

Industrial Automation Catalog Section - U906

Circuit Breakers

Circuit Breakers

NRC Series





For up-to-date information, or to request a full copy of this catalog, contact us at **www.idec.com** or **800-262-IDEC**.

Due to continuous product improvements, specifications are subject to change without notice.

Selection Guide, continued

Selection Guide: NRBM and NRC Series

| Series Model | NRBM | NRC |
|-----------------------------|---|---|
| Page | N-12 | N-19 |
| Appearance |  |  |
| Actuator Style | Lever | Slide, lever |
| Protection Method | Electromagnetic trip | |
| Number of Poles | 1, 2, 3 | 1, 2 |
| Internal Circuits | Series current trip | Series current trip |
| Auxiliary Contact | Optional (250V AC, 5A; 50V DC, 1A) | |
| Alarm Contact | Optional (250V AC, 5A; 50V DC, 1A) | |
| Inertia Delay | Optional (for resistance to high inrushes) | — |
| Time Delay Curves | 2 types for DC; 3 types for AC | 2 types for DC; 2 types for AC |
| Rated Voltage | 250V AC, 50/60Hz, 65V DC | |
| Rated Tripping Currents | 1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A, 40A, 50A | 0.30A, 0.5A, 0.75A, 1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A |
| Rated Interruption Capacity | 1000A, 250V AC (50/60Hz), 65V DC | 2,500A, 220V AC 50/60Hz (1-pole) 1,500A, 220V AC 50/60Hz (2-pole) 1,500A, 65V DC (1-pole) 1000A, 65V DC (2-pole) |
| Approvals | UL, CSA | UL, CSA |



1. For NRBM dimensions, see page N-25.
2. For NRC dimensions, see page N-26.
3. All switch only units are not CSA certified.
4. UL recognized, applicable standard: UL1077, "Supplementary Protectors."
5. Not suitable for branch circuit protection.



UL Recognized
File No. E68029



CSA Certified
File No. LR47985

NRC Series

NRC series circuit breakers offer circuit protection which is far superior to using fuses in applications containing relay circuits, motor circuits, heater circuits, transformers, solenoid valves, and semiconductors.



Key features of the NRC series include:

- Mounting options include DIN rail, direct surface, or panel cut-out
- Designed for control circuit and power line protection
- Rated interrupting capacity of 2,500A (1-pole) and 1,500A (2-pole)
- Choice of slide or lever actuators
- All models equipped with reset trip indicators
- Models available for AC or DC loads
- Two curves available for long or short delay
- Available in 11 rated currents from 300mA to 30A
- Options include auxiliary contacts
- UL1077 recognized "Supplementary Protectors"



UL Recognized
File No. E68029



CSA Certified
File No. LR83454

| Specifications | Load Type | AC | DC |
|----------------|-----------------------------|---|------------------------------------|
| | Protection Method | Electromagnetic tripping | |
| | Internal Circuit | Series current trip | |
| | Number of Poles | 1, 2 | |
| | Rated Voltage | 250V AC, 50/60Hz, 65V DC | |
| | Rated Tripping Currents | 0.30A, 0.50A, 1A, 2A, 3A, 5A, 7A, 10A, 15A, 20A, 30A | |
| | Rated Interrupting Capacity | 2,500A, 250V AC, 50/60Hz (2-pole: 1,500A) | 1,500A, 65V DC (2-pole: 1,000A) |
| | Auxiliary Contact | Optional SPDT contact output 250V AC 3A (resistive load) 65V DC 1A (resistive load)) | |
| | Reference Temperature | 40°C | |
| | Operating Temperature | -10 to +60°C (avoid freezing) | |
| | Insulation Resistance | 100MΩ minutes (500V megger) | |
| | Dielectric Strength | Between the live part and the ground, between terminals of different poles, between terminals of the same pole, and between main circuit and auxiliary contact: 2,000V AC, 1 minute | |
| | Vibration Resistance | 100N (approximately 10G) (10 to 55Hz) | |
| | Shock Resistance | 500N (approximately 50G) | |
| | Life | 10,000 operations minimum | |
| | Terminal Style | Main terminal: M4 screw (20A maximum) M5 screw (30A) Auxiliary terminal: M3.5 screw | |
| | Weight (approximate) | 1-pole: 115g, 2-pole: 230g | |



Not suitable for branch circuit protection.

