

### **NRA Series**



**NRAS**



**NRAN**



**NRAR  
Rocker**



**NRAR  
Illuminated Rocker  
(neon lamp)**

#### **Key features of the NRA series include:**

- Available in 4 different styles
- Excellent overload and short circuit protection
- Small size and high-efficiency
- Life expectancy of over 10,000 operations
- UL1077 recognized "Supplementary Protectors"
- VDE certified to EN60934



File No. E68029



license #116381

|                       |                                                         |                                                                                                                                                           |
|-----------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Specifications</b> | <b>Protection Method</b>                                | Electromagnetic tripping                                                                                                                                  |
|                       | <b>Internal Circuit</b>                                 | Series current trip                                                                                                                                       |
|                       | <b>Number of Poles</b>                                  | NRAS and NRAN: 1, 2, 3<br>NRAR: 1                                                                                                                         |
|                       | <b>Rated Voltage</b>                                    | 250V AC, 50/60Hz, 65V DC                                                                                                                                  |
|                       | <b>Rated Tripping Currents</b>                          | 0.3A, 0.5A, 0.75A<br>1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A                                                                                        |
|                       | <b>Rated Interrupting Capacity</b>                      | 250V AC, 50/60Hz, 1,000A<br>65V DC, 1,000A                                                                                                                |
|                       | <b>Auxiliary Contact</b>                                | SPDT microswitch 250V AC, 5A (resistive load)                                                                                                             |
|                       | <b>Alarm Contact</b>                                    | 50V DC, 1A (resistive load)                                                                                                                               |
|                       | <b>Reference Temperature</b>                            | 25°C                                                                                                                                                      |
|                       | <b>Operating Temperature</b>                            | −40 to +85°C (avoid freezing)                                                                                                                             |
|                       | <b>Insulation Resistance</b>                            | 100MΩ minute (measured with 500V megger)                                                                                                                  |
|                       | <b>Dielectric Strength</b>                              | Between main circuit terminals: 2,000V AC, 1 minute<br>Between main circuit and auxiliary contact: 2,000V AC, 1 minute                                    |
|                       | <b>Vibration Resistance</b>                             | 100N (approximately 10G) (10 to 100Hz)                                                                                                                    |
|                       | <b>Shock Resistance</b>                                 | 1,000N (approximately 100G)                                                                                                                               |
|                       | <b>Life Expectancy</b>                                  | Minimum 10,000 cycles (at 6 operations per minute)                                                                                                        |
|                       | <b>Termination</b>                                      | Main terminal: Quick-connect receptacle 0.250" (accepts M3.5 screw terminal adapter)<br>Auxiliary contact, alarm contact: Quick-connect receptacle 0.080" |
|                       | <b>Illumination Voltage</b><br>(NRAR illuminated units) | Neon: 120, 240V AC, 50/60Hz                                                                                                                               |



*Not suitable for branch circuit protection.*

## Part Numbering Guide

NRA series part numbers are composed of up to 8 part number codes. When ordering an NRA series part, select one code from each category.  
Example: NRAR 1 1 11 -F - 30A -AA -31



## Part Number Codes: NRA Series

|                                | Description                       | Part Number Code                                                 | Remarks                                                                                                                                                  |
|--------------------------------|-----------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① Model                        | Toggle (round cutout)             | NRAS                                                             |                                                                                                                                                          |
|                                | Toggle (rectangular cutout)       | NRAN                                                             |                                                                                                                                                          |
|                                | Rocker                            | NRAR                                                             |                                                                                                                                                          |
| ② No. of Poles                 | 1-pole                            | 1                                                                | NRAR available in 1-pole only.<br>All multi-pole circuit breakers are simultaneous throw/simultaneous break.<br>All levers are mechanically interlocked. |
|                                | 2-pole                            | 2                                                                |                                                                                                                                                          |
|                                | 3-pole                            | 3                                                                |                                                                                                                                                          |
| ③ Internal Circuit             | Series current trip               | 1                                                                |                                                                                                                                                          |
| ④ Auxiliary and Alarm Contacts | Without                           | 00                                                               | Auxiliary contact switches change state with lever and/or overload condition<br>Alarm contact switches change state only with overload condition         |
|                                | With auxiliary contact            | 11                                                               |                                                                                                                                                          |
|                                | With alarm contact                | 21                                                               |                                                                                                                                                          |
| ⑤ Inertia Delay                | Without inertia delay             | Blank                                                            |                                                                                                                                                          |
|                                | With inertia delay                | F                                                                |                                                                                                                                                          |
| ⑥ Rated Current                | Rated current (current trip)      | 0.3A, 0.5A, 0.75A, 1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A | All current ratings must be listed in amps (A).<br>Example conversion: 300mA = 0.30A.                                                                    |
| ⑦ Time Delay Curve             | DC curves                         | AD, MD                                                           | For time delay curves, see page N-7.                                                                                                                     |
|                                | AC curves                         | AA, BA,MA                                                        |                                                                                                                                                          |
| ⑧ Pilot Light*                 | With neon light 120V AC (50/60Hz) | 1                                                                | * Applicable to illuminated NRAR only.                                                                                                                   |
|                                | With neon light 240V AC (50/60Hz) | 2                                                                |                                                                                                                                                          |



