wires as shown in the table at right.
- Wiring Example




| Indicator | | Lead Wire | |
|---|---|---|---|
| | | A | B |
| Neon (for AC) | 100 to 110V | White | White |
| | 200 to 220V | Black | Black |
| LED (for DC) | Positive | Black | – |
| | Negative | – | White |

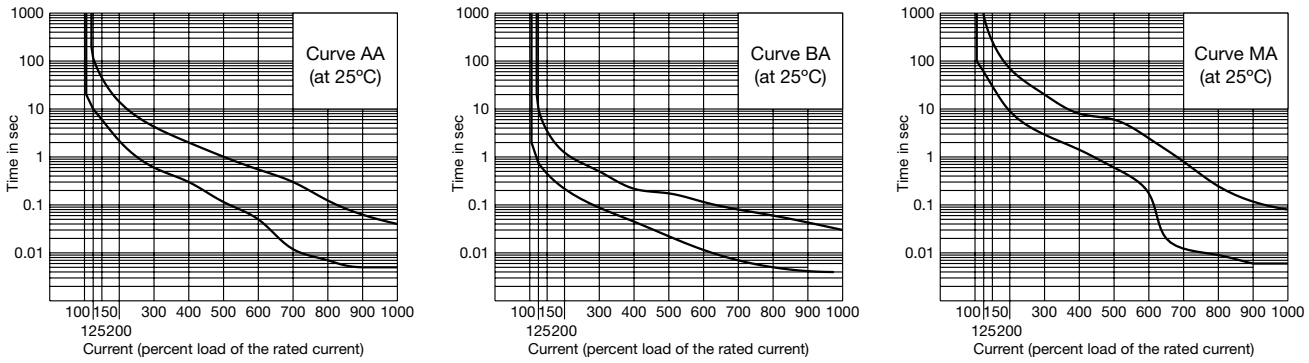
## Overcurrent - Time Delay Characteristics (sec at 25°C)

| For | Time Delay Curve | Percent of Rated Current | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 100% | 125% | 150% | 200% | 400% | 600% | 800% | 1000% |
| AC 50/60Hz | AA | No Trip | 10-120 | 6-45 | 2.2-15 | 0.3-2 | 0.05-0.55 | 0.007-0.13 | 0.005-0.04 |
| | BA | No Trip | 0.75-10 | 0.45-3.5 | 0.22-1.3 | 0.045-0.22 | 0.012-0.12 | 0.005-0.06 | 0.004-0.03 |
| | MA | No Trip | 60-900 | 30-260 | 9-70 | 1.5-8 | 0.18-2.5 | 0.009-0.25 | 0.006-0.08 |
| DC | AD | No Trip | 10-130 | 6-55 | 2.6-20 | 0.5-3.5 | 0.12-1.4 | 0.008-0.1 | 0.005-0.05 |
| | MD | No Trip | 35-400 | 20-200 | 7-60 | 1.3-8 | 0.2-3 | 0.01-0.25 | 0.006-0.08 |

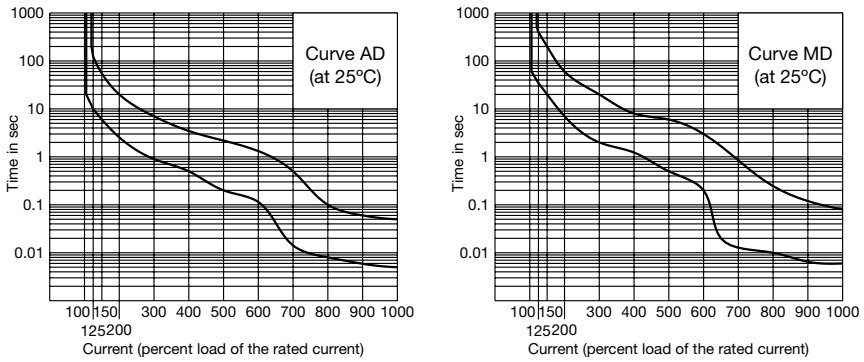
Note: Circuit protectors with inertia delay may have a slightly longer time delay at 600% or higher.

## Time Delay Curves

For AC




For DC

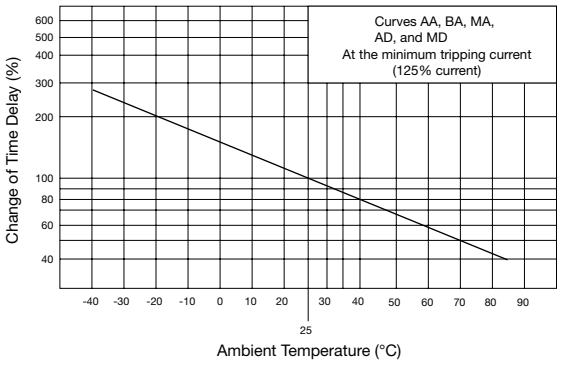



## Time Delay Curve and Ambient Temperature

Since the NRA series circuit protectors employ an electromagnetic tripping system, the rated current (trip current) is not affected by the ambient temperatures, but the time delay varies with the oil viscosity in the oil dash pot. Lower oil viscosity at higher temperatures results in shorter delay, whereas at lower temperatures the delay will be prolonged.
The above time delay curves are at 25°C. With reference to these curves, time delays can be corrected.

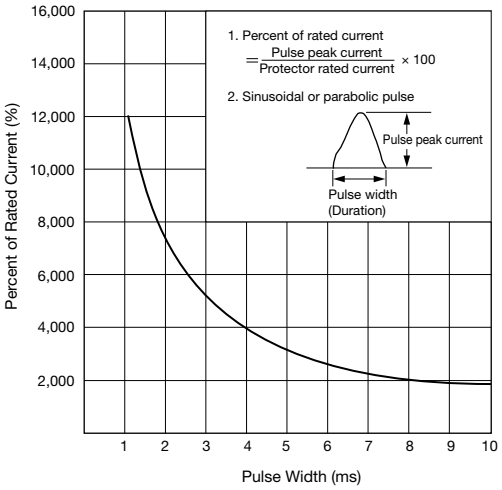
## Temperature Correction Curve

The above time delay curves are at 25°C. With reference to the following figure, time delays can be corrected.




## Circuit Protector with Inertia Delay

Circuit protectors equipped with inertia delay do not respond to high inrush currents caused by transformer or lamp loads, but perform the specified interruption on the subsequent overcurrents.




Note: Inertia delay is designed not to trip on a pulse of 20 times the rated current (peak value) for a duration of 8 ms. See the above curve.

All dimensions in mm.

## Impedance and Coil Resistance

### Series Trip (Current Trip) (at 25°C)

| Rated Current | Current Trip | |
|---|---|---|
| | For AC 50/60Hz Impedance (Ω) | For DC Resistance (Ω) |
| | Curves AA, BA, and MA | Curves AD and MD |
| 0.3A | 9.82 | 9.67 |
| 0.5A | 3.36 | 3.24 |
| 0.75A | 1.49 | 1.45 |
| 1A | 0.92 | 0.90 |
| 2A | 0.21 | 0.21 |
| 3A | 0.092 | 0.09 |
| 5A | 0.036 | 0.036 |
| 7.5A | 0.018 | 0.017 |
| 10A | 0.012 | 0.0012 |
| 15A | 0.0068 | 0.0066 |
| 20A | 0.0048 | 0.0048 |
| 25A | 0.0043 | 0.0043 |
| 30A | 0.0041 | 0.0036 |

Note: Tolerance: ±25% (up to 5A), ±50% (7.5A or higher)

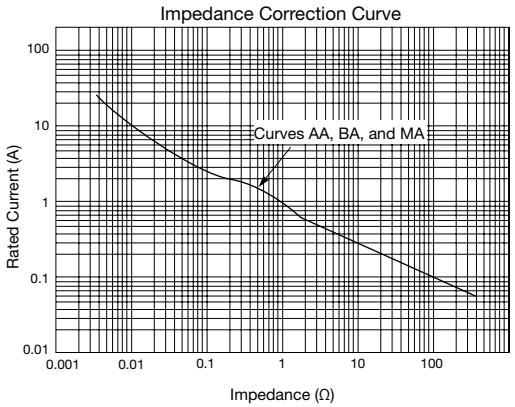
### Relay Trip (Voltage Trip) (at 25°C)

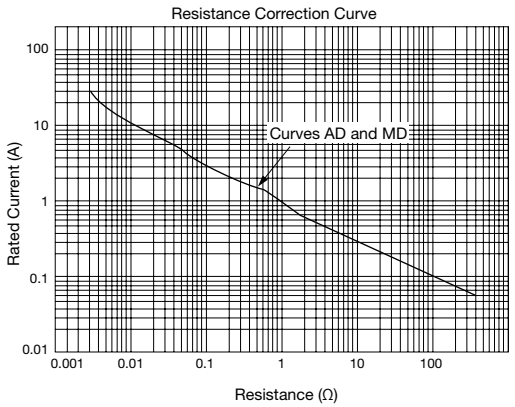
| Rated Voltage | For DC Resistance (Ω) |
|---|---|
| 24V DC | 163 |

Note: Tolerance: ±25%

### Voltage Drop due to Coil Resistance or Impedance

The internal resistance or impedance of a circuit protector tends to be larger for a smaller rated current. Therefore, when circuit protectors of a small rated current are used for a power-supply switch, voltage drop should be taken into consideration. Internal resistance also varies with time delay curves in spite of the same rated current, which should also be considered during installation.

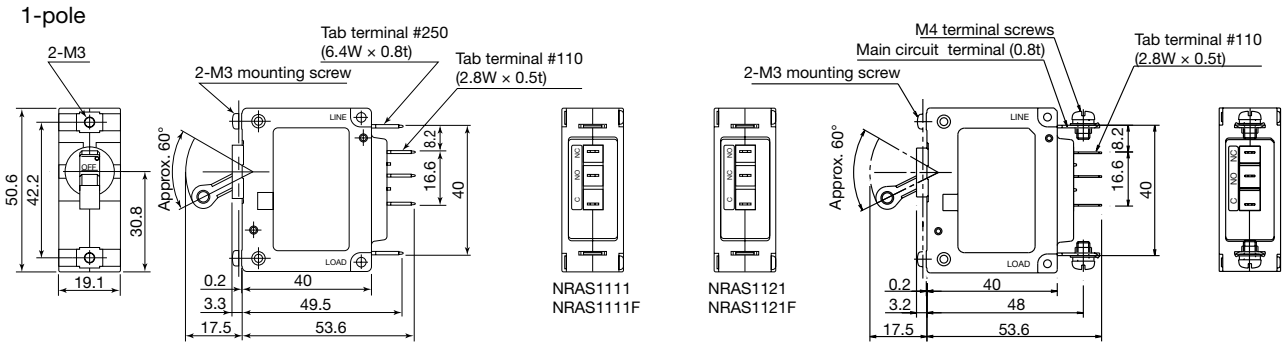


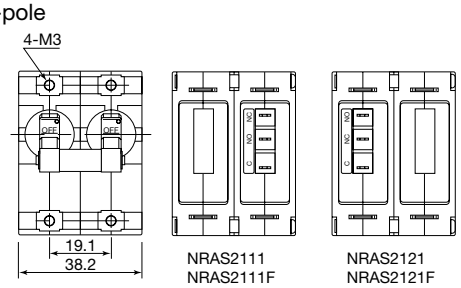

## Dimensions

### NRAS (Lever)

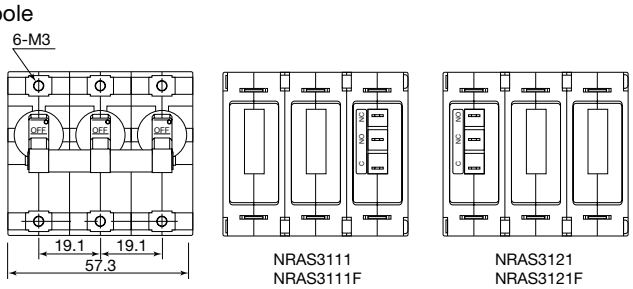
1-pole




2-pole

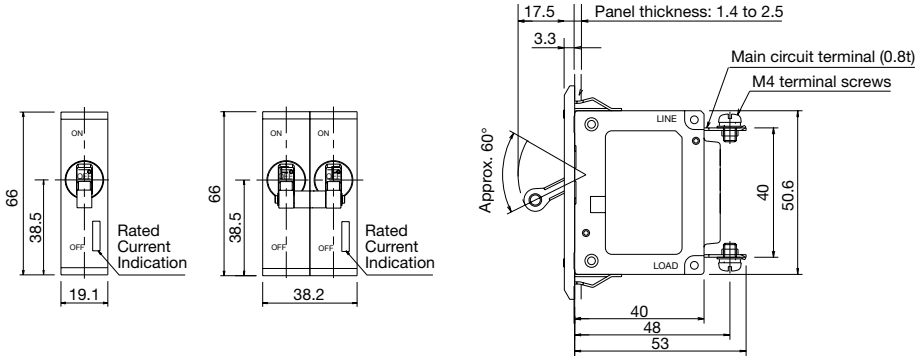



3-pole



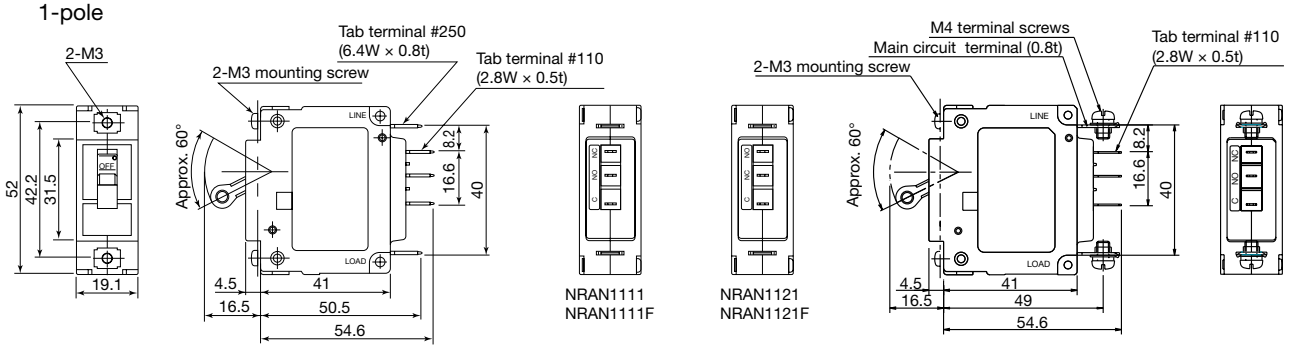

All dimensions in mm.