Part Numbering Guide

NRC series part numbers are composed of 5 part number codes. When ordering an NRC series part, select one code from each category.

Example: NRC111L-0.30A-AA

NRC

11

No. of Poles

1

② Auxiliary Contacts

L

③ Actuator Type



0.30A

④ Rated Current

AA

⑤ Time Delay Curve

Part Number Codes: NRC Series



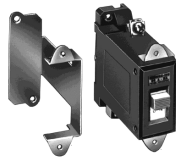

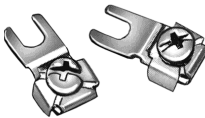

| Appearance | | Description | Part Number Code | Remarks |
|----------------------|---|-------------|--|--|
| ① No. of Poles | | 1-pole | 11 | |
| | | 2-pole | 21 | |
| ② Auxiliary Contacts | | No | 0 | |
| | | Yes | 1 | |
| ③ Actuator Type |  | Slide | Leave blank | Slide actuator available only for 1-pole models. |
| |  | Lever | L | |
| ④ Rated Current | | | 0.30A, 0.50A, 1A, 2A, 3A, 5A, 7A, 10A, 15A, 20A, 30A | |
| ⑤ Time Delay Curve | | | AC curves: AA, EA; DC curves: AD, ED | |



1. For NRC series accessories, see page N-21.
2. For NRC series time delay curves, see page N-22.
3. For NRC series dimensions, see page N-26.

Accessories

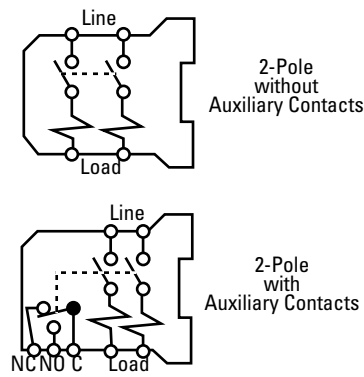
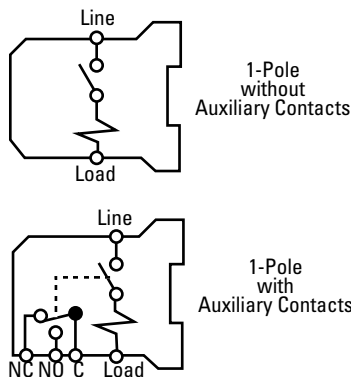
Part Numbers: DIN Rail and Mounting Clips

| Description | Appearance | Part No. | Remarks |
|--|--|----------|--|
| Aluminum DIN Rail (1 meter length) |  | BNDN1000 | For dimensional drawing, see page N-30. |
| DIN Rail End Clip Metal end clip used to prevent side-to-side movement of circuit breakers when mounted on a DIN rail. One clip required at each end. |  | BNL5 | |
| Panel Cut-Out Mounting Bracket Mounting bracket used to mount circuit breaker(s) in panel cut-outs. Not applicable for models with auxiliary contacts (NRC111, NRC111L, NRC211L). When mounting 2-pole models (NRC210L), use two brackets side-by-side. It is recommended to use the "Fast-On Tab Terminal Adapter" (below) when using this bracket. |  | NRC-M | For dimensional drawings, see page N-26. |
| Surface Mounting Bracket Used for direct surface mounting 1-pole circuit breaker models. |  | NRC-F | For dimensional drawings, see page N-26. |
| Fast-On Tab Terminal Adapter Adapter used for Fast-On wiring termination. Fast-On tab extends 0.47" (12mm) in length. Cannot be used to replace models with M5 main terminals (30A). Fast-On terminal adapter recommended when using panel cut-out mounting bracket for rear wiring. |  | NRC-T | For dimensional drawings, see page N-30. |
| Jumper Used for jumping auxiliary terminals. The rated current for jumper is 3A. |  | NRC-J | |



For dimensions of NRC series accessories, see page N-30.