1. For NRA series accessories, see page N-6.
2. For NRA series time delay curves, see page N-7.
3. For NRA series dimensions, see page N-10.
4. Not suitable for branch circuit protection.
5. UL recognized, applicable standard: UL1077, "Supplementary Protectors."

**Information About Circuit Breakers**

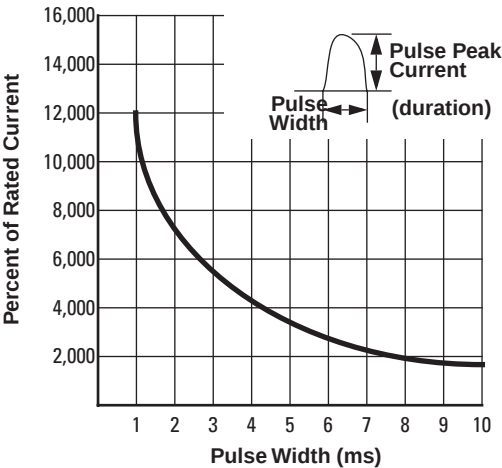
**Time Delay Curve Descriptions**

| Time Delay Curve       | NRA Application                                                                                                                                                                                                                   |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AD, AA                 | Common curves used in molded-case circuit breakers.                                                                                                                                                                               |
| BA                     | Response to overcurrent is quite fast. Suited for protection of semiconductor circuits with very little overload tolerance. If overcurrents are expected to flow, fuses may be required according to the circuit characteristics. |
| MD, MA                 | Suited for motor loads that draw high inrush currents lasting a considerable length of time.                                                                                                                                      |
| With Inertia Delay (F) | Designed not to trip on 20 times the rated current (peak value) for a duration of 8ms. Suited for transformer and lamp loads that draw steep inrush currents.                                                                     |

**Inertia Delay Descriptions**

Circuit breakers equipped with inertia delay do not respond to high inrush currents such as those produced by transformer, lamp, or motor loads, but perform the specified interruption on the rated overcurrents.

Specify inertia delay by inserting an "F" in the part number as shown in Part Number Guide on previous page.



1.  $\text{Percent of Rated Current} = \frac{\text{Pulse Peak Current}}{\text{Protector Rated Current}} \times 100\%$

2. Based on sinusoidal or parabolic pulse profile.

**Notes**

**Multi-Pole**

Multi-pole types such as 2- or 3-pole should be assembled by IDEC.

**Because of their characteristics, 1-pole breakers cannot be combined to provide multi-pole units.**

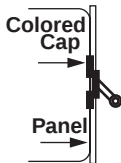
**Auxiliary and Alarm Contacts**

Multi-pole units can incorporate auxiliary and alarm contacts.

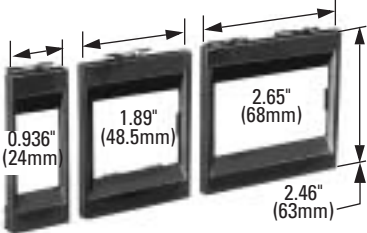
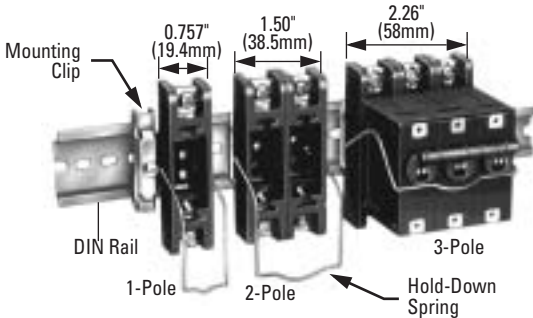
**Auxiliary and alarm contacts will not work with IDEC's DIN rail adapters.**