## NRAS (Lever with Flush Plate)

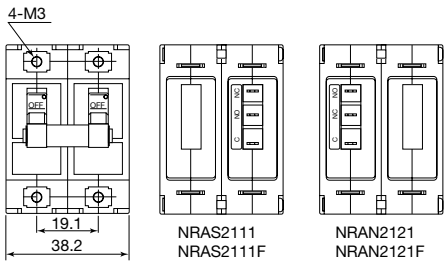



## NRAN (Lever)

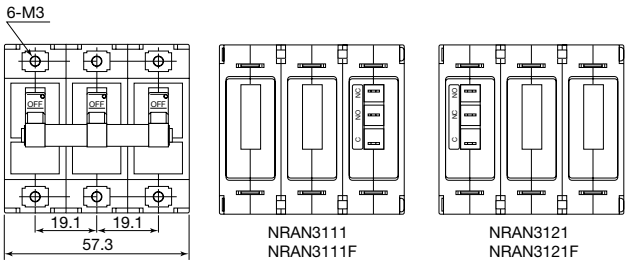
1-pole



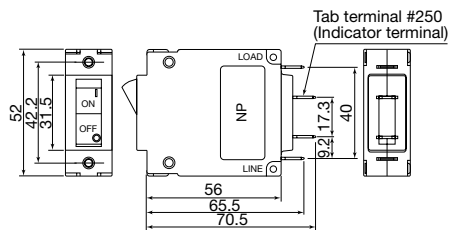

2-pole



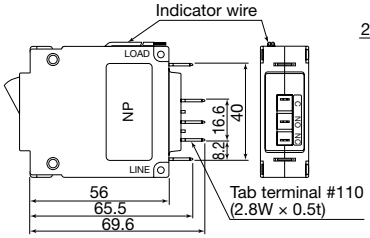

3-pole



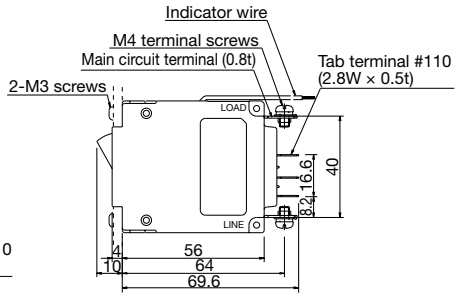

## NRAR (Rocker)




NRAR1100 (with indicator)



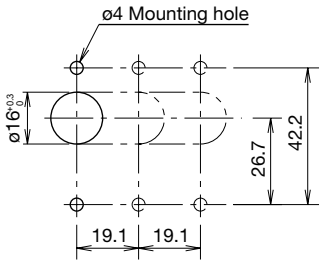
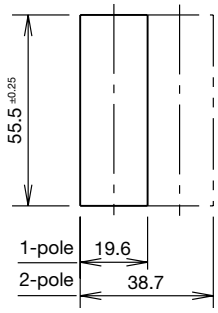
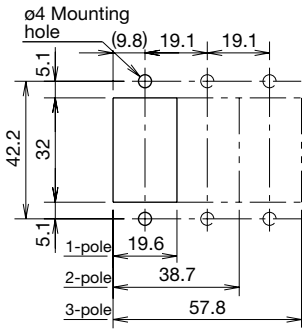

NRAR1111 (with auxiliary contact and indicator)




(Screw Terminal)

All dimensions in mm.

## Mounting Hole Layout

| Model | NRAS | NRAS with Flush Plate | NRAN and NRAR |
|---|---|---|---|
| Panel Cut-out |  Note: See "Accessories" for the mounting hole when the plug-in base is used. |  Note: Flush plate is installed on the circuit protector before shipment and cannot be removed. |  Note: "Accessories" for the mounting holes when the flush plate or plug-in base is used. |

- M3 screw mounting
- Tightening torque: 0.5 to 0.8 N·m

### Panel Mounting Screw Length

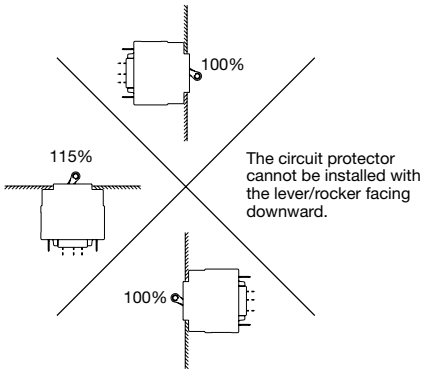
Select the screw length with reference to the following table.

| Panel thickness (mm) | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.3 | 2.6 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Without washer | (4) | (4) | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 |
| With plain washer (0.5 mm thick) | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | (7) |
| With spring washer (0.7 mm thick) | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 7 |
| With plain washer (0.5 mm thick) and spring washer (0.7 mm thick) | 6 | 6 | 6 | 6 | 6 | 6 | 6 | (7) | (7) | 8 |

Note: Avoid using screws in the parenthesized lengths whenever possible.

### Installation Angle

Overcurrent tripping method is hydraulic magnetic. Minimum operating current varies with installation angle because operating currents are influenced by the weight of movable iron core. With reference to the following figure, correct the minimum operating current.




## Instructions

One-pole type circuit protectors cannot be combined to make 2- or 3-pole units due to their characteristics. Order multi-pole types from IDEC.

### Recommended Soldering Conditions

Solder the main terminal at a temperature of 390°C within 10 seconds using a 60W soldering iron.
Solder the auxiliary/alarm terminal at a temperature of 350°C within 3 seconds using a 60W soldering iron. (Sn-Ag-Cu lead-free solder is recommended.)
When soldering, do not touch the circuit protector housing, auxiliary and alarm contacts with the soldering iron, and do not bend the terminals or pull the wires.
Check your actual soldering conditions before soldering.

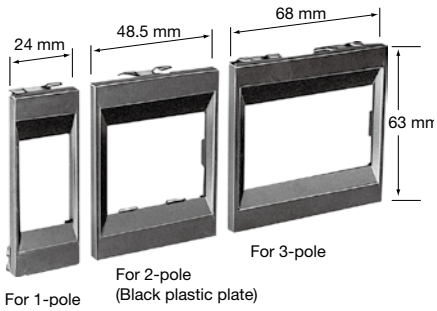
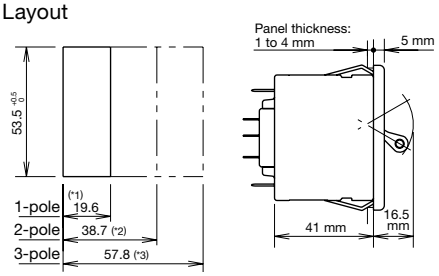
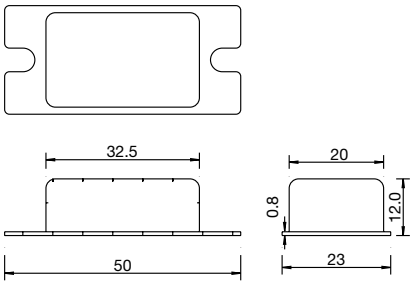
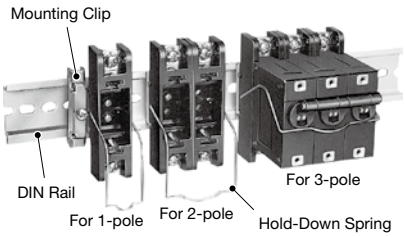
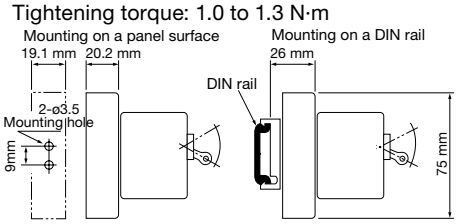
### Main Circuit Terminal: Screw terminal

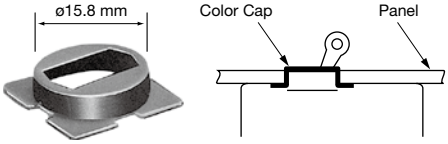
| | |
|---|---|
| Applicable wire size | 1.25 to 5.5 $mm^2$ |
| Applicable crimping terminal | R1.25-4 to R5.5-4 |
| No.of crimping terminal | 1 |
| Tightening torque | 1.0 to 1.2 N·m |

Thrust force (screw pressing load) in screw tightening should be 29N or less. The screw driver may slip out depending on the shape and conditions. In this case, hold the terminal with a tool and tighten the screw by applying a thrust force of about 50N without deforming the terminal.

## Accessories

Package Quantity: 1

| Shape | Specifications | Part No. | For Use on | Description / Dimensions |
|---|---|---|---|---|
| Flush Plate<br>  | For 1-pole | **NR31** | NRAN<br>NRAR | Mounting Hole Layout<br>  |
| | For 2-pole | **NR32** | NRAN | |
| | For 3-pole | **NR33** | | |
| Dustproof Cover<br>  <br>(Silicon rubber) | For 1-pole | **NRA-C1** | NRAR |  |
| Plug-in Base<br>(250V AC/DC · 20A max.)<br>  | Surface Mount: For 1-pole | **NUS1** | NRAS<br>NRAN | Surface mount can mount directly on a panel surface with two M3 screws.<br>DIN rail mount can snap onto a DIN rail.<br>• Applicable only for series trip units. (Not applicable for units with auxiliary and alarm contact or with indicator.)<br>• Terminal screw M4, 20A max., with hold-down spring<br>Tightening torque: 1.0 to 1.3 N·m<br>  |
| | Surface Mount: For 2-pole | **NUS2** | | |
| | Surface Mount: For 3-pole | **NUS3** | | |
| | Surface Mount: For 1-pole | **NUS11** | NRAR | |
| | DIN Rail Mount: For 1-pole | **NR21** | NRAS<br>NRAN | |
| | DIN Rail Mount: For 2-pole | **NR22** | | |
| | DIN Rail Mount: For 3-pole | **NR23** | | |
| | DIN Rail Mount: For 1-pole | **NR211** | NRAR | |

| Shape | Color | Part No. | Ordering No. | Package Quantity | For Use on | Description |
|---|---|---|---|---|---|---|
| Color Cap<br>  | Blue | **NR5S** | **NR5SPN05** | 5 | NRAS | Color caps fit onto NRAS circuit protectors for color-coding circuits and improved appearance of the panel. Available in four colors:<br><br>Blue (7.5B4/8 approx.)<br>Red (7.5R5/14 approx.)<br>White (N9.5 approx.)<br>Yellow (2.5Y9/4 approx.) |
| | Red | **NR5R** | **NR5RPN05** | | | |
| | White | **NR5H** | **NR5HPN05** | | | |
| | Yellow | **NR5Y** | **NR5YPN05** | | | |

# NRL Series Circuit Protectors

**Miniature circuit protectors with hydraulic-magnetic tripping system, allow for space and cost savings. Long life also reduces maintenance costs.**

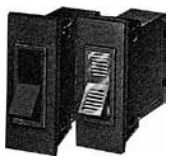
- Compact size (only 36.6H × 16.8W × 42D mm)
- One-lever (one-rocker) for 2-poles, ensures proper interruption to both poles when one pole is tripped.
- Low, middle, and high speed response
- Variety of rated currents and internal circuits
- Available with auxiliary contacts and inertia delay
- Over 20,000 mechanical operations
- Hydraulic-magnetic tripping system
- Safe trip-free mechanism
- Vibration-proof design

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

| Applicable Standards | Mark | Certification Organization / File No. |
|---|---|---|
| UL1077 | | UL/c-UL recognized File No. E68029 |
| CSA C22.2 No. 235 | | CSA file No. LR83454 |
| EN60934 (VDE0642) | | VDE No. 102746 |
| EN60934 | | EU Low Voltage Directive (Note) |
| GB17701 | | CCC No. 2005010307151789 |
| Electrical Appliance and Material Safety Law Technical Standard | (For switch type) | (Electrical appliance excepting specified appliances) |

For details, see the list of standard certified products in the back of this catalog.
Note: Series trip only

## Specifications

| Model | NRLT | NRLP | NRLY | NRLR | NRLK |
|---|---|---|---|---|---|
| Shape |  |  |  |  |   |
| Operator Style | Lever (lever color: black) | Lever (lever color: black) | Rocker (non-illuminated), Illuminated rocker | | Large rocker |
| Protection Method | Hydraulic-magnetic tripping system | | | | |
| Internal Circuit | Series trip (Current trip), Relay trip (Voltage trip)* Series trip (Current trip) with auxiliary contacts, Switch only, Switch only with auxiliary contact | | | | *: Not available on NRLP |
| No. of Poles | 1-pole, 2-pole (1-lever) | 1-pole | 1-pole, 2-pole (1-rocker) | | |
| Rated Voltage | 250V AC 50/60Hz, 50V DC | | | | |
| Minimum Applicable Load | 24V AC/DC, 100 mA (reference value) | | | | |
| Rated Current | Current trip: 0.1A, 0.5A, 1A, 2A, 3A, 4A, 5A, 7.5A, 10A, 12.5A, 15A, 20A | | | | Switch only: 20A max. |
| Trip Voltage (Voltage trip) | 100V AC 50/60Hz,24V DC (operating at 90% of the rated voltage or higher, at 25°C) Voltage application duration: 1 sec maximum Trip time: 0.05 sec maximum (at the rated voltage) | | | | |
| Rated Interrupting Current | 250V AC 50/60Hz, 750A PC1 (UL rating: 1000A) 50V DC, 500A PC1 (UL rating: 1000A) | | | | |
| Auxiliary Contact | SPDT microswitch 125V AC · 3A (resistive load), 30V DC · 2A (resistive load) | | | | |
| Reference Temperature | +25°C | | | | |
| Operating Temperature | −40 to +60°C (no freezing) | | | | |
| Storage Temperature | −40 to +85°C (no freezing) | | | | |
| Operating Humidity | 45 to 85% RH (no condensation) | | | | |
| Storage Humidity | 45 to 85% RH (no condensation) | | | | |
| Insulation Resistance | 100 MΩ minimum (500V DC megger) | | | | |
| Dielectric Strength | 2000V AC, 1 minute (between live part and ground, between terminals of different poles, between terminals of the same pole when main contacts are open, between main circuit and auxiliary contact) | | | | |
| Vibration Resistance | 100 m/s$^2$ (10 to 55 Hz), with the rated current applied | | | | |
| Shock Resistance | 500 m/s$^2$ (operating extremes and damage limits), with the rated current applied (auxiliary contact: 360 m/s$^2$) | | | | |
| Life | Electrical: Over 10,000 operations minimum (6 operations/min) Mechanical: Over 20,000 operations minimum (6 operations/min) | | | | |
| Terminal Style (Note) | Main terminal: Tab terminal #250 [NRLP: PCB terminal] Auxiliary contact terminal: Solder terminal [NRLP: PCB terminal] Indicator terminal [Illuminated rocker] : Tab terminal #110 | | | | |
| Mounting Style | Ring mounting | PC board mounting | Snap-on mounting | Screw mounting | Screw mounting |
| Weight (Approx.) | 1-pole: 30g, 2-pole: 60g (NRLT series trip) | | | | |

- Do not use the NRL circuit protectors in environments where they are exposed to extreme temperature, humidity, dust, corrosive gases, vibration, shock, or in a circuit where inrush current may be present, otherwise unnecessary operations and damage may occur.
- The ratings of switch only type are 250V AC/50V DC and 20A, without protection function.

Note: Indicator terminal of 1-pole illuminated rocker with auxiliary contact is a lead wire.