Internal Circuit



Time Delay Curves (numerical equivalent)

Overcurrent — Time Delay Characteristics in Seconds (at 40°C)

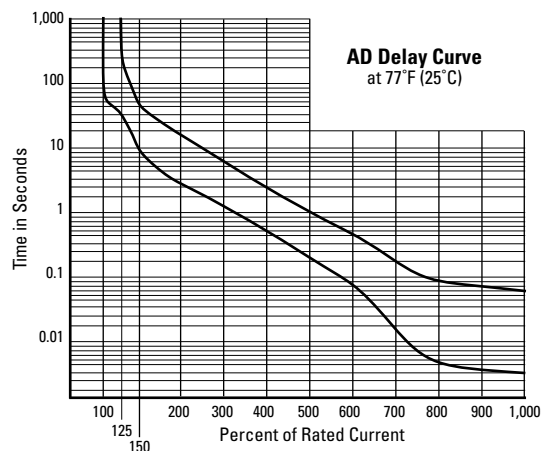
| | | Percent of Rated Current | | | | | | | |
|----|-------|--------------------------|------------|--------------|--------------|---------------|---------------|---------------|---------------|
| | Curve | 100% | 125% | 150% | 200% | 400% | 600% | 800% | 1000% |
| DC | AD | No trip | 40 – 240 | 10 – 50 | 3.5 – 18 | 0.6 – 3 | 0.008 – 0.5 | 0.005 – 0.09 | 0.004 – 0.07 |
| | ED | No trip | 0.04 – 0.4 | 0.025 – 0.15 | 0.015 – 0.06 | 0.007 – 0.025 | 0.005 – 0.018 | 0.004 – 0.017 | 0.004 – 0.017 |
| AC | AA | No trip | 40 – 240 | 10 – 50 | 3.5 – 18 | 0.9 – 4 | 0.35 – 2 | 0.07 – 1.2 | 0.01 – 0.5 |
| | EA | No trip | 0.05 – 0.4 | 0.03 – 0.17 | 0.02 – 0.07 | 0.008 – 0.025 | 0.005 – 0.018 | 0.004 – 0.017 | 0.004 – 0.017 |



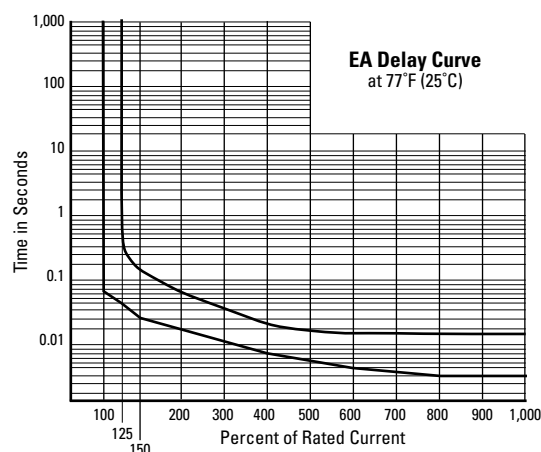
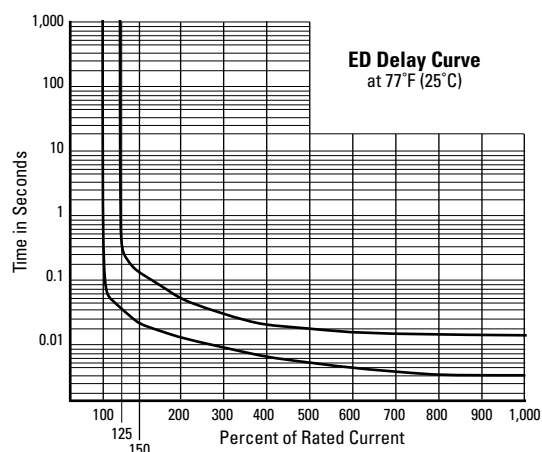
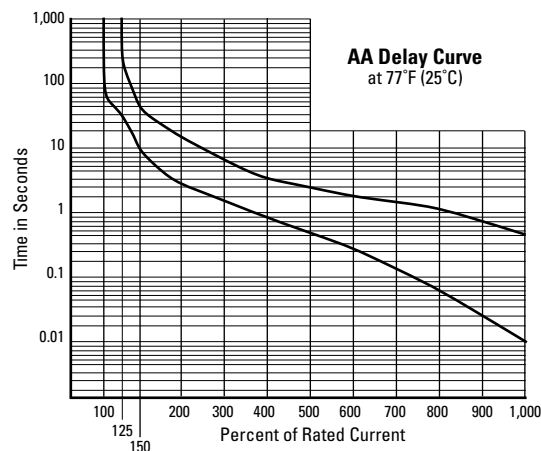
1. All values above are in seconds.
2. Data in this table is equivalent to information presented in following time delay curves.