Accessories

Part Numbers: NRA Series Accessories

| Description                        |        | Appearance                                                                        | Part No. | Remarks                                                                                                                                                                                                 |
|------------------------------------|--------|-----------------------------------------------------------------------------------|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Color Caps<br>(NRAS only)          | Red    |  | NR5R     | <br>Colored caps fit onto NRAS circuit breakers for color coding circuits and improving the appearance of the panel. |
|                                    | Blue   |                                                                                   | NR5S     |                                                                                                                                                                                                         |
|                                    | Yellow |                                                                                   | NR5Y     |                                                                                                                                                                                                         |
|                                    | White  |                                                                                   | NR5H     |                                                                                                                                                                                                         |
| Screw Terminal Adapter<br>(1 pair) |        |  | NRT      | For use on main terminals only.<br>Includes M3.5 clamp screw.<br>For dimensions see page N-10.                                                                                                          |

Part Numbers: NRA Mounting Accessories

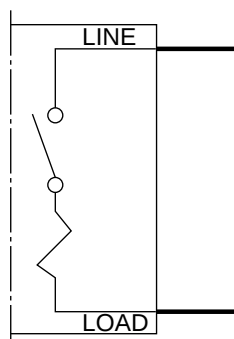
| Description                   | Appearance                                                                          | For Model    | No. of Poles | Part No. | Remarks                                                                                                                                                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------|--------------|--------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Panel Mount<br>Flush Plate    |   | NRAN<br>NRAR | 1-pole       | NR31     | Use of a flush plate makes snap-in mount possible for NRAN, and NRAR circuit breakers (tightening screws not necessary). Multiple units can mount in a single panel cut-out.                                                      |
|                               |                                                                                     | NRAN         | 2-pole       | NR32     |                                                                                                                                                                                                                                   |
|                               |                                                                                     | NRAN         | 3-pole       | NR33     |                                                                                                                                                                                                                                   |
| DIN Rail<br>Plug-in Base      |  | NRAS<br>NRAN | 1-pole       | NR21     | 1. Furnished with a hold-down spring.<br>2. Applicable only for series trip units up to 20 amps.<br>3. Not applicable for NRAR lighted series.<br>4. Not for use with circuit breakers incorporating auxiliary or alarm contacts. |
|                               |                                                                                     |              | 2-pole       | NR22     |                                                                                                                                                                                                                                   |
|                               |                                                                                     |              | 3-pole       | NR23     |                                                                                                                                                                                                                                   |
|                               |                                                                                     | NRAR         | 1-pole       | NR211    |                                                                                                                                                                                                                                   |
| Surface Mount<br>Plug-in Base |                                                                                     | NRAS<br>NRAN | 1-pole       | NUS1     |                                                                                                                                                                                                                                   |
|                               |                                                                                     |              | 2-pole       | NUS2     |                                                                                                                                                                                                                                   |
|                               |                                                                                     |              | 3-pole       | NUS3     |                                                                                                                                                                                                                                   |
|                               |                                                                                     | NRAR         | 1-pole       | NUS11    |                                                                                                                                                                                                                                   |



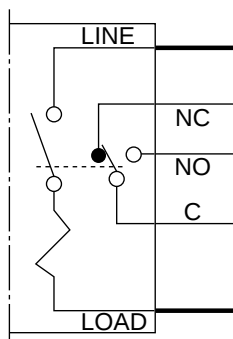
For dimensions of NRA series accessories and panel cut-out layouts, see drawings starting on page N-10.

## Internal Circuits and Terminal Arrangements: NRAS and NRAN Series

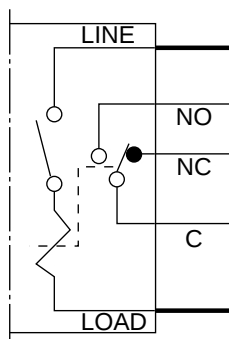
Series Current Trip



Series Current Trip with Auxiliary Contacts

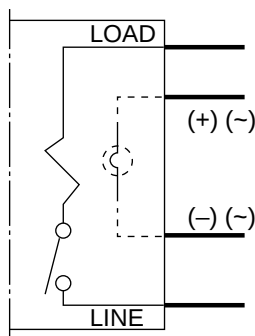


Series Current Trip with Alarm Contacts

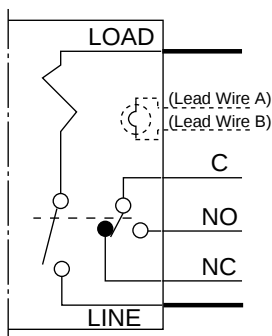


## Internal Circuits and Terminal Arrangements: NRAR Series

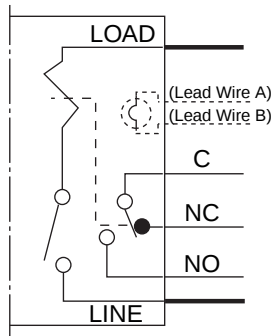
Series Current Trip



Series Current Trip with Auxiliary Contacts



Series Current Trip with Alarm Contacts



Pilot Lights (NRAR only)

| Pilot Light    | Lead Wire |       |
|----------------|-----------|-------|
|                | A         | B     |
| Neon (120V AC) | White     | White |
| Neon (240V AC) | Black     | Black |



Dashed lines represent NRAR illuminated rocker units. Lead wires for neon pilot light as shown above.