### Indicator Ratings (Illuminated Rocker)

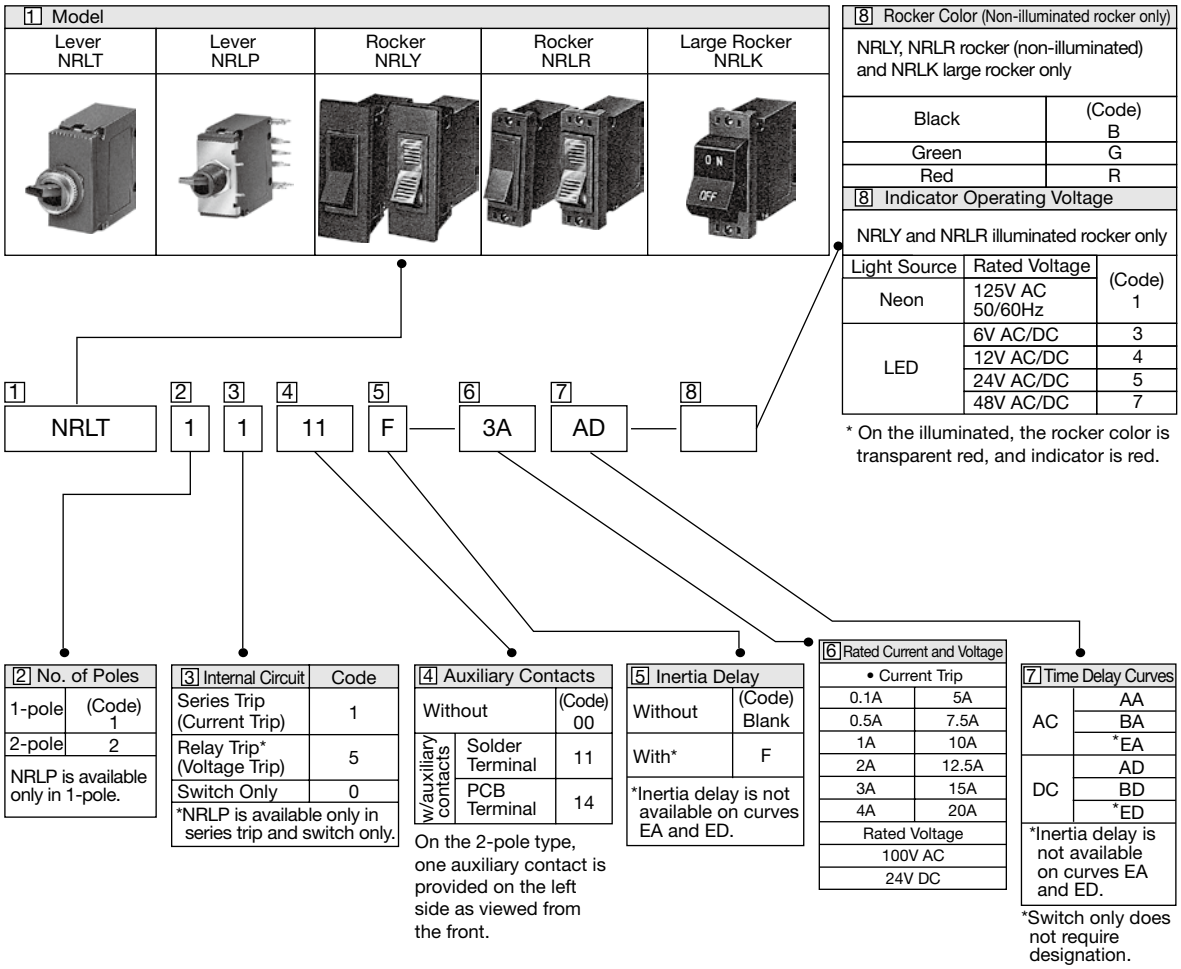
| Indicator | Voltage |
|---|---|
| Neon | 100 to 125V AC |
| LED | 6V, 12V, 24V, 48V AC/DC ±10% |

Note: Both neon and LED indicators have a built-in current limiting resistors.

### Standard Color

| | | | |
|---|---|---|---|
| Housing | | Black | |
| Lever (NRLT and NRLP) | | Black | |
| Rocker and Indicator | | Rocker Color | Indicator Color |
| (NRLY) (NRLR) | Non-illuminated | Black, red, green | – |
| | Neon | Transparent red | Red |
| | LED | Transparent red | Red |
| Large Rocker (NRLK) | | Black, Red | |

## Part No. Development




## NRLT (Lever)

Specify a rated current or voltage, and time delay curve in place of 6 7.

Package Quantity: 1

| Internal Circuit | No. of Poles | Inertia Delay | Auxiliary Contact | Part No. | Designation Code | |
|---|---|---|---|---|---|---|
| | | | | | 6 Rated Current or Voltage | 7 Time Delay Curve |
| Series Trip Current Trip | 1 | Without | Without | **NRLT1100-** 6 7 | 0.1A, 0.5A, 1A, 2A, 3A, 4A, 5A, 7.5A, 10A, 12.5A, 15A, 20A | AA, AD, BA, BD, EA, ED |
| | | | With | **NRLT1111-** 6 7 | | |
| | | With | Without | **NRLT1100F-** 6 7 | | AA, AD, BA, BD |
| | | | With | **NRLT1111F-** 6 7 | | |
| | 2 | Without | Without | **NRLT2100-** 6 7 | | AA, AD, BA, BD, EA, ED |
| | | | With | **NRLT2111-** 6 7 | | |
| | | With | Without | **NRLT2100F-** 6 7 | | AA, AD, BA, BD |
| | | | With | **NRLT2111F-** 6 7 | | |
| Relay Trip Voltage Trip | 1 | Without | Without | **NRLT1500-** 6 | 100V AC 24V DC | – |
| | 2 | | Without | **NRLT2500-** 6 | | |
| Switch Only | 1 | Without | Without | **NRLT1000** | – | – |
| | | | With | **NRLT1011** | | |
| | 2 | | Without | **NRLT2000** | | |
| | | | With | **NRLT2011** | | |

## NRLY (Rocker)

[Snap-on Mounting Part]

Specify a rated current or voltage, time delay curve, and indicator or rocker color in place of 6 7 8. Package Quantity: 1

| Illumination | Internal Circuit | No. of Poles | Inertia Delay | Auxiliary Contact | Part No. | Designation Code | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 6 Rated Current and Voltage | 7 Time Delay Curve | 8 Indicator | 9 Rocker Color |
| Illuminated | Series Trip Current Trip | 1 | Without | Without | NRLY1100- 6 7 - 8 | 0.1A 0.5A 1A 2A 3A 4A 5A 7.5A 10A 12.5A 15A 20A | AA, AD, BA, BD, EA, ED | 1: Neon 125V AC 50/60Hz<br>3: LED 6V AC/DC<br>4: LED 12V AC/DC<br>5: LED 24V AC/DC<br>7: LED 48V AC/DC | – |
| | | | | With | NRLY1111- 6 7 - 8 | | | | |
| | | | With | Without | NRLY1100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLY1111F- 6 7 - 8 | | | | |
| | | 2 | Without | Without | NRLY2100- 6 7 - 8 | | AA, AD, BA, BD, EA, ED | | |
| | | | | With | NRLY2111- 6 7 - 8 | | | | |
| | | | With | Without | NRLY2100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLY2111F- 6 7 - 8 | | | | |
| | Relay Trip Voltage Trip | 1 | Without | Without | NRLY1500- 6 - 8 | 100V AC 24V DC | – | | |
| | | 2 | | Without | NRLY2500- 6 - 8 | | | | |
| | Switch Only | 1 | Without | Without | NRLY1000- 8 | – | – | | |
| | | | | With | NRLY1011- 8 | | | | |
| | | 2 | | Without | NRLY2000- 8 | | | | |
| | | | | With | NRLY2011- 8 | | | | |
| Non-illuminated | Series Trip Current Trip | 1 | Without | Without | NRLY1100- 6 7 - 8 | 0.1A 0.5A 1A 2A 3A 4A 5A 7.5A 10A 12.5A 15A 20A | AA, AD, BA, BD, EA, ED | – | B, G, R |
| | | | | With | NRLY1111- 6 7 - 8 | | | | |
| | | | With | Without | NRLY1100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLY1111F- 6 7 - 8 | | | | |
| | | 2 | Without | Without | NRLY2100- 6 7 - 8 | | AA, AD, BA, BD, EA, ED | | |
| | | | | With | NRLY2111- 6 7 - 8 | | | | |
| | | | With | Without | NRLY2100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLY2111F- 6 7 - 8 | | | | |
| | Relay Trip Voltage Trip | 1 | Without | Without | NRLY1500- 6 - 8 | 100V AC 24V DC | – | | |
| | | 2 | | Without | NRLY2500- 6 - 8 | | | | |
| | Switch Only | 1 | Without | Without | NRLY1000- 8 | – | – | | |
| | | | | With | NRLY1011- 8 | | | | |
| | | 2 | | Without | NRLY2000- 8 | | | | |
| | | | | With | NRLY2011- 8 | | | | |

## NRLR (Rocker) [Screw Mounting]

Specify a rated current or voltage, time delay curve, and indicator or rocker color in place of 6 7 8. Package Quantity: 1

| Illumination | Internal Circuit | No. of Poles | Inertia Delay | Auxiliary Contact | Part No. | Designation Code | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 6 Rated Current and Voltage | 7 Time Delay Curve | 8 Indicator | 9 Rocker Color |
| Illuminated | Series Trip Current Trip | 1 | Without | Without | NRLR1100-6 7 - 8 | 0.1A 0.5A 1A 2A 3A 4A 5A 7.5A 10A 12.5A 15A 20A | AA, AD, BA, BD, EA, ED | 1: Neon 125V AC 50/60Hz<br>3: LED 6V AC/DC<br>4: LED 12V AC/DC<br>5: LED 24V AC/DC<br>7: LED 48V AC/DC | – |
| | | | | With | NRLR1111- 6 7 - 8 | | | | |
| | | | With | Without | NRLR1100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLR1111F- 6 7 - 8 | | | | |
| | | 2 | Without | Without | NRLR2100- 6 7 - 8 | | AA, AD, BA, BD, EA, ED | | |
| | | | | With | NRLR2111- 6 7 - 8 | | | | |
| | | | With | Without | NRLR2100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLR2111F- 6 7 - 8 | | | | |
| | Relay Trip Voltage Trip | 1 | Without | Without | NRLR1500- 6 - 8 | 100V AC 24V DC | – | | |
| | | 2 | | Without | NRLR2500- 6 - 8 | | | | |
| | Switch Only | 1 | Without | Without | NRLR1000- 8 | – | – | | |
| | | | | With | NRLR1011- 8 | | | | |
| | | 2 | | Without | NRLR2000- 8 | | | | |
| | | | | With | NRLR2011- 8 | | | | |
| Non-illuminated | Series Trip Current Trip | 1 | Without | Without | NRLR1100- 6 7 - 8 | 0.1A 0.5A 1A 2A 3A 4A 5A 7.5A 10A 12.5A 15A 20A | AA, AD, BA, BD, EA, ED | – | B, G, R |
| | | | | With | NRLR1111- 6 7 - 8 | | | | |
| | | | With | Without | NRLR1100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLR1111F- 6 7 - 8 | | | | |
| | | 2 | Without | Without | NRLR2100- 6 7 - 8 | | AA, AD, BA, BD, EA, ED | | |
| | | | | With | NRLR2111- 6 7 - 8 | | | | |
| | | | With | Without | NRLR2100F- 6 7 - 8 | | AA, AD, BA, BD | | |
| | | | | With | NRLR2111F- 6 7 - 8 | | | | |
| | Relay Trip Voltage Trip | 1 | Without | Without | NRLR1500- 6 - 8 | 100V AC 24V DC | – | | |
| | | 2 | | Without | NRLR2500- 6 - 8 | | | | |
| | Switch Only | 1 | Without | Without | NRLR1000- 8 | – | – | | |
| | | | | With | NRLR1011- 8 | | | | |
| | | 2 | | Without | NRLR2000- 8 | | | | |
| | | | | With | NRLR2011- 8 | | | | |

## NRLK (Large Rocker)

[Snap-on Mounting]

Specify a rated current or voltage, time delay curve, and rocker color in place of 6 7 8.

Package Quantity: 1

| Internal Circuit | No. of Poles | Inertia Delay | Auxiliary Contact | Part No. | Designation Code | | |
|---|---|---|---|---|---|---|---|
| | | | | | 6 Rated Current and Voltage | 7 Time Delay Curve | 8 Rocker Color |
| Series Trip Current Trip | 1 | Without | Without | NRLK1100- 6 7 - 8 | 0.1A 0.5A 1A 2A 3A 4A 5A 7.5A 10A 12.5A 15A 20A | AA, AD, BA, BD, EA, ED | B, G, R |
| | | | With | NRLK1111- 6 7 - 8 | | | |
| | | With | Without | NRLK1100F- 6 7 - 8 | | AA, AD, BA, BD | |
| | | | With | NRLK1111F- 6 7 - 8 | | | |
| | 2 | Without | Without | NRLK2100- 6 7 - 8 | | AA, AD, BA, BD, EA, ED | |
| | | | With | NRLK2111- 6 7 - 8 | | | |
| | | With | Without | NRLK2100F- 6 7 - 8 | | AA, AD, BA, BD | |
| | | | With | NRLK2111F- 6 7 - 8 | | | |
| Relay Trip Voltage Trip | 1 | Without | Without | NRLK1500- 6 - 8 | 100V AC 24V DC | – | |
| | 2 | | Without | NRLK2500- 6 - 8 | | – | |
| Switch Only | 1 | Without | Without | NRLK1000- 8 | – | – | |
| | | | With | NRLK1011- 8 | | | |
| | 2 | | Without | NRLK2000- 8 | | | |
| | | | With | NRLK2011- 8 | | | |

## NRLP (Lever)

[PC Board Mounting]

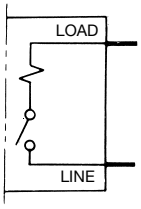
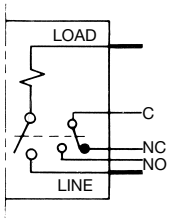
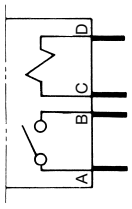
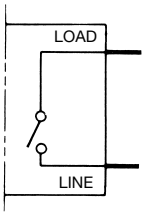
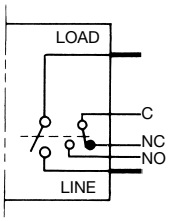
Specify a rated current and time delay curve in place of 6 7.

Package Quantity: 1

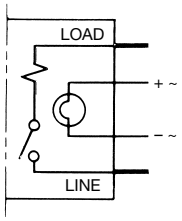
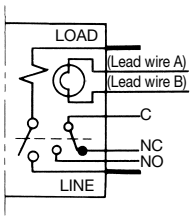
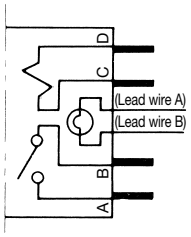
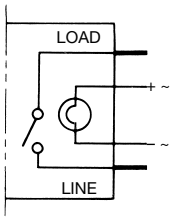
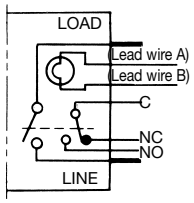
| Internal Circuit | No. of Poles | Inertia Delay | Auxiliary Contact | Part No. | Designation Code | |
|---|---|---|---|---|---|---|
| | | | | | 6 Rated Current | 7 Time Delay Curve |
| Series Trip Current Trip | 1 | Without | Without | NRLP1100- 6 7 | 0.1A 0.5A 1A 2A 3A 4A 5A 7.5A 10A 12.5A 15A 20A | AA, AD, BA, BD, EA, ED |
| | | | With | NRLP1114- 6 7 | | |
| | | With | Without | NRLP1100F- 6 7 | | AA, AD, BA, BD |
| | | | With | NRLP1114F- 6 7 | | |
| Switch Only | 1 | Without | Without | NRLP1000 | – | – |
| | | | With | NRLP1014 | | |

## Internal Circuits

NRLT, NRLP, NRLY (Non-illuminated), NRLR (Non-illuminated), and NRLK

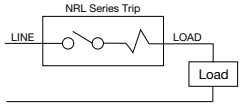
| Series Trip (Current Trip) | Series Trip (Current Trip) | Relay Trip (Voltage Trip) | Switch Only | Switch Only With Auxiliary Contact |
|---|---|---|---|---|
|  |  |  |  |  |

NRLY (Illuminated), NRLR (Illuminated)

| Series Trip (Current Trip) | Series Trip (Current Trip) | Relay Trip (Voltage Trip) | Switch Only | Switch Only With Auxiliary Contact |
|---|---|---|---|---|
|  |  |  |  |  <br>On the 2-pole type, indicator terminal are a tab terminals. |

Note 1: On the 2-pole type, one auxiliary contact is provided on the left side as viewed from the front.
See the dimensional drawing for the terminal arrangement.
Note 2: NRLP is available with series trip and switch type.