Time Delay Curves

DC Time Delay Curves



AC (50/60 Hz) Time Delay Curves



Resistance and Impedance Characteristics

Coil Impedance (at 40°C)

| Rated Current | AC Impedance (50/60Hz) | DC Resistance |
|---------------|------------------------|---------------|
| 0.30A | 15.1Ω | 25.6Ω |
| 0.50A | 5.58Ω | 9.04Ω |
| 1A | 1.54Ω | 2.33Ω |
| 2A | 0.341Ω | 0.548Ω |
| 3A | 0.162Ω | 0.261Ω |
| 5A | 0.061Ω | 0.099Ω |
| 7A | 0.031Ω | 0.048Ω |
| 10A | 0.017Ω | 0.026Ω |
| 15A | 0.008Ω | 0.013Ω |
| 20A | 0.0058Ω | 0.0075Ω |
| 30A | 0.0039Ω | 0.0046Ω |

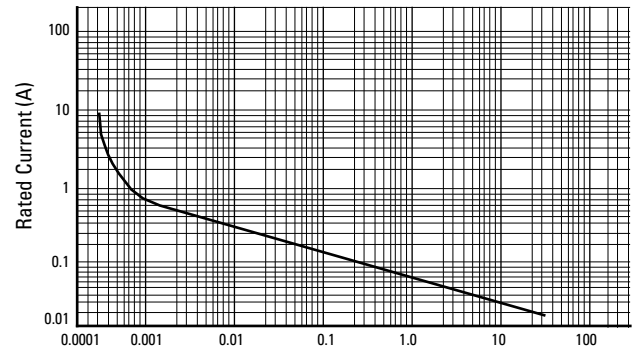


Tolerance: $\pm 10\%$ (0.3A to 3A), $\pm 25\%$ (5A to 30A).

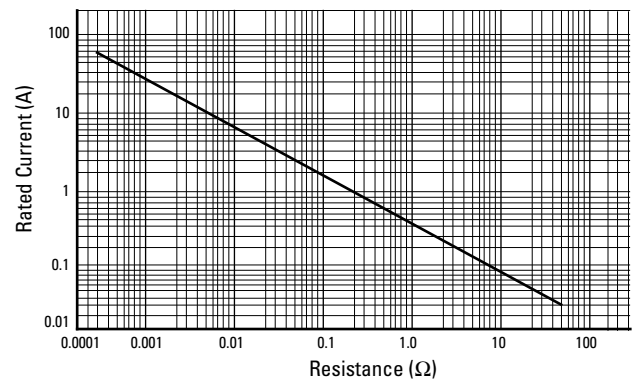
Voltage Drop Due to Coil Impedance

The internal impedance of a circuit breaker tends to be larger for a smaller rated current. Therefore, when low rated circuit breakers are used, the voltage drop should be taken into consideration.

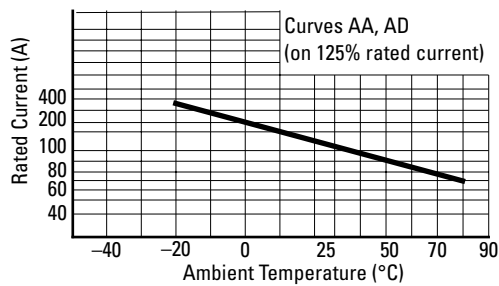
AC Impedance at 40°C



DC Resistance at 40°C



Temperature Correction Curve



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.