## Time Delay Curves (numerical equivalent)

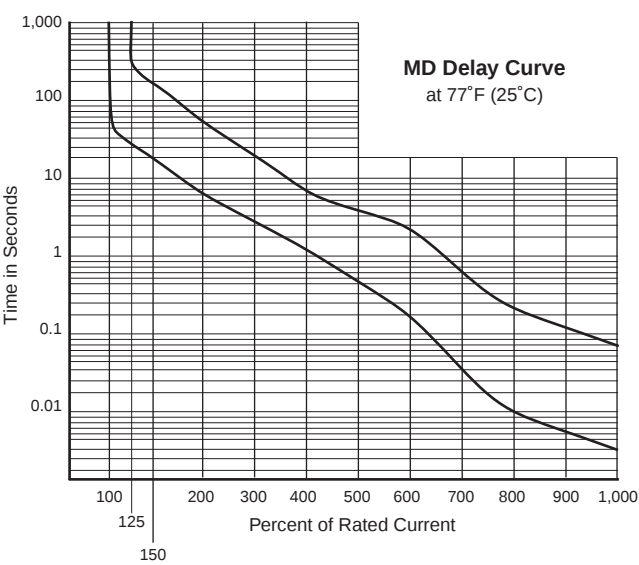
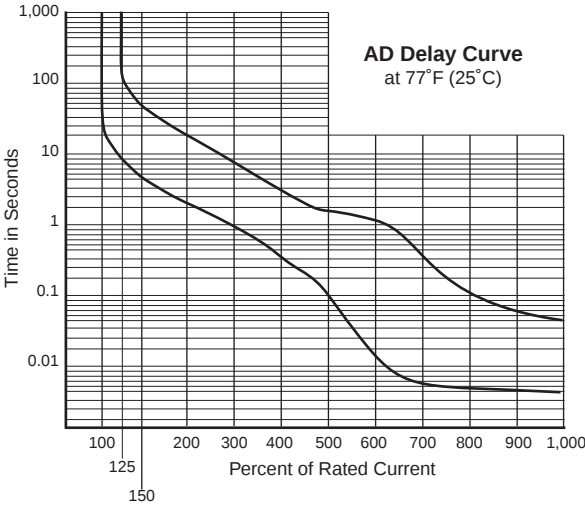
Overcurrent — Time Delay Characteristics in Seconds (at 25°C)

|              |       | Percent of Rated Current |           |            |            |              |              |              |              |
|--------------|-------|--------------------------|-----------|------------|------------|--------------|--------------|--------------|--------------|
|              | Curve | 100%                     | 125%      | 150%       | 200%       | 400%         | 600%         | 800%         | 1000%        |
| 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 |
| 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 |

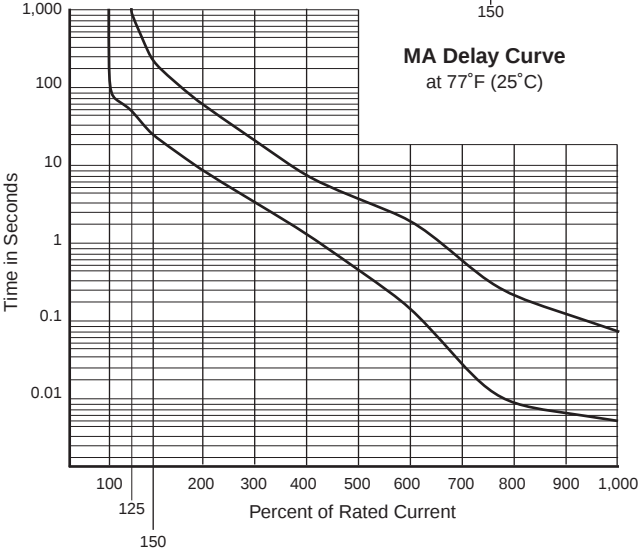
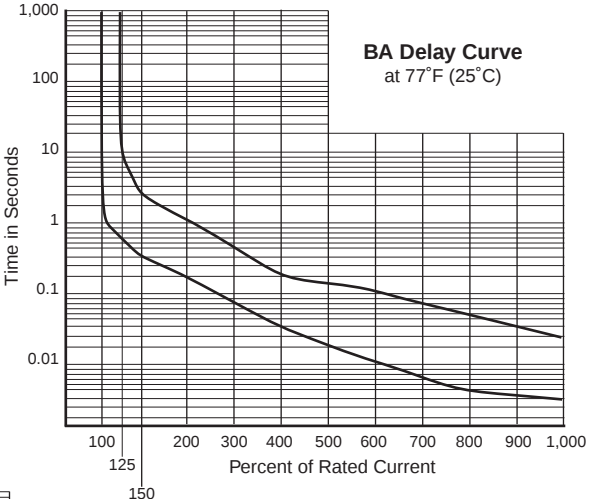
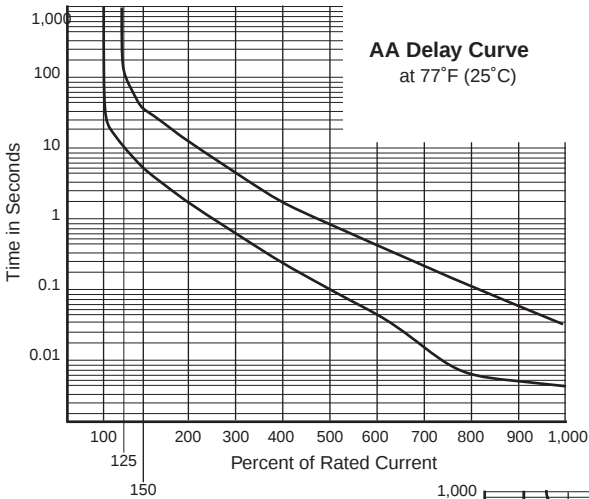