• Wiring Example




• Lead wires are color-coded as follows (illuminated):

| Lead wire | Color | Neon Indicator | LED Indicator |
|---|---|---|---|
| (Lead wire A) | Red | AC | Positive |
| (Lead wire B) | Black | AC | Negative |

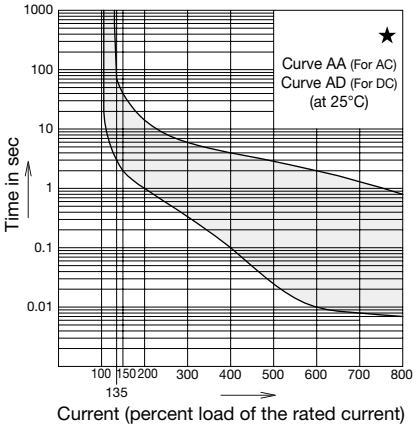
## Overcurrent - Time Delay Characteristics (sec at 25°C)

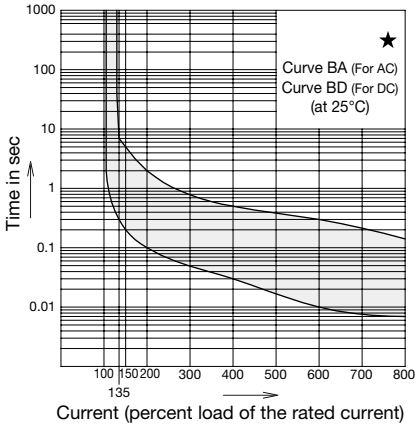
| Time Delay Curves | | Percent of Rated Current | | | | | | |
|---|---|---|---|---|---|---|---|---|
| AC 50/60Hz | DC | 100% | 135% | 150% | 200% | 400% | 600% | 800% |
| AA ★ | AD ★ | No Trip | 3-70 | 2-40 | 1-15 | 0.1-4 | 0.01-2 | 0.007-0.8 |
| BA ★ | BD ★ | No Trip | 0.3-7 | 0.2-5 | 0.1-2 | 0.03-0.5 | 0.01-0.3 | 0.007-0.15 |
| EA | ED | No Trip | 0.015-0.5 | 0.01-0.25 | 0.009-0.1 | 0.006-0.03 | 0.005-0.02 | 0.004-0.02 |

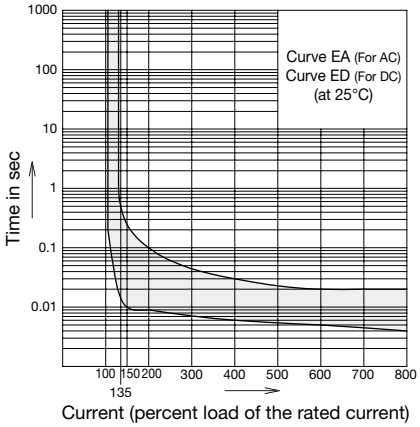
Note: Curves marked with ★ are also available with inertia delay. (Inertia delay is not available for Curves ED and EA)

## Time Delay Curves

Note: Curves marked with ★ are also available with inertia delay.

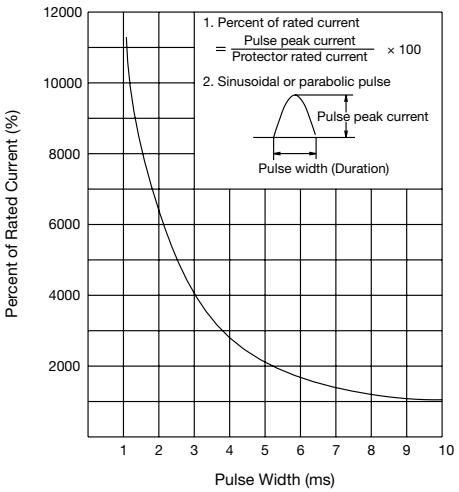


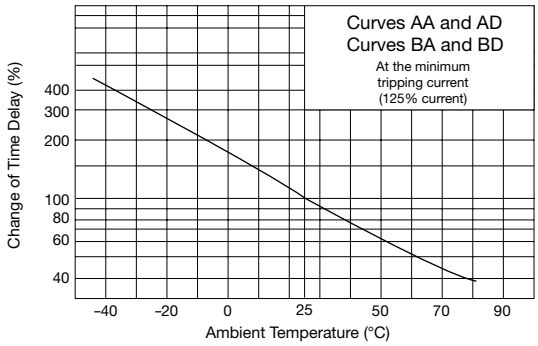
## Circuit Protector with Inertia Delay

Inertia delay is designed not to trip on a non-repeating single pulse of 12 times the rated current (peak value) for duration of 8 ms. In addition, circuit protectors equipped with inertia delay do not respond to high inrush currents caused by transformer or lamp loads, but perform the specified interruption on the subsequent overcurrents.
Curves EA and ED are not available with inertia delay.




## Temperature Correction Curve

The time delay curves on the preceding page are at 25°C. With reference to the following curves, time delays can be corrected according to the ambient temperature.




## Operation of Auxiliary Contacts

At tripping or manual ON-OFF operation, there is a lag in time between the operation of the main contact and the auxiliary contact.

## Impedance and Coil Resistance (at 25°C)

**[Current Trip] (initial value)**

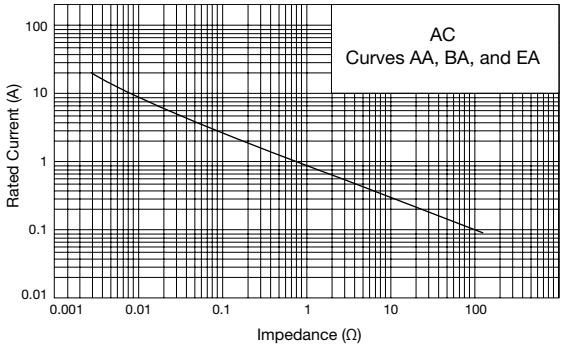
| Rated Current | For AC 50/60Hz Impedance (Ω) | For DC, Impedance between Terminals (Ω) |
|---|---|---|
| | Curves AA, BA, and EA | Curves AD, BD, and ED |
| 0.1A | 97.0 | 96.0 |
| 0.5A | 3.2 | 3.1 |
| 1A | 0.81 | 0.78 |
| 2A | 0.19 | 0.18 |
| 3A | 0.086 | 0.085 |
| 4A | 0.051 | 0.050 |
| 5A | 0.034 | 0.034 |
| 7.5A | 0.017 | 0.016 |
| 10A | 0.0092 | 0.0087 |
| 12.5A | 0.0068 | 0.0065 |
| 15A | 0.0052 | 0.0050 |
| 20A | 0.0033 | 0.0031 |

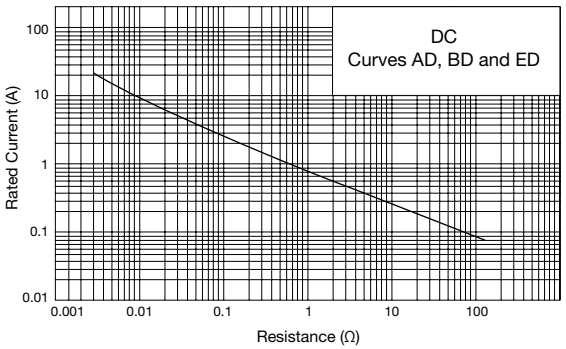
Note: Tolerance: ±25% (up to 5A), ±50% (7.5A or higher)

**[Voltage trip] (initial value)**

| | For AC 50/60Hz Impedance (Ω) | For DC, Impedance between Terminals (Ω) |
|---|---|---|
| 100V AC | 3000 | — |
| 24V DC | — | 370 |

Note: Tolerance: ±25%

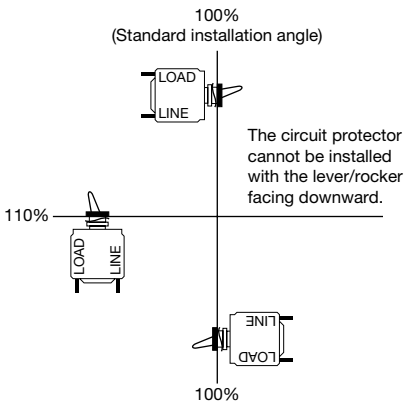



## Rated Current (Trip Current) by Installation Angle

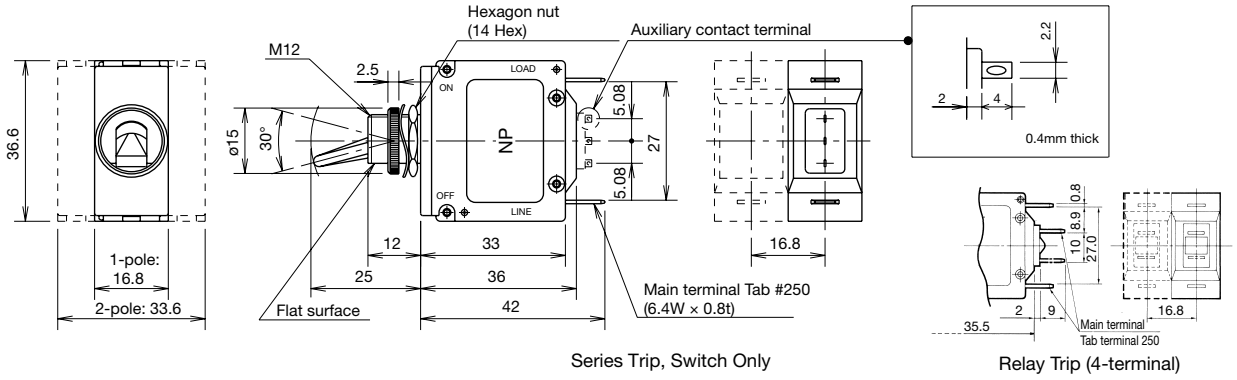
Overcurrent tripping method is hydraulic magnetic. Minimum operating currents vary with installation angle because operating currents are influenced by the weight of the iron core. With reference to the following figure, correct the rated current.

Note 1: The rated current does not change depending on the installation angle.
Note 2: The minimum operating current is calculated from the following formula:
(Minimum operating current) = (Rated current) × 135% × (Correction factor by installation angle)



## Dimensions

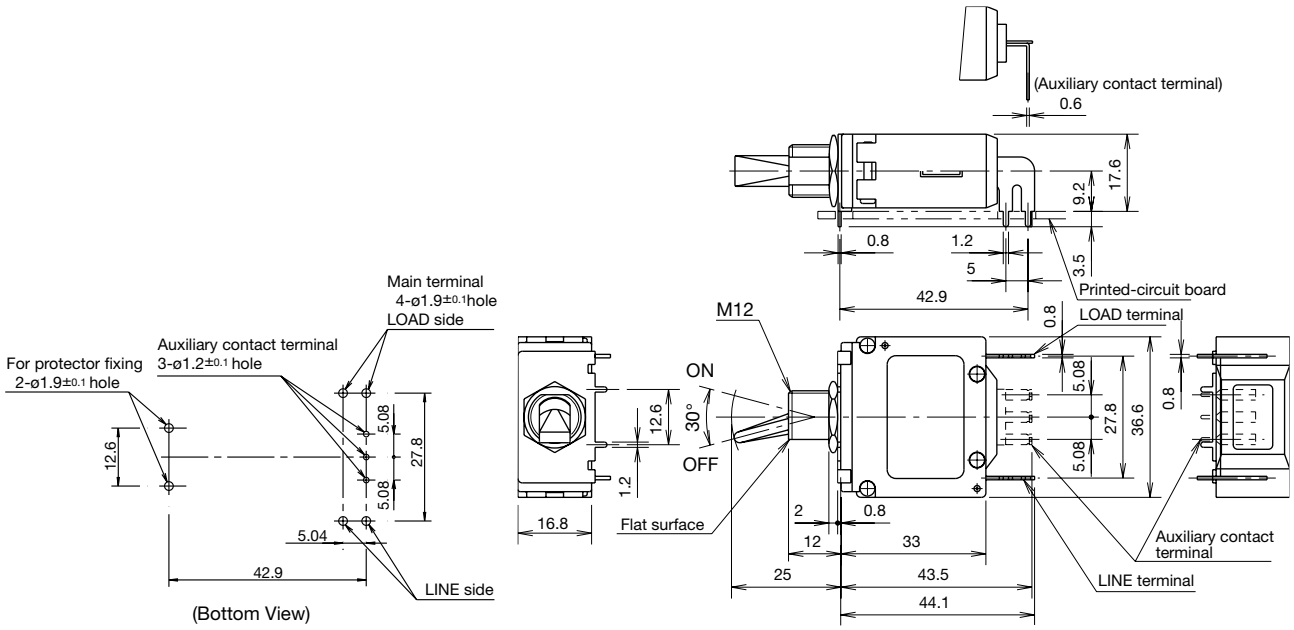
**NRLT (Lever)** Note: The dashed lines show the 2-pole type.




Series Trip, Switch Only

Relay Trip (4-terminal)

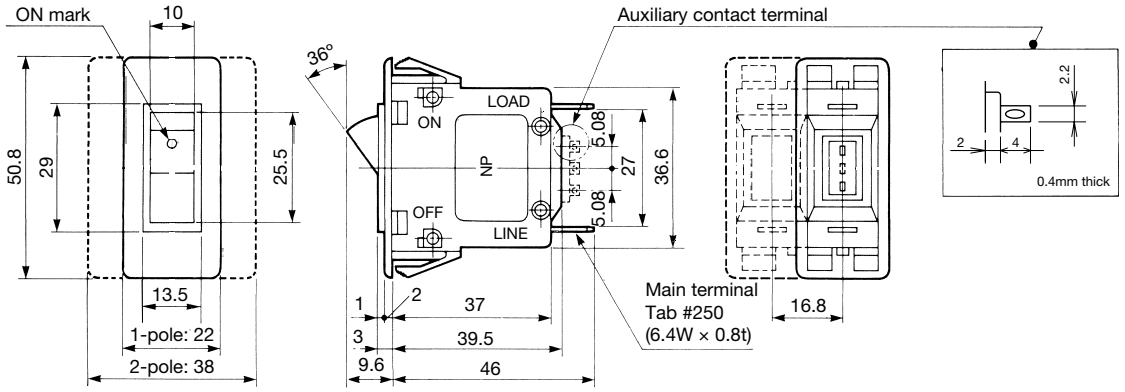
**NRLP (Lever with PCB terminals)**



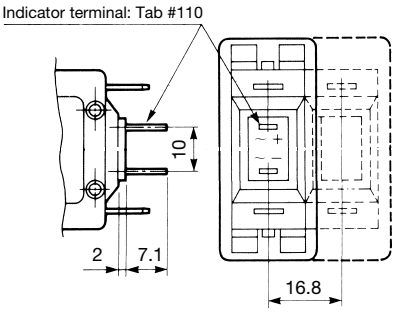

All dimensions in mm.