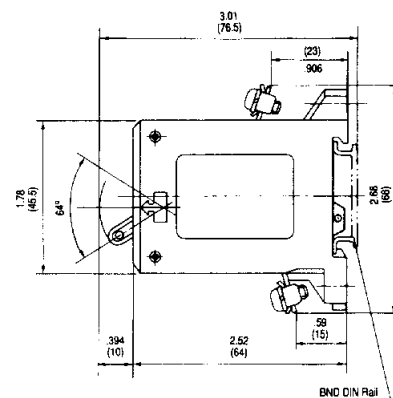
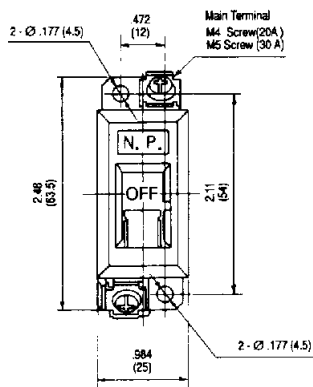
In case of sudden short circuit, the magnetic field created will instantly trip the breaker.

Internal Circuits Overview

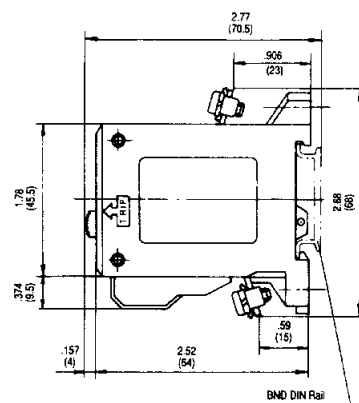
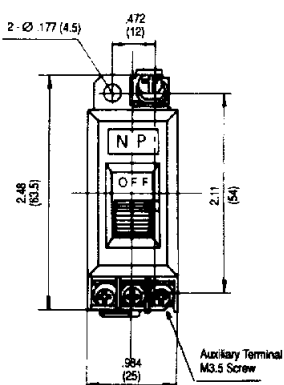
| Description | Circuit Example |
|-------------|--|
| | Series Trip This is the most common circuit breaker, providing excellent overload and short circuit protection. It can also be used as an ON/OFF switch. |
| | Series Trip with Auxiliary Contact Since the auxiliary contact operation is interlocked 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). |
| | Series Trip with Alarm Contact 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). |

Dimensions: NRC Series

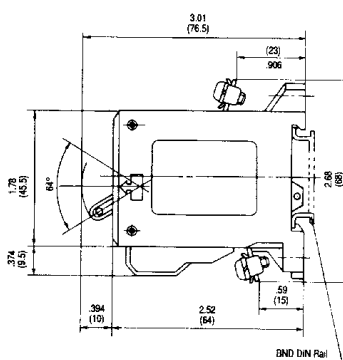
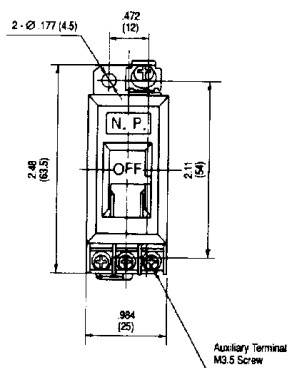
NRC110
Slide Actuator
1-Pole without Auxiliary Contacts



NRC110L
Lever Actuator
1-Pole without Auxiliary Contacts



NRC111
Slide Actuator
1-Pole with Auxiliary Contacts

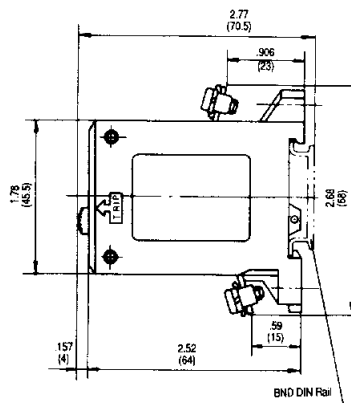
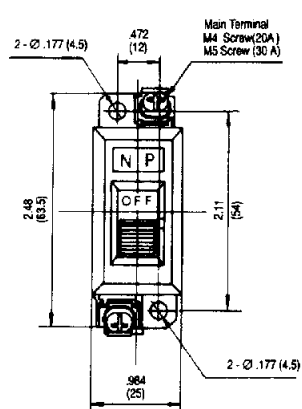


Installation Angle: Circuit breakers are designed to operate on a vertical surface. The mounting angle should not exceed a vertical plane by more than 10°.