1. All values above are in seconds.
2. Data in this table is equivalent to information presented in following time delay curves.

DC Time Delay Curves



AC (50/60Hz) Time Delay Curves



## Resistance and Impedance Characteristics

### Coil Data for Series Current Trip at 25°C

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



Tolerance  $\pm 25\%$  (up to 20A),  $\pm 50\%$  (25A and over).

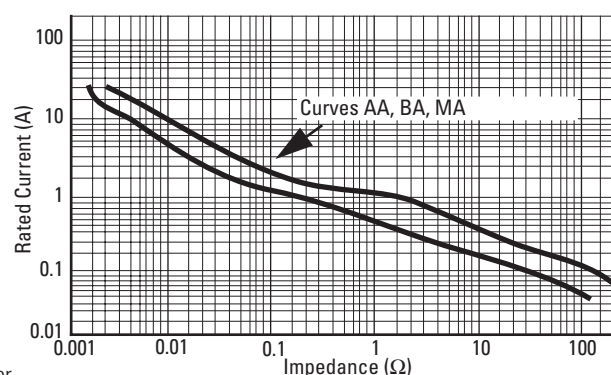
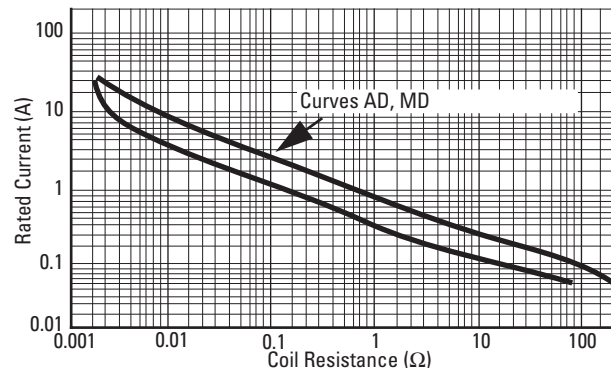
### Voltage Drop Due to Resistance or Impedance

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

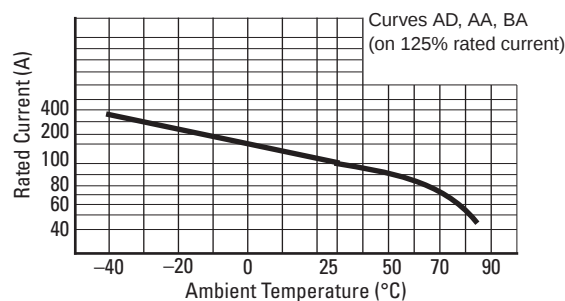
### Time Delay Curve and Ambient Temperature

Since NRA series circuit breakers employ an electromagnetic tripping system, the rated current (trip current) is not affected by the ambient temperature, but the time delay varies with the oil viscosity in the tube. Lower oil viscosity at higher temperatures results in shorter delay; whereas at lower temperatures, the delay will be prolonged. The time delay curves, shown starting on page N-7, are at 25°C. Time delay curves can be corrected.