**NRLY (Snap-on Mounting, Rocker)** Note: The dashed lines show the 2-pole type.

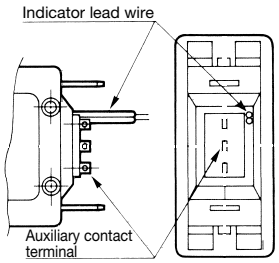
Rocker (Non-illuminated)
Series Trip, Switch Only




**Illuminated Rocker (without auxiliary contact)**
**Series Trip, Switch Only**

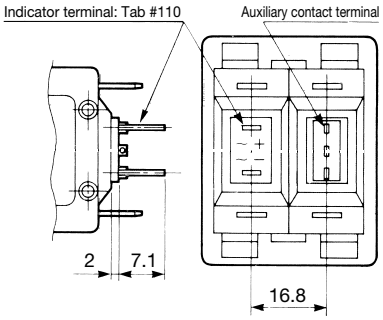



**Illuminated Rocker (1-pole, with auxiliary contact)**
**Series Trip, Switch Only**

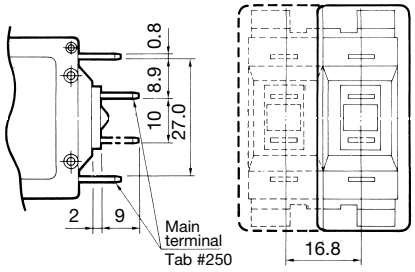



Lead wire length: Approx. 100 mm

**Illuminated Rocker (2-pole, with auxiliary contact)**
**Series Trip, Switch Only**

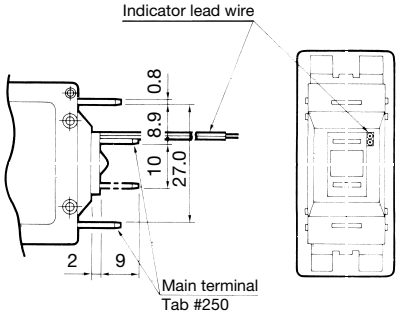



**Rocker (Non-illuminated)**
**Relay Trip (4-terminal)**



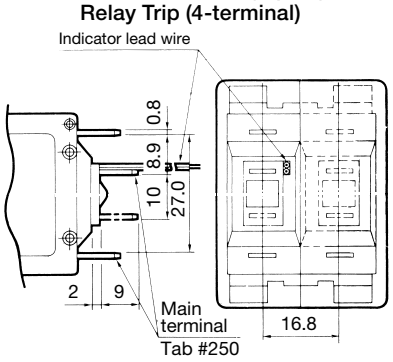

Lead wire length: Approx. 100 mm

**Illuminated Rocker (1-pole)**
**Relay Trip (4-terminal)**




Lead wire length: Approx. 100 mm

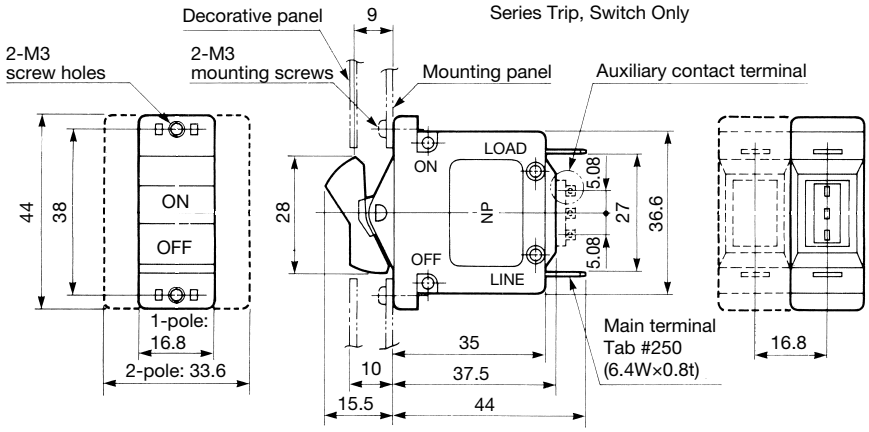
**Illuminated Rocker (2-pole)**
**Relay Trip (4-terminal)**



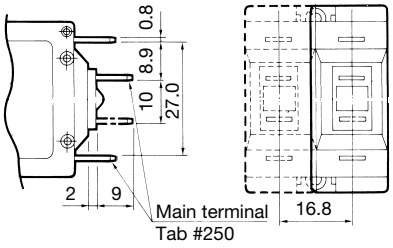

Lead wire length: Approx. 100 mm

**NRLK (Large Rocker)** Note: The dashed lines show the 2-pole type.

Series Trip, Switch Only

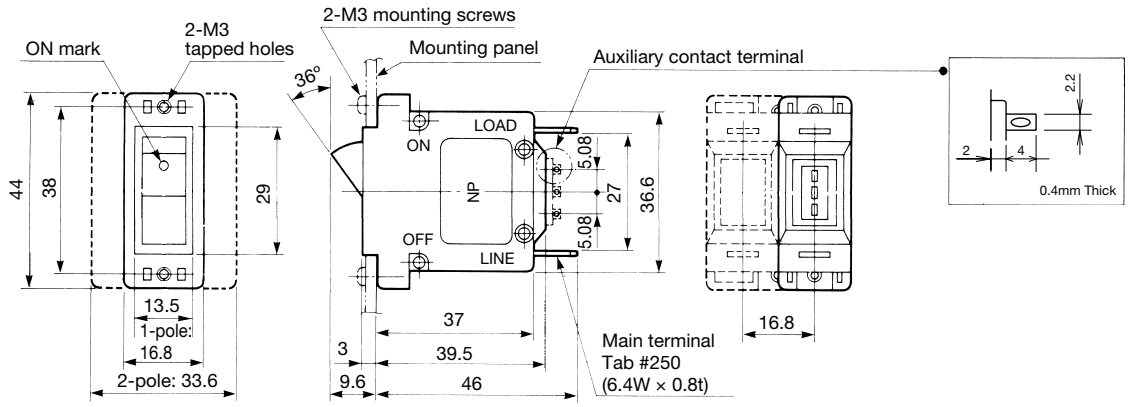



Relay Trip (4-terminal)

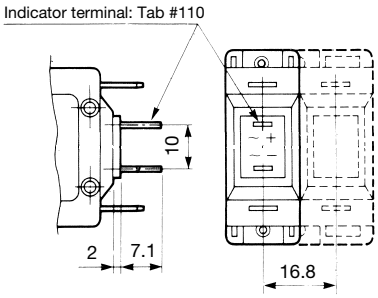


**NRLR (Screw Mounting, Rocker)** Note: The dashed lines show the 2-pole type.

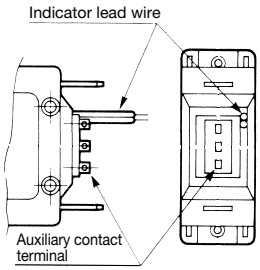
Rocker Type (Non-illuminated)
Series Trip, Switch Only




**Illuminated Rocker**
**(without auxiliary contact)**
**Series Trip, Switch Only**

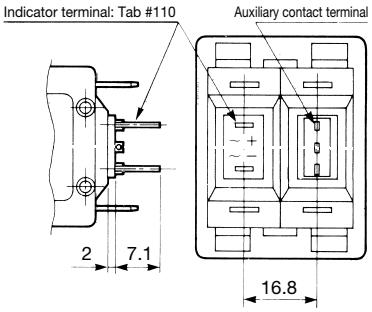



**Illuminated Rocker**
**(1-pole, with auxiliary contact)**
**Series Trip, Switch Only**

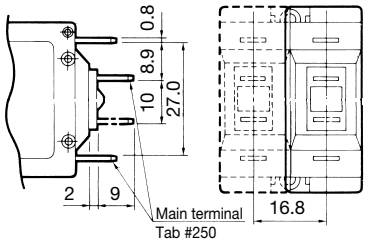



Lead wire length: Approx. 100 mm

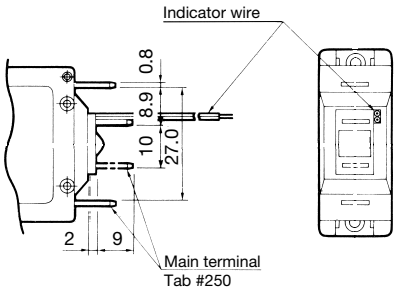
**Illuminated Rocker**
**(2-pole, with auxiliary contact)**
**Series Trip, Switch Only**




**Rocker (Non-illuminated)**
**Relay Trip (4-terminal)**

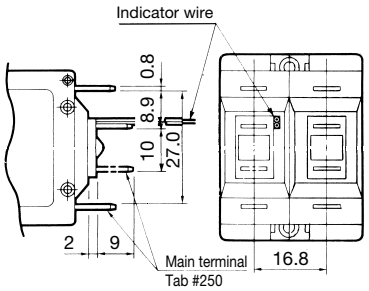



**Illuminated Rocker (1-pole)**
**Relay Trip (4-terminal)**




Lead wire length: Approx. 100 mm

**Illuminated Rocker (2-pole)**
**Relay Trip (4-terminal)**




Lead wire length: Approx. 100 mm

## Instructions

One-pole circuit protectors cannot be combined to make 2- or 3-pole units due to their characteristics. Order multi-poles from IDEC.

**Recommended Soldering Conditions**

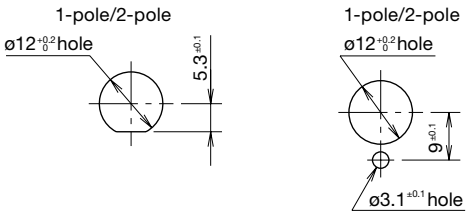
Solder the main terminal at a temperature of 390°C within 10 seconds using a 60W soldering iron.
Solder the auxiliary/alarm terminal at a temperature of 350°C within 3 seconds using a 60W soldering iron. (Sn-Ag-Cu lead-free solder is recommended.)
When soldering, do not touch the circuit protector housing, auxiliary and alarm contacts with the soldering iron, and do not bend the terminals or pull the wires.
Check your actual soldering conditions before soldering.

## Mounting Hole Layout

### NRLT (Lever)

**Panel Cut-out**

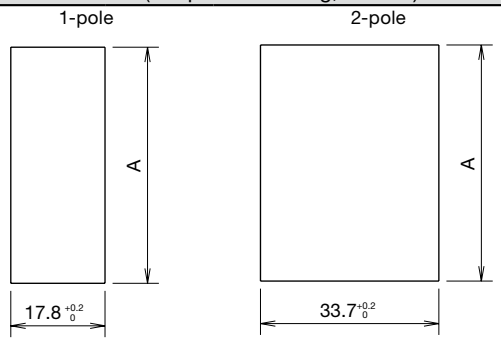
When anti-rotation ring is used.
(Part No.: NRL-L)




Tightening torque: 1.2 to 1.4 N·m

### NRLY (Snap-on Mounting, Rocker)

**Panel Cut-out**




**Panel Thickness**

Maximum mounting panel thickness (NRLT):

| Mounting Nut | Name Plate | Anti-rotation Ring | Maximum Panel Thickness NRLT |
|---|---|---|---|
| When a standard bezel is used (Thickness: 2.5 mm) | – | – | 5.5 mm |
| | X | – | 4.7 mm |
| | – | X | 4.7 mm |
| | X | X | 3.9 mm |
| When a decorative bezel is used (Thickness: 4 mm) | – | – | 4.0 mm |
| | X | – | 3.2 mm |
| | – | X | 3.2 mm |
| | X | X | 2.4 mm |

Note 1: Standard mounting nut is supplied with the protector.
Note 2: Decorative bezel, name plate, and anti-rotation ring are sold separately.
(See "Accessories" for details.)

Panel thickness and Dimension A

| Panel Thickness | 0.8 to 1.2 mm | 1.6 mm | 2.3 mm | 3.2 mm |
|---|---|---|---|---|
| Dimension A | 44.6 mm | 45.1 mm | 45.9 mm | 46.9 mm |
| | Tolerance ±0.1 mm | | | |

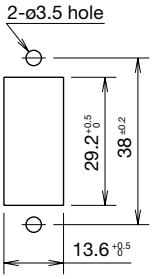
Note 1: Allowable range of mounting panel thickness: 0.8 to 3.2 mm
Note 2: Within the allowable range of mounting panel, Dimension A for panel thicknesses other than those listed in the above table can be calculated from the following formula:

Dimension A = 45.1 + 1.1 × (Panel thickness −1.6)

### NRLR (Screw Mounting, Rocker)

**Panel Cut-out**

1-pole/2-pole



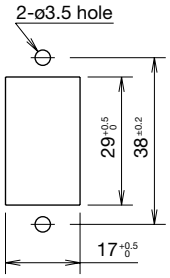

**Panel Thickness**

3 mm maximum

### NRLK (Large Rocker)

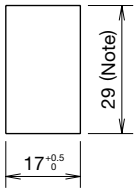
**Panel Cut-out**

1-pole/2-pole




Panel cut-out of decorative panel

Note: These dimensions are reference values. When considering the design, check the actual unit.




**Panel Thickness**

See the dimensional drawing and select proper thickness, considering the height of mounting screw head.

### Applicable Mounting Screw Length

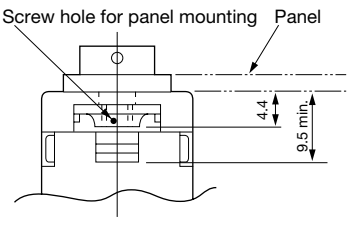
**Applicable length of panel mounting screw (M3)**

Select proper length according to the table.