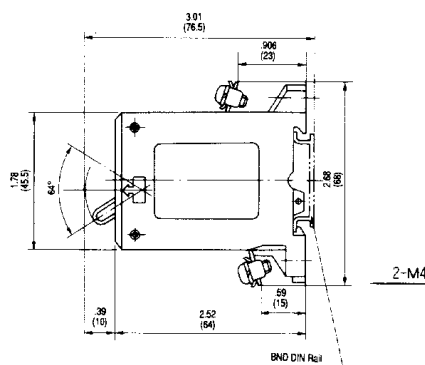
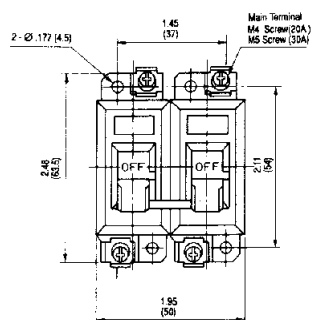


Dimensions: NRC Series, continued

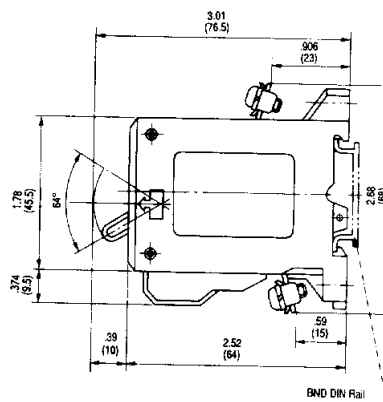
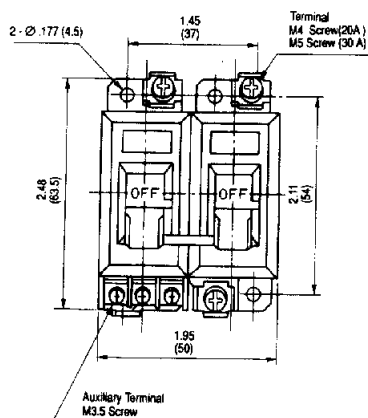
NRC111L
Lever Actuator
1-Pole with Auxiliary Contacts



NRC210L
Lever Actuator
2-Pole without Auxiliary Contacts



NRC211L
Lever Actuator
2-Pole with Auxiliary Contacts



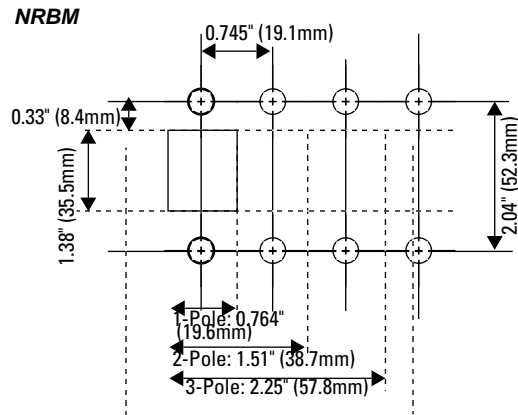
Installation Angle: Circuit breakers are designed to operate on a vertical surface. The mounting angle should not exceed a vertical plane by more than 10°.

Panel Cut-Outs, continued



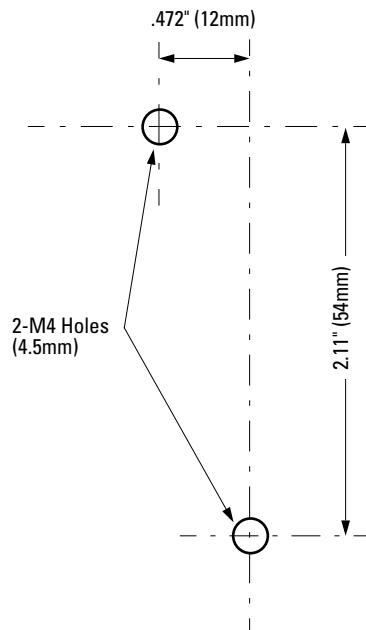
All drawings are not to scale unless scale is indicated.