Coil Resistance at 25°C



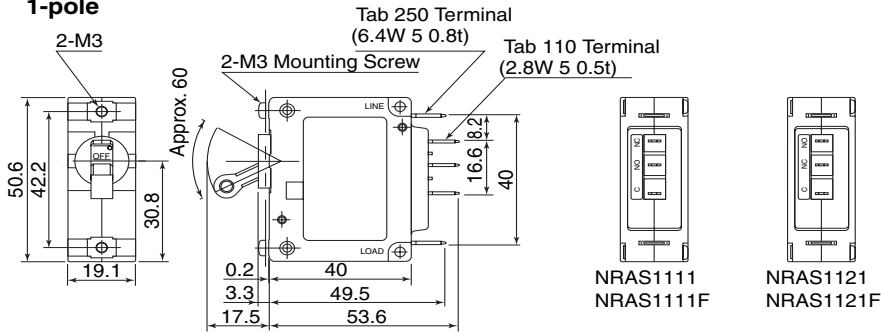
Temperature Correction Curves



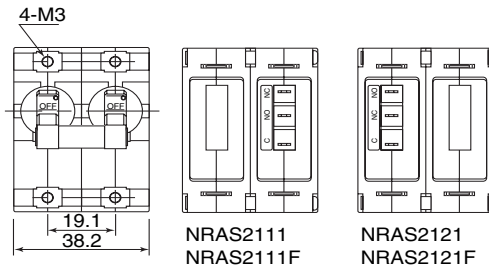
## Dimensions

## NRAS

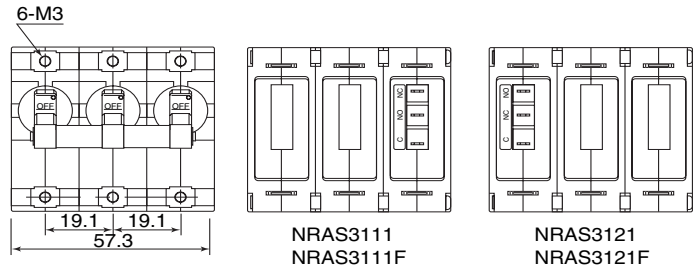
## 1-pole



## 2-pole

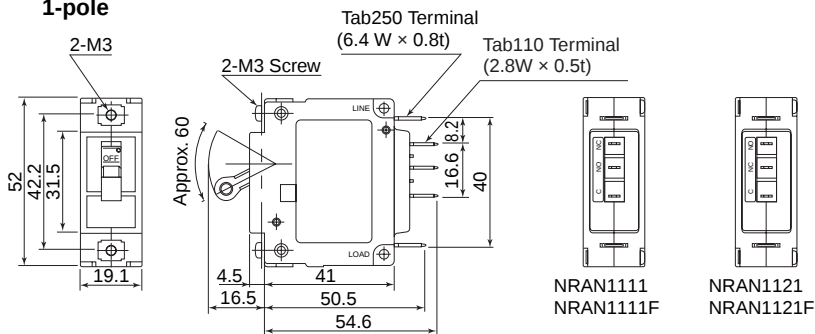


## 3-pole

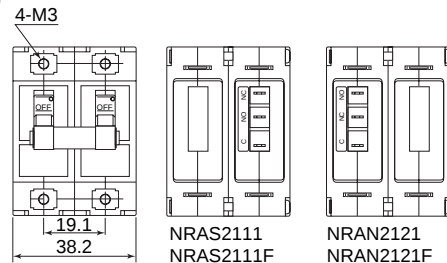


## NRAN

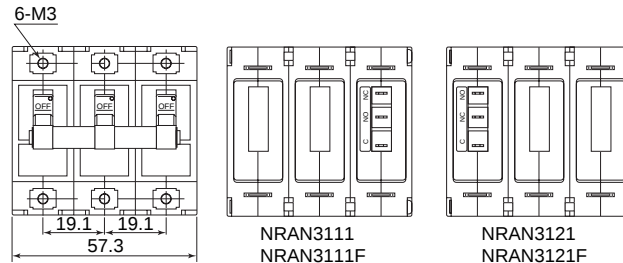
## 1-pole



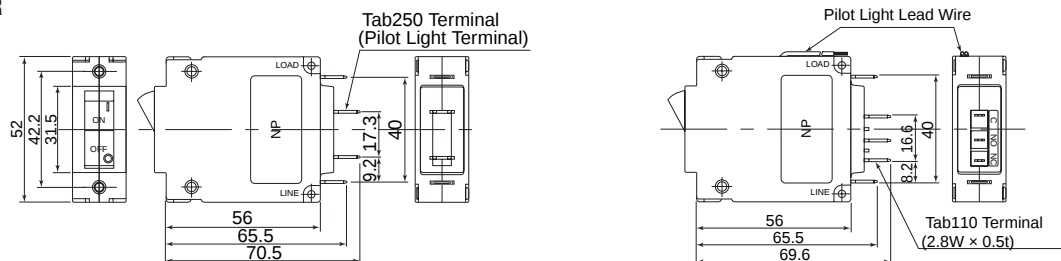
## 2-pole



## 3-pole



## NRAR



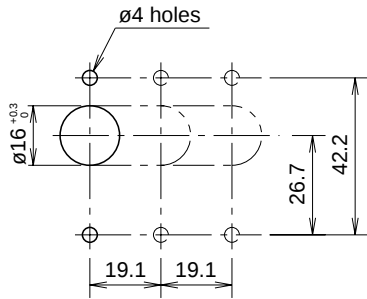
**Panel Cut-Outs**



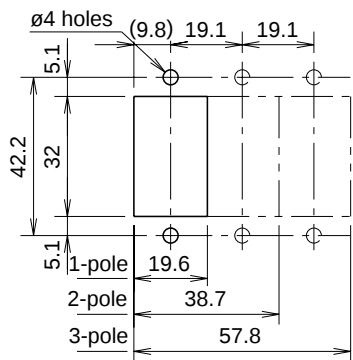
**Installation Angle:** Circuit breakers are designed to operate on a vertical surface. The mounting angle should not exceed a vertical plane by more than 10°.

**NRA Series**

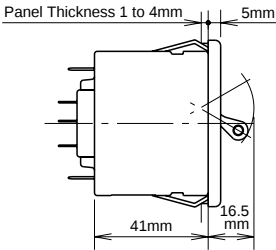
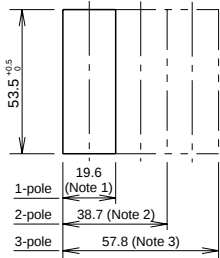
**NRAS**



**NRAR, NRAN**



**NR31, NR32, NR33 — Panel Mount Flush Plate**

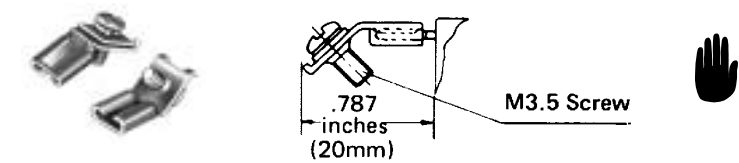


Panel cut-out when two or more units are mounted closely (n = number of units).  
Note 1: 24.3n - 5  
Note 2: 48.8n - 10  
Note 3: 69.3n - 10

| Model | Maximum Mounting Distance |                 | Schematics in mm          |                      |
|-------|---------------------------|-----------------|---------------------------|----------------------|