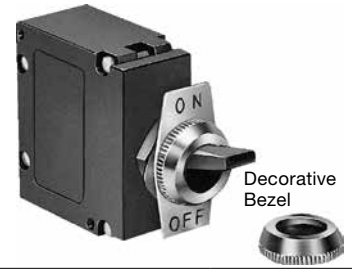
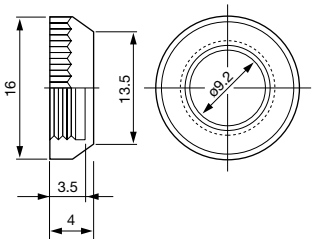
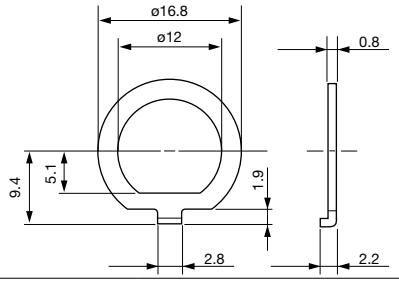
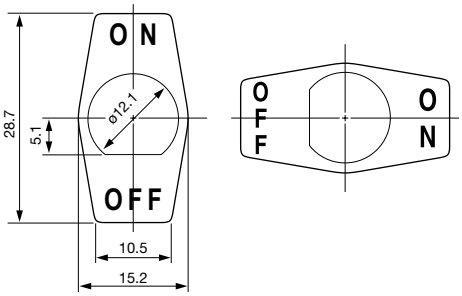
| Panel thickness (mm) | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.3 | 2.6 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Without washer | 6 to 10 mm | | | | 7 to 11 mm | | | | 8 to 12 mm | |
| With plain washer (0.5 mm thick) | 6 to 10 mm | 7 to 11 mm | | | | | 8 to 12 mm | | | 9 to 13 mm |
| With spring washer (0.7 mm thick) | 7 to 11 mm | | | | | 8 to 12 mm | | | | 9 to 13 mm |
| With plain washer (0.5 mm thick), and spring washer (0.7 mm thick) | 7 to 11 mm | | | | 8 to 12 mm | | | 9 to 13 mm | | |

(Tightening torque: 0.5 to 0.8 N·m)

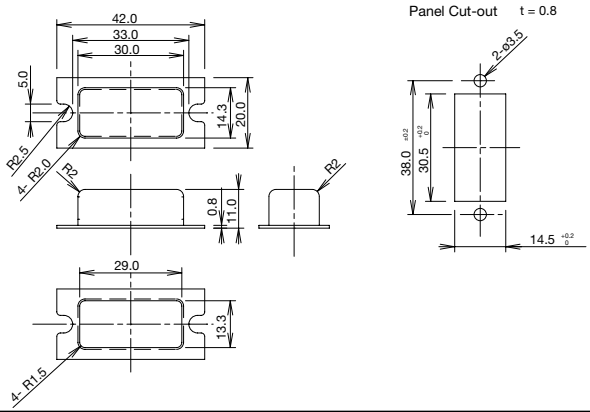
Screw Mounting Part Dimensions



## Accessories

| Name and Shape | | Part No. | Ordering No. | Package Quantity | Description and Dimensions |
|---|---|---|---|---|---|
| Decorative Bezel   | | NRL-R | NRL-RPN05 | 5 | • The decorative bezel can be used in place of the standard bezel. Note that the maximum panel thickness differs from that with the standard bezel.<br>• Material: Chrome-plated metal   (See "Mounting Hole Layout".) |
| Anti-rotation Ring  | | NRL-L | NRL-LPN05 | 5 | • The anti-rotation ring is intended to ensure firm rotation prevention. (See "Mounting Hole Layout".)<br>• Metal ring   |
| Nameplate   | (Legend)<br>ON<br>I<br>OFF | NRL-N1 | NRL-N1PN05 | 5 | • Aluminum plate (Aluminum colored) with black legend   |
| | I<br>I<br>O | NRL-N3 | NRL-N3PN05 | | |
|   | OFF – ON | NRL-N2 | NRL-N2PN05 | 5 | |
| | O – I | NRL-N4 | NRL-N4PN05 | | |

Package Quantity: 1

| Name and Shape | | Part No. | Dimensions |
|---|---|---|---|
| Dustproof Cover  (Silicon Rubber) | For 1-pole<br>For 2-pole | NRL-C | • For NRLR   |

# NRBM Series Circuit Protectors

## Variety of rated currents: 1A to 50A
## Widely employed for protection of PC power circuits and large current circuits of welding machines.

NRBM is the largest in the rated current among the IDEC circuit protector series.

- Electromagnetic trip, not affected by ambient temperature
- Safe trip-free mechanism
- Available with auxiliary contact and alarm contact
- Available with inertia delay
- Vibration-proof design

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

| Applicable Standards | Mark | Certification Organization / File No. |
|---|---|---|
| UL1077<br>CSA C22.2 No. 235 | c UL us | UL/c-UL recognized<br>File No. E68029 |
| EN60934<br>(VDE0642) | | VDE No. 113434 |
| EN60934 | CE | EU Low Voltage Directive |
| GB17701 | | CCC No. 2005010307151788 |
| Electrical Appliance and Material Safety Law Technical Standard | PS E | JET |

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

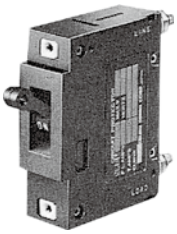
## Specifications

| | |
|---|---|
| Model | NRBM |
| Operator | Lever |
| Protection Method | Hydraulic-magnetic tripping system |
| Internal Circuit | Series trip (current trip)<br>Series trip with auxiliary contacts<br>Series trip with alarm contacts |
| No. of poles | 1, 2, 3 poles |
| Rated Voltage | 250V AC 50/60 Hz, 65V DC |
| Minimum Applied Load | 24V AC/DC, 100 mA (reference value) |
| Rated Current | Current trip: 1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A, 40A, 50A |
| Rated Interrupting Current | 250V AC 50/60Hz, 65V DC, 1000A |
| Auxiliary Contact<br>Alarm Contact | SPDT microswitch<br>250V AC 5A<br>50V DC 1A (resistive load) |
| Reference Temperature | +25°C |
| Operating Temperature | −40 to +85°C (no freezing) |
| Storage Temperature | −40 to +90°C (no freezing) |
| Operating Humidity | 45 to 85% RH (no condensing) |
| Storage Humidity | 45 to 85% RH (no condensation) |
| Insulation Resistance | 100 MΩ minimum (500V DC megger) |
| Dielectric Strength | 2000V AC for 1 minute (between live part and ground, between terminals of different poles, between terminals of the same poles when main contacts are open, between main circuit and auxiliary contact) |
| Vibration Resistance | 100 $m/s^2$ (10 to 55 Hz) |
| Shock Resistance | 1000 $m/s^2$ |
| Life | 10,000 operations minimum (6 operations per minute) |
| Terminal Style | Main terminal: M5 stud screw<br>Auxiliary contact and alarm contact: Tab terminal #80 |
| Weight (Approx.) | 1-pole: 100g, 2-pole: 200g, 3-pole: 300g |

Note: auxiliary/alarm contact: Tab #80 terminal

- Do not use the NRBM circuit protectors in environments where they are exposed to extreme temperature, humidity, dust, corrosive gases, vibration, shock, or in a circuit where inrush current may be present, otherwise unnecessary operations and damage may occur.

## Part No. Development

| 1 Model |
|---|
| NRBM  |

| 4 Auxiliary Contact / Alarm Contact | |
|---|---|
| Without | (Code) 00 |
| With auxiliary contact | 11 |
| With alarm contact | 21 |

Note:
On the multi-pole types, one auxiliary contact is provided on the left side or one alarm contact is provided on the right side as viewed from the front.

| 5 Inertia Delay | |
|---|---|
| Without | (Code) Blank |
| With | F |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| NRBM | 1 | 1 | 11 | F | 50A | AA |

| 2 No. of Poles | |
|---|---|
| 1-pole | (Code) 1 |
| 2-pole | 2 |
| 3-pole | 3 |

Note:
NRBM is also available in standard 2, 3, or 4-pole with identical internal circuits, ratings and curves in each pole. Simultaneous-throw and simultaneous-break (all levers interconnected) is standard.

| 3 Internal Circuit | |
|---|---|
| Series Trip (Current Trip) | (Code) 1 |

| 6 Rated Current | |
|---|---|
| • Rated Current | |
| 1A | 15A |
| 2A | 20A |
| 3A | 25A |
| 5A | 30A |
| 7.5A | 40A |
| 10A | 50A |

| 7 Time Delay Curve | |
|---|---|
| | Time Delay Curve |
| AC [50/60Hz] | AA |
| | BA |
| | MA |
| DC | AD |
| | MD |

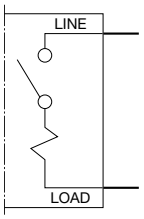
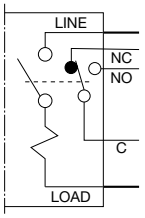
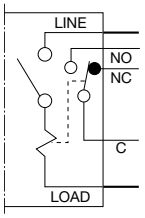
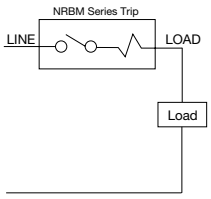
## NRBM (Lever)

Specify a rated current and time delay curve in place of 6 7 .

Package Quantity: 1

| Internal Circuit | No. of Poles | Inertia Delay | Auxiliary Contact Alarm Contact | Part No. | Code for Ordering | |
|---|---|---|---|---|---|---|
| | | | | | 6 Rated Current | 7 Time Delay Curve |
| Series Trip Current Trip | 1 | Without | Without | NRBM1100- 6 7 | 1A 2A 3A 5A 7.5A 10A 15A 20A 25A 30A 40A 50A | AA BA MA AD MD |
| | | | w/Auxiliary Contact | NRBM1111- 6 7 | | |
| | | | w/Alarm Contact | NRBM1121- 6 7 | | |
| | | With | Without | NRBM1100F- 6 7 | | |
| | | | w/Auxiliary Contact | NRBM1111F- 6 7 | | |
| | | | w/Alarm Contact | NRBM1121F- 6 7 | | |
| | 2 | Without | Without | NRBM2100- 6 7 | | |
| | | | w/Auxiliary Contact | NRBM2111- 6 7 | | |
| | | | w/Alarm Contact | NRBM2121- 6 7 | | |
| | | With | Without | NRBM2100F- 6 7 | | |
| | | | w/Auxiliary Contact | NRBM2111F- 6 7 | | |
| | | | w/Alarm Contact | NRBM2121F- 6 7 | | |
| | 3 | Without | Without | NRBM3100- 6 7 | | |
| | | | w/Auxiliary Contact | NRBM3111- 6 7 | | |
| | | | w/Alarm Contact | NRBM3121- 6 7 | | |
| | | With | Without | NRBM3100F- 6 7 | | |
| | | | w/Auxiliary Contact | NRBM3111F- 6 7 | | |
| | | | w/Alarm Contact | NRBM3121F- 6 7 | | |

## Internal Circuits

| Shape | Series Trip (Current Trip) | Series Trip (Current Trip) With Auxiliary Contact | Series Trip (Current Trip) With Alarm Contact | Wiring Example |
|---|---|---|---|---|
|  |  |  |  |  |

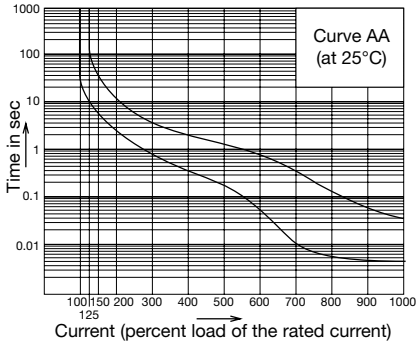
## Overcurrent - Time Delay Characteristics (sec at 25°C)

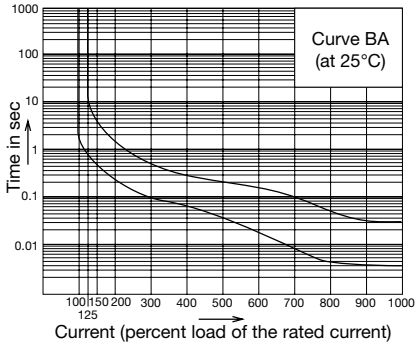
| Type | Time Delay Curve | Percent of Rated Current | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 100% | 125% | 150% | 200% | 400% | 600% | 800% | 1000% |
| AC 50/60Hz | AA | No Trip | 15-120 | 8-45 | 3-15 | 0.48-2.5 | 0.06-0.8 | 0.007-0.13 | 0.005-0.04 |
| | BA | No Trip | 0.75-10 | 0.45-3.5 | 0.22-1.3 | 0.045-0.22 | 0.012-0.12 | 0.005-0.06 | 0.004-0.03 |
| | MA | No Trip | 70-900 | 30-260 | 10-70 | 1.8-11 | 0.5-4 | 0.009-1.1 | 0.006-0.2 |
| DC | AD | No Trip | 10-130 | 6-55 | 2.6-20 | 0.5-3.5 | 0.14-1.4 | 0.008-0.7 | 0.005-0.35 |
| | MD | No Trip | 35-400 | 20-180 | 8-60 | 1.6-10 | 0.6-4.5 | 0.01-2 | 0.007-0.5 |

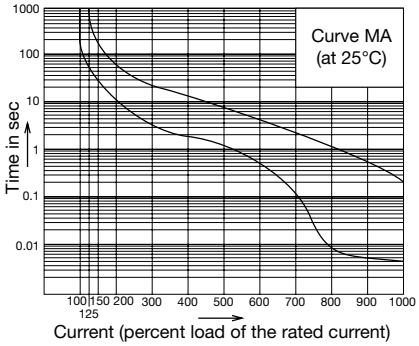
Note: Circuit protectors with inertia delay may have a slightly longer time delay at 600% or higher.

## Time Delay Curves

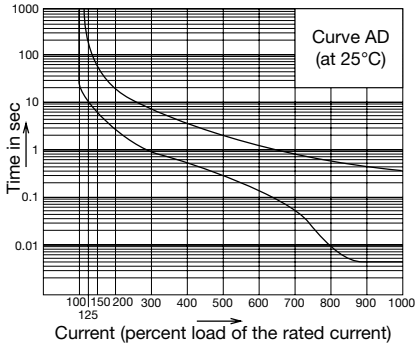
### For AC

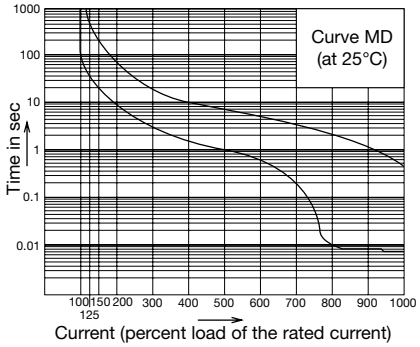


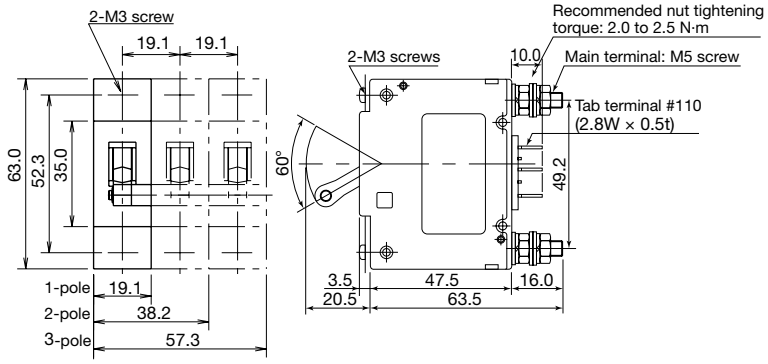




### For DC

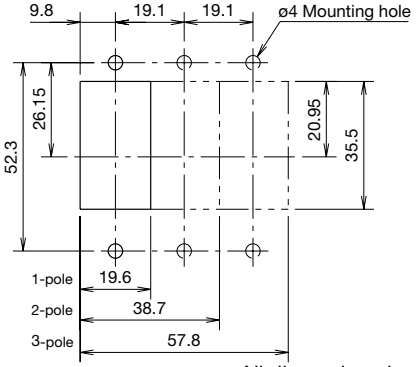



## Dimensions



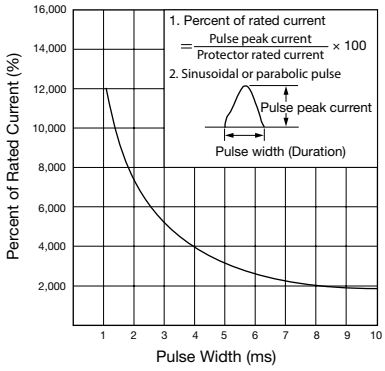

## Mounting Hole Layout




All dimensions in mm.