NRBM Series

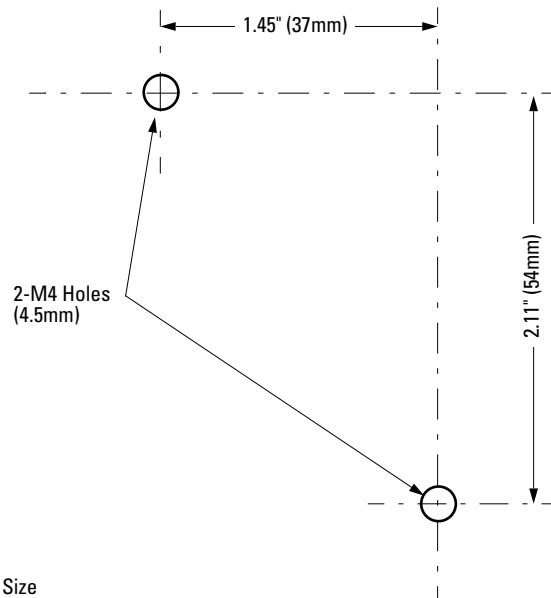


NRC Series

Surface Mounting Hole Layout 1-Pole



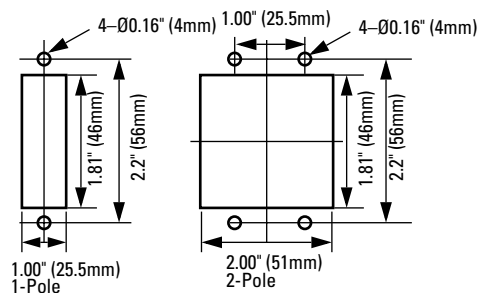
Surface Mounting Hole Layout 2-Pole



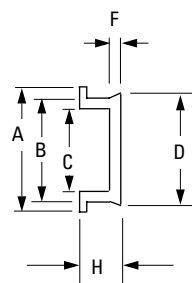
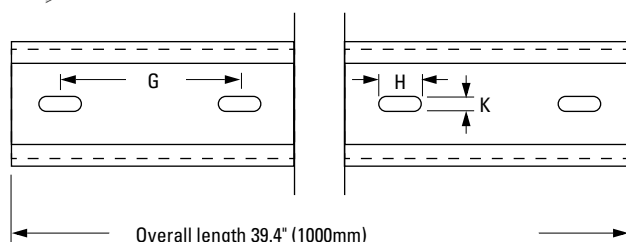
Scale: Full Size

Accessory Dimensions

Panel Cut-Out (when using NRC-M)

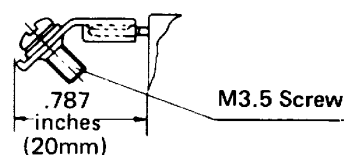


BNDN1000 Aluminum DIN Rail



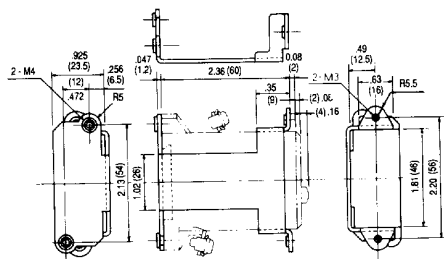
| | Length in Inches (mm) |
|---|-----------------------|
| A | 1.4" (35mm) |
| B | 1.14" (29mm) |
| C | 0.78" (23mm) |
| D | 1.2" (31mm) |
| E | 0.41" (10.5mm) |
| F | 0.11" (3mm) |
| G | 2" (51mm) |
| H | 0.47" (12mm) |
| K | 0.16" (4mm) |

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



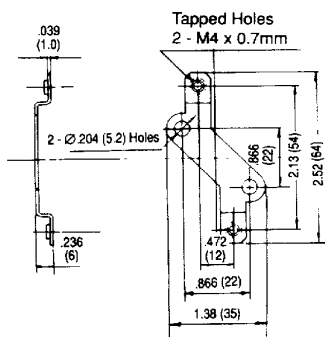
1. For use on main terminals only.
2. Includes M3.5 clamp screw.

Panel Cut-Out Adapter (NRC-M)



NRC-M Panel Mounting

Surface Mounting Bracket (NRC-F)



NRC-F Surface Mounting