|       | A                         | B               | Mounting to Panel Surface | Mounting to DIN Rail |
| NRAS  | 3.02" (77.5mm)            | 3.57" (91.5mm)  |                           |                      |
| NRAN  | 3.02" (77.5mm)            | 3.57" (91.5mm)  |                           |                      |
| NRAR  | 3.38" (86.7mm)            | 3.93" (100.7mm) |                           |                      |

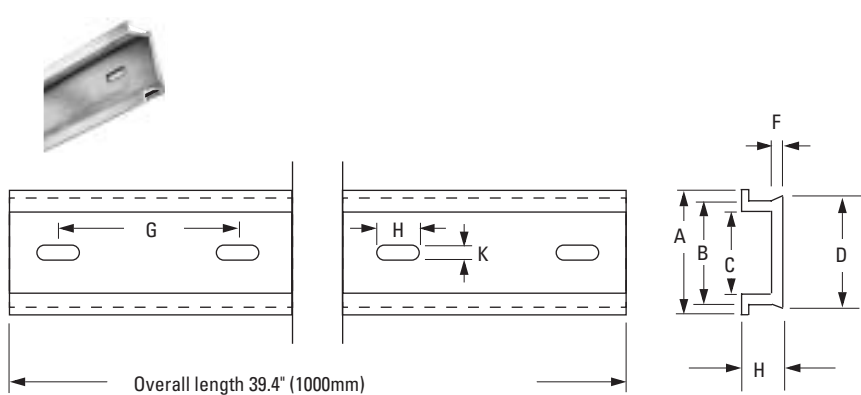
Accessory Dimensions

**NRT: Screw Terminal Adapter** (for use with NRA Series)



- 1. For use on main terminals only.
- 2. Includes M3.5 clamp screw.

**BNDN1000 Aluminum DIN Rail**



|   | Length in<br>Inches (mm) |
|---|--------------------------|
| A | 1.4" (35mm)              |
| B | 1.14" (29mm)             |
| C | 0.78" (23mm)             |
| D | 1.2" (31mm)              |
| E | 0.41" (10.5mm)           |
| F | 0.11" (3mm)              |
| G | 2" (51mm)                |
| H | 0.47" (12mm)             |
| K | 0.16" (4mm)              |

**Instructions: All Series**

**General**

IDEC's circuit breakers have been developed for the protection of electrical circuits and small-sized electrical equipment and provide excellent protection against overloads and short-circuits.