## Circuit Protector with Inertia Delay

Circuit protectors equipped with inertia delay do not respond to high inrush currents caused by transformer or lamp loads, but perform the specified interruption on the subsequent overcurrents.




Note: Inertia delay is designed not to trip on a pulse of 20 times the rated current (peak value) for a duration of 8 ms. See the above curve.

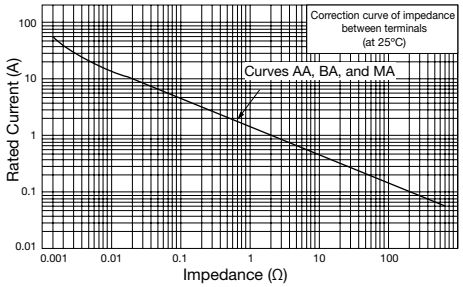
## Impedance and Coil Resistance (at 25°C) (initial value)

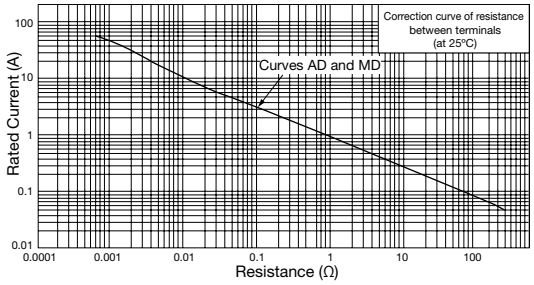
| Rated Current (A) | For AC 50/60Hz Impedance (Ω) | For DC Resistance (Ω) |
|---|---|---|
| | Curves AA, BA, and MA | Curves AD and MD |
| 1 | 1.1 | 1 |
| 2 | 0.245 | 0.227 |
| 3 | 0.11 | 0.091 |
| 5 | 0.039 | 0.035 |
| 7.5 | 0.018 | 0.015 |
| 10 | 0.0124 | 0.0088 |
| 15 | 0.0065 | 0.005 |
| 20 | 0.0047 | 0.003 |
| 25 | 0.0032 | 0.0023 |
| 30 | 0.0031 | 0.0019 |
| 40 | 0.002 | 0.001 |
| 50 | 0.0016 | 0.0006 |

Note: Tolerance: ±25% (up to 20A), ±50% (25A or higher)

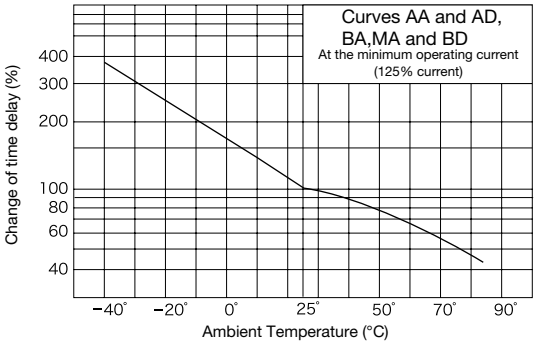
### Voltage Drop due to Coil Resistance or Impedance

The internal resistance or impedance of a circuit protector tends to be larger for a smaller rated current. Therefore, when circuit protectors of a small rated current are used for a power-supply switch, voltage drop should be taken into consideration. Internal resistance also varies with time delay curves in spite of the same rated current, which should be also considered during installation.




## Temperature Correction Curve




## Time Delay Curve and Ambient Temperature

Since the NRBM series circuit protectors employ an electromagnetic tripping system, the rated current (trip current) is not affected by ambient temperatures, but the time delay varies with the oil viscosity in the oil dash pot. Lower oil viscosity at higher temperatures results in shorter delay, whereas at lower temperatures the delay will be prolonged.
The time delay curves on the preceding page are at 25°C. With reference to these curves, time delays can be corrected.

## Instructions

### Panel Mounting Screw Length

Select a proper screw length according to the table.

| Panel thickness (mm) | 0.8 | 1.0 | 1.2 | 1.4 | 1.6 | 1.8 | 2.0 | 2.3 | 2.6 | 3.2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Without washer | (4) | (4) | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 |
| With plain washer (0.5 mm thick) | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | (7) |
| With spring washer (0.7 mm thick) | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 7 |
| With plain washer (0.5 mm thick) and spring washer (0.7 mm thick) | 6 | 6 | 6 | 6 | 6 | 6 | 6 | (7) | (7) | 8 |

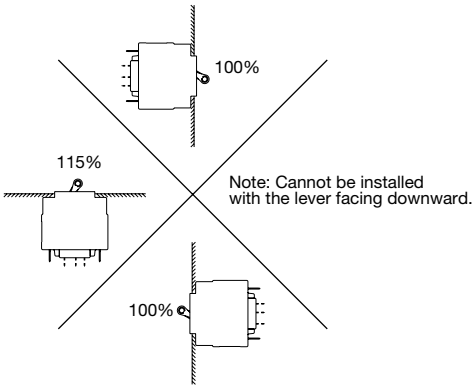
Note: Avoid using screws in the parenthesized lengths whenever possible.

### M3 Screw Mounting

Tightening torque: 0.5 to 0.8 N·m minimum

### Installation Angle

Designed to be mounted on a vertical surface in principle, the circuit protector must be mounted on a surface within 10° from a vertical plane. If the circuit protector is mounted on a horizontal surface or at any angle other than specified, the characteristics will be changed.




Overcurrent tripping method is hydraulic magnetic. Minimum operating currents vary with installation angle because operating currents are influenced by the weight of the iron core. With reference to the following figure, correct the rated current.

### Multi-pole

Multi-pole such as 2- or 3-pole are assembled by IDEC. Because of their characteristics, 1-pole protectors cannot be combined to provide multi-pole.

# NRF Series Circuit Protectors

## Snaps into a 16-mm-diameter hole
## Wide variety of applications such as office automation equipment

- 16-mm-dia fuse holder size
- More than 1,000 repeat operations
- Snap-on mounting
- Visible trip indicator
- Variety of rated currents
- Available with auxiliary contact which can be used to make an alarm or control circuit
- Solder or quick-connect terminations
- Round design and colorful bezels
- Mounting on 35-mm-width DIN rails is made possible by using a special adapter
- Cycling trip-free mechanism

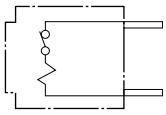
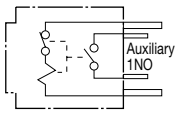
This product is recognized by Underwriters Laboratories under UL1077 as a "Supplementary Protector."

| Applicable Standards | Mark | Certification Organization / File No. |
|---|---|---|
| UL1077 | | UL recognized File No. E68029 |
| CSA C22.2 No. 235 (Note 1) | | CSA file No. LR83454 |
| EN60934 (Note 2) | | TÜV SÜD |
| GB17701 | | CCC No. 2005010309151798 |

For details, see the list of standard certified products in the back of this catalog.
Note 1: Only NRF series circuit protectors without manual OFF mechanism are certified by CSA.
Note 2: NRF110, rated current 8A, 10A, and 15A, without manual OFF mechanism

Specify a rated current and the bezel color code in place of 1 2.

Package Quantity: 1

| Auxiliary Contact | Internal Circuit | Manual OFF Mechanism | Part No. | Standard | Designation Code | |
|---|---|---|---|---|---|---|
| | | | | | 1 Rated Current | 2 Bezel Color |
| w/o Auxiliary Contact |  | Without | **NRF110** 2-1 | UL CSA CCC | 0.3A, 0.5A | |
| | | | **NRF110** 2-1 | UL CSA CCC TÜV (Note) | 1A, 2A, 3A, 5A, 8A, 10A, 15A | |
| | | With | **NRF210** 2-1 | UL CCC | 0.3A, 0.5A | |
| | | | **NRF210** 2-1 | UL CCC | 1A, 2A, 3A, 5A, 8A, 10A, 15A | |
| w/Auxiliary Contact |   | Without | **NRF111** 2-1 | UL CSA CCC | 0.3A, 0.5A, 1A, 2A, 3A, 5A, 8A, 10A, 15A | |
| | | With | **NRF211** 2-1 | UL CCC | | |

| Bezel Color | Code |
|---|---|
| Black | Blank |
| Green | G |
| Red | R |
| Blue | S |
| White | W |
| Yellow | Y |

Note: TÜV approved models are for 8A, 10A, and 15A only. When ordering the TÜV approved models, specify "-EN" at the end of the Part No.

## Part No. Development

When ordering, specify the Part No. the rated current, and the bezel color code.

[Example]

NRF 2 11 R - 3A

Model
Manual OFF Mechanism

| | |
|---|---|
| Without | 1 |
| With | 2 |

Auxiliary Contact

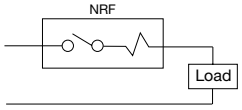
| | |
|---|---|
| Without | 10 |
| With | 11 |

1 Rated Current: 0.3A, 0.5A, 1A, 2A, 3A, 5A, 8A, 10A, 15A

2 Bezel Color

| Bezel Color | Code |
|---|---|
| Black | Blank (standard color) |
| Green | G |
| Red | R |
| Blue | S |
| White | W |
| Yellow | Y |

### Wiring Example




### Manual OFF Mechanism

Manual OFF mechanism opens the main contacts by pressing the button, convenient for checking the circuit with power OFF. When manually turning OFF, make sure that the current is not applied (under no-load condition).

## Specifications

| | |
|---|---|
| Protection Method | Thermal tripping |
| Internal Circuit | Series trip<br>Series trip (w/auxiliary contact) |
| No. of Poles | 1 pole |
| Rated Voltage | 250V AC, 32V DC |
| Rated Current | 0.3A, 0.5A, 1A, 2A, 3A, 5A, 8A, 10A, 15A |
| Minimum Applicable Load | 24V AC/DC 100mA (reference value) |
| Rated Interrupting Current | 300 mA to 5A: Rated current × 6<br>8, 10, and 15A: Rated current × 10<br>(Turns on when the main circuit is off, including tripping.) |
| Auxiliary Contact Rating | 1NO (contact output) 125V AC / 32V DC, 50mA |
| Reference Temperature | 25°C |
| Operating Temperature | −10 to +60°C (no freezing) |
| Storage Temperature | −30 to +80°C (no freezing) |
| Operating Humidity | 45 to 85% RH (no condensation) (Note 1) |
| Storage Humidity | 45 to 85% RH (no condensation) |
| Trip Time (at 25 °C) | No trip at the rated current<br>Within 1 hour at 135% the rated current |
| Reset Time | 60 sec minimum (Note 2) |
| Vibration Resistance | 100 m/s$^2$ (10 to 55 Hz) |
| Shock Resistance | Damage limits: 1000 m/s$^2$,<br>Operating extremes: 500 m/s$^2$ |
| Life | Overcurrent durability:<br>1,000 operations minimum (tripping at 200% the rated current)<br>Mechanical life (with manual OFF mechanism):<br>240 operations minimum (switching at no load) |
| Insulation Resistance | 100 MΩ minimum (500V DC megger) |
| Dielectric Strength | Between main contacts and between main contact and ground: 2000V AC, 1 minute<br>Between main and auxiliary contacts: 1500V AC, 1 minute |
| Terminal Style | Main terminal: Tab terminal #250<br>Auxiliary contact terminal: 1.4W × 0.2mm thick solder terminal |
| Degree of Protection | IP40 (IEC 60529) |
| Weight (Approx.) | 15g |

Note 1: The rated current is the value at the reference ambient tempera ture of 25°C, and varies with the operating temperature. The rated current can be corrected according to the temperature correction curve.

Note 2: Reset time is the value at the reference ambient temperature of 25°C.

## Applications

NRF series circuit protectors are small, high-performance over-current protectors developed for use in control circuits and small electrical equipment. Because they can be easily reset, they are suited for use in relay circuits, motor circuits, heater circuits, transformers, solenoids, solenoid valves, semiconductor circuits, and many other applications.

**[Application Examples]**

**Office Automation Equipment**
Copiers, shredders, personal computers, word processors, fax machines, printers, computer terminals, communication equipment, and power supplies.

**Measuring Instruments**
Electrical measuring instruments, industrial meters, analyzers, recorders, data processors, test equipment, and chemical equipment

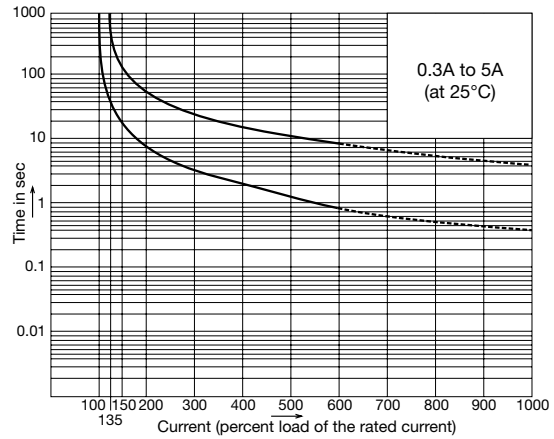
**Industrial Machines**
CNC equipment, robots, molding machines, processing machines, packaging machines, and carriers

**Business machines**
Medical equipment, vending machines, hairdresser's equipment, recreation and game machines, and small printing machines

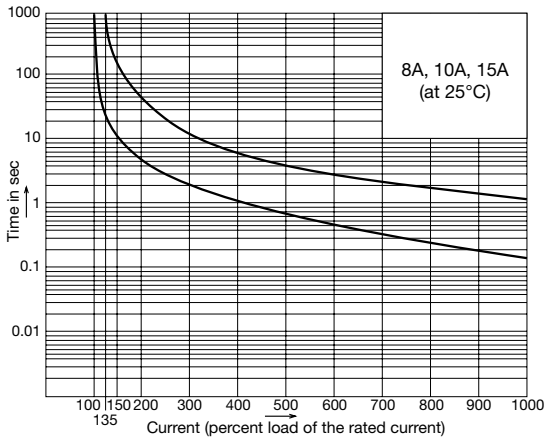
**Electric Controller and Instrumentation Equipment**
Automatic control devices, electronic equipment, and instrumentation boards

## Time Delay Curves

Rated Current 0.3A to 5A




Rated Current 8A, 10A, 15A




Note: Dashed lines are reference values.

## Overcurrent Trip Time

0.3A to 5A

| Percent of Rated Current | 100% | 135% | 150% | 200% | 400% | 600% |
|---|---|---|---|---|---|---|
| Trip Time (sec) | NO TRIP | 30 to 3600 | 16 to 120 | 7 to 55 | 2 to 17 | 0.9 to 8.5 |

(Ambient temperature + 25°C)

8 to 15A

| Percent of Rated Current | 100% | 135% | 150% | 200% | 400% | 600% | 800% | 1000% |
|---|---|---|---|---|---|---|---|---|
| Trip Time (sec) | NO TRIP | 28 to 3600 | 10 to 130 | 5 to 50 | 1 to 7 | 0.45 to 3 | 0.25 to 1.8 | 0.15 to 1.2 |

(Ambient temperature + 25°C)

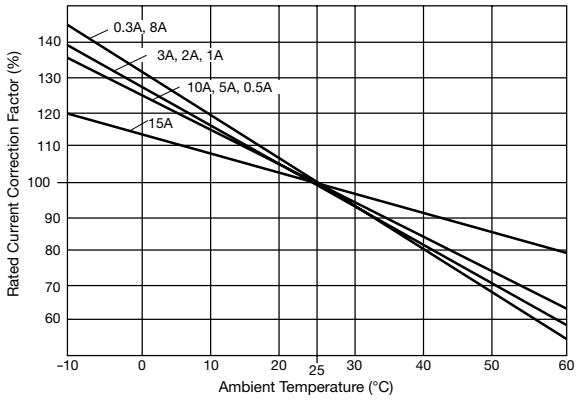
## Rated Current vs Internal Resistance

| Rated Current | Internal Resistance (Ω) ±15% | Remarks |
|---|---|---|
| 0.3A | 9.08 | at 25°C |
| 0.5A | 3.27 | |
| 1A | 0.81 | |
| 2A | 0.235 | |
| 3A | 0.0922 | |
| 5A | 0.0503 | |
| 8A | 0.0085 | |
| 10A | 0.0095 | |
| 15A | 0.0064 | |

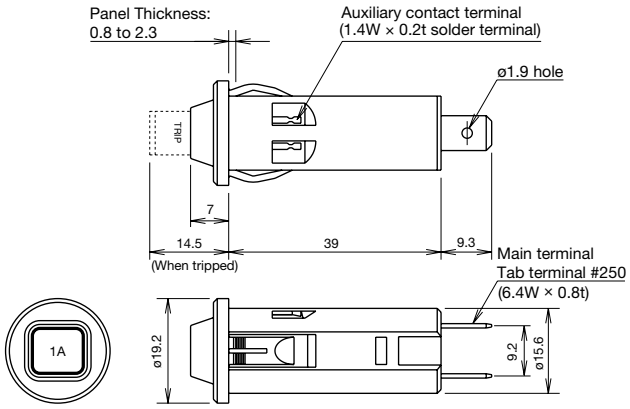
The internal resistance tends to be larger for smaller rated currents. When the circuit protector is used in a low-voltage circuit, voltage drop should be taken into consideration.

## Temperature Correction Curve

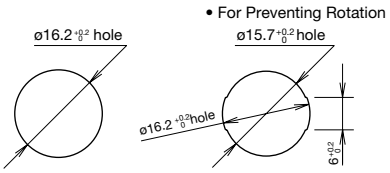
The rated current is based on an ambient temperature of 25°C. Since a thermal tripping method is employed, the rated current should be corrected according to the ambient temperature with reference to the curves shown below.




## Dimensions




Mounting Hole

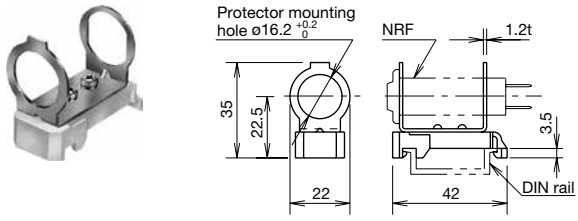



* Chamfering on the front edge of the mounting hole is recommended for easy insertion.

## Accessories

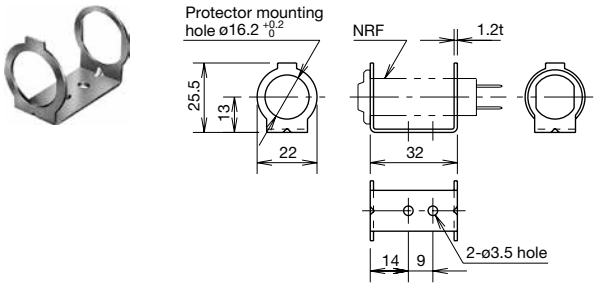
### 35-mm-wide DIN Rail Mount Adapter

| Part No. | Ordering No. | Package Quantity |
|---|---|---|
| **NRF-D** | **NRF-DPN05** | 5 |




### Surface Mount Adapter

| Part No. | Ordering No. | Package Quantity |
|---|---|---|
| **NRF-M** | **NRF-MPN10** | 10 |




All dimension in mm.

## Instructions

1. Since the NRF is designed for protection against overload, it should be used within the rated interrupting current. An excessive overcurrent may affect the bimetal characteristics or damage the internal mechanism.
2. After tripping, the NRF cannot be reset until the bimetal cools down. Allow the NRF at least 60 seconds before resetting. When the NRF is used at an ambient temperature higher than the reference temperature, resetting sometimes fails even after 60 seconds because it takes a long time to cool down the bimetal.
3. The NRF may not trip at an instantaneous overcurrent due to its principle.
4. The NRF is shipped in the ON status. To confirm operation of the models without manual OFF mechanism, apply approximately 200% the rated current to trip the NRF.
5. When installing quick connect receptacles to the terminals, hold the NRF body and press it into the quick connect receptacles.
6. Unlike conventional switches, the models with manual OFF mechanism are not suited for frequent switching due to their construction. (Their mechanical life is 240 operations at minimum when switching at no load.)
7. The models with manual OFF mechanism should be operated without load.

## Recommended Soldering Conditions

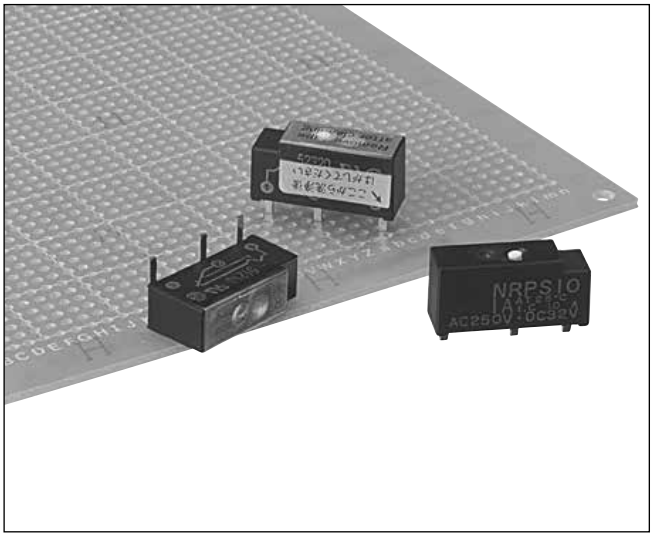
Solder the main terminal at a temperature of 390°C within 10 seconds using a 60W soldering iron. Solder the auxiliary/alarm terminal at a temperature of 350°C within 3 seconds using a 60W soldering iron. (Sn-Ag-Cu lead-free solder is recommended.) When soldering, do not touch the circuit protector housing, auxiliary and alarm contacts with the soldering iron, and do not bend the terminals or pull the wires. Check your actual soldering conditions before soldering.

# NRP Series PC Board Circuit Protectors

## Higher economic efficiency than a fuse

- SIL 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) 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 styles. Slims (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

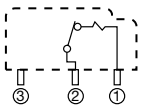
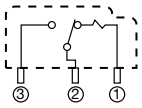
This product is recognized by Underwriters Laboratories under UL1077 as a "Supplementary Protector."



| Applicable Standard | Mark | Certification Organization / File No. |
|---|---|---|
| UL1077 | | UL recognized<br>File No. E68029 |
| CSA C22.2 No. 235 | | CSA file No. LR65560 |

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

Specify a rated current in place of ☐.

| Style | | Shape | Part No. | Ordering No. | ☐ Rated Current | Contact | Internal Circuit (Note) | Package Quantity |
|---|---|---|---|---|---|---|---|---|
| NRPS (Slim) | Non-sealed |  | **NRPS10-☐** | **NRPS10-☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A,6A | 1NC |  | 10 |
| | Sealed (Tape-sealed) |  | **NRPS10-G☐** | **NRPS10-G☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A | 1NC | | 10 |
| NRPF (Flat) | Non-sealed |  | **NRPF10-☐** | **NRPF10-☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A | 1NC | | 10 |
| | Sealed (Tape-sealed) |  | **NRPF10-G☐** | **NRPF10-G☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A | 1NC | | 10 |
| NRPS (Slim) | Non-sealed |  | **NRPS11-☐** | **NRPS11-☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A | SPDT |  | 10 |
| | Sealed (Tape-sealed) |  | **NRPS11-G☐** | **NRPS11-G☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A | SPDT | | 10 |
| NRPF (Flat) | Non-sealed |  | **NRPF11-☐** | **NRPF11-☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A | SPDT | | 10 |
| | Sealed (Tape-sealed) |  | **NRPF11-G☐** | **NRPF11-G☐PN10** | 1A, 1.6A, 2A, 3.15A, 4A, 5A, 6A | SPDT | | 10 |

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.

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

| Applications | Slim | | Flat | |
|---|---|---|---|---|
| | Non-sealed | Sealed | Non-sealed | Sealed |
| | NRPS10-☐<br>NRPS11-☐ | NRPS10-G ☐<br>NRPS11-G ☐ | NRPF10-☐<br>NRPF11-☐ | NRPF10-G ☐<br>NRPF11-G ☐ |
| Manual soldering | X | X | X | X |
| Dip soldering | — | X | — | X |
| Cleaning after soldering | — | X | — | X |
| Automatic mounting on PC boards | X | X | — | — |

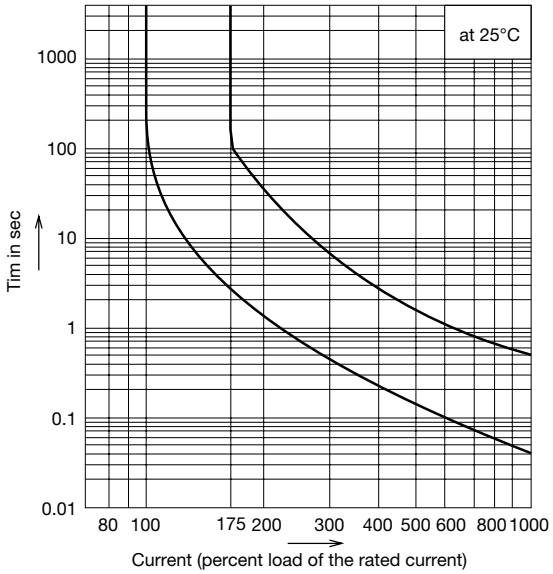
Note: The sealed type is provided with epoxy-seal on the base and a tape seal on the actuator side. After cleaning, be sure to remove the tape seal.
When using flux, use rosin flux. Select the sealed type irrespective of cleaning necessity.

## 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 Current | 1 to 4A: Rated current x 10 (resistive load)<br>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) |
| Storage Temperature | –30 to +70°C (no freezing) |
| Operating Humidity | 45 to 85% RH (no condensation) |
| Storage Ambient Humidity | 45 to 85% RH (no condensation) |
| Vibration Resistance | 100 m/sec$^2$ (10 to 55 Hz) |
| Shock Resistance | Damage limits: 1000 m/s$^2$<br>Operating extremes: 500 m/s$^2$ |
| 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:<br>200 mΩ maximum (5V DC · 1A)<br>Between terminals ② and ③:<br>100 mΩ maximum (5V DC · 100mA) |
| Weight (Approx.) | 2g |

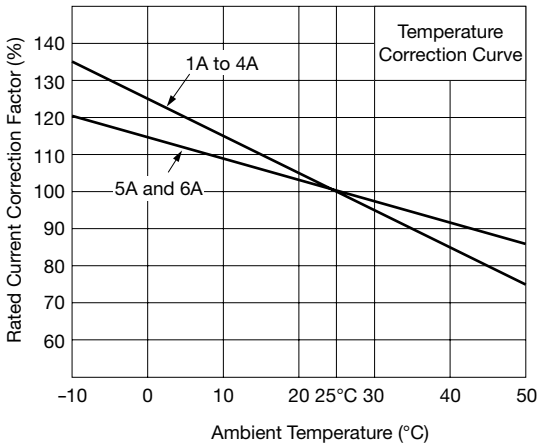
Note: The rated current is the value at the reference ambient temperature of 25°C, and varies with operating temperature. The rated current can be corrected according to the Temperature Correction Curve.

## 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.



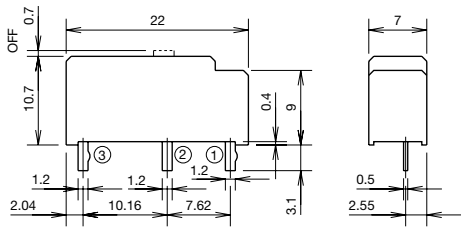

## Overcurrent - Time Delay Characteristics (sec at 25°C)

| 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 |

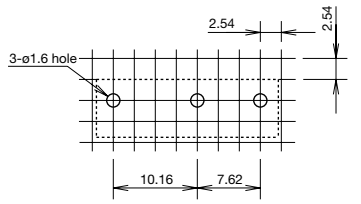
## Dimensions and PC Board Drilling Layout

**Slim**

Dimensions (mm)



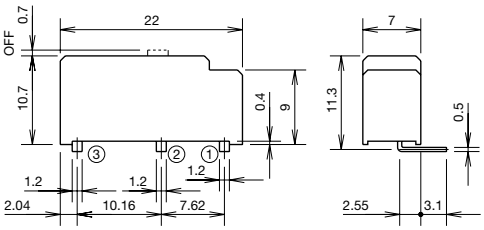

PC Board Drilling Layout



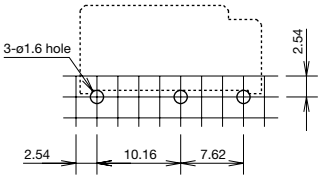

Top View

**Flat**

Dimensions (mm)




PC Board Drilling Layout




Top View

## 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.

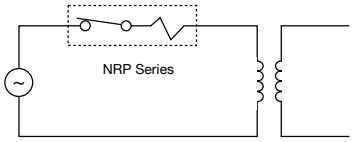
## Applications Examples

| | |
|---|---|
| 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 |

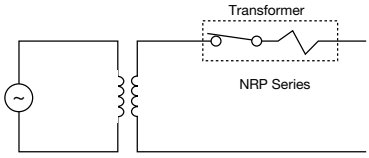
## Application Circuits Example

Transformer Protection Example

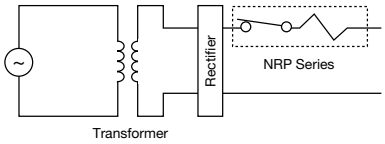
Transformer Primary Protection



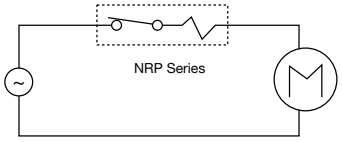

Transformer Secondary Protection




Rectifier Protection Example




Motor Coil Protection



## Safety Precautions

**1. Soldering**

**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 with in 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

- 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.
- 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.
- Non-corrosive rosin flux is recommended because washing is not required.

**2. Washing**

- When there is a possibility of washing, select the seal type.
- 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.
- 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**

- Storage temperature should not exceed 70°C. If storage temperature exceeds 70°C, the bimetal may trip.
- 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.
- Since the NRPS and NRPF are designed for protection against overloads, they should be used within the rated interrupting current. An excessive overcurrent may affect the bimetal characteristics or damage the internal mechanism.
- 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**

- 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).
- Turn power off and allow at least 60 seconds before re-throwing (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.
- Do not hold the actuator depressed while an overcurrent is present, because the overcurrent may damage the circuit protectors.

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