Additionally, IDEC's circuit breakers are designed to suit specific needs. Each series offers unique circuit protection characteristics and a choice of actuator styles.

**IDEC's Circuit Breaker Features**

- Various models are available with different internal circuits, tripping characteristics, and rated currents
- 1- to 3- multi-pole
- Inertia delay
- Auxiliary contacts and alarm contacts
- The electromagnetic tripping system is not affected by ambient temperature
- Safe trip-free mechanism
- Vibration- and impact-resistant design
- When using accessories such as plug-in bases, flush plates, and colored caps, a variety of mounting styles is possible — such as DIN rail mounting, snap mounting into panel cut-outs, and color-coded arrangement on the panel

**Mounting Instructions: Installation Angle**

Designed to be mounted on a vertical surface, the circuit breakers should be mounted on a surface within 10° of the vertical plane. If the circuit breaker is mounted on a horizontal surface or at any angle other than the specified angle, its characteristics will be changed.

**Multi-Pole Assemble**

Multi-pole types such as 2- or 3-pole should be assembled by IDEC. **Because of their characteristics, 1-pole breakers cannot be combined to produce multi-pole units.**

**Applications**

The IDEC NRA circuit breaker series features superior overload and short-circuit protection. Many combinations of protection mechanisms and internal circuit connections enable wide applications.

- **Precision measuring instruments:** electronic counters, projection instruments, oscilloscopes, industrial instrumentation, and analytic devices
- **Electronic communication devices:** facsimile machines, computers, recorders
- **Industrial machinery:** printers, elevators, cranes
- **Chemical and food industry machines:** vacuum devices, wrappers, centrifuges, agitators
- **Machine tools:** mill grinders, drills, presses
- **Business machines:** automatic vendors, medical equipment, beauty salon equipment, entertainment games
- **Other:** office equipment, air-conditioners, conveyor belts, and many more

**How the Breaker Operates**

IDEC's hydraulic magnetic circuit breakers operate like a solenoid coil. The coil unit consists of an oil-filled tube with a metal core at one end and a pole piece and armature at the opposite end with a spring in between.

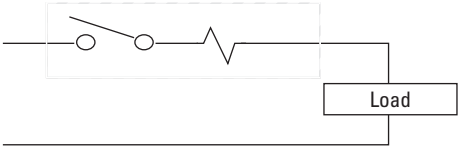
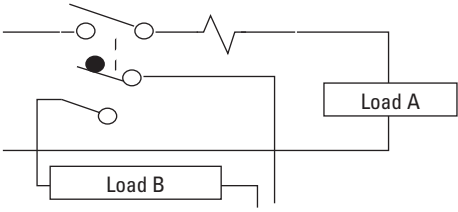
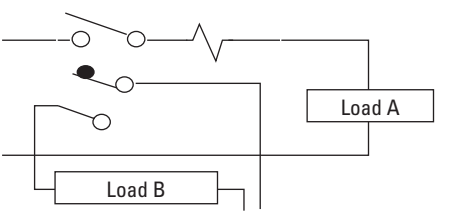
When a current load passes through the coil winding, it creates a magnetic field. As long as the current load is either at or below the nominal rating of the breaker, the metal core will remain stationary.

If the current load increases beyond the nominal rating, the strength of the magnetic field causes the core to move toward the pole-end of the tube. The oil viscosity regulates the core's movement through the tube, thereby regulating the time delay. As the percentage of current load increases, the required trip time of the breaker decreases and vice versa.

When the current reaches the overload rating, the metal core will meet the pole piece at the opposite end of the tube. At this point, the armature is attracted to the same pole piece, tripping the breaker.

In case of sudden short circuit, the magnetic field created will instantly trip the breaker.

**Internal Circuits Overview**

| Description                                                                         | Circuit Example                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>Series Trip</b><br>This is the most common circuit breaker, providing excellent overload and short circuit protection. It can also be used as an ON/OFF switch.                                                                                                                                                                                     |
|  | <b>Series Trip with Auxiliary Contact</b><br>Since the auxiliary contact operation is interlocked with the ON/OFF of the main contactor, circuit breaker operation can be monitored by a lamp or buzzer. This circuit breaker can also be used to control auxiliary circuits up to 250V AC/5A (resistive load).                                        |
|  | <b>Series Trip with Alarm Contact</b><br>Since the alarm contact is electrically independent of the main contactor, but actuates when the protective element operates. The alarm can be used with a lamp or buzzer to monitor trip operations, and can also be used for controlling alarm circuits. The contact rating is 250V AC/5A (resistive load). |