NRBM Series

NRBM circuit breakers are the largest in rated current (1A to 50A) among the IDEC circuit breakers series. These small sized, high-efficiency breakers offer a variety of protection characteristics that can be widely employed for semiconductors, relay circuits, heater circuits, transformers, and solenoids.

Key features of the NRBM series include:

- **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**

c UL us File No. E68029

VDE license #113434

General Specifications

Protection Method	Electromagnetic tripping
Internal Circuit	Series current trip
Number of Poles	1, 2, 3
Rated Voltage	250V AC, 50/60Hz, 65V DC
Rated Tripping Currents	Current trip: 1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A, 40A, 50A
Rated Interrupting Capacity	250V AC, 50/60Hz, 1,000A 65V DC, 1,000A
Auxiliary Contacts **Alarm Contact**	SPDT microswitch 250V AC, 5A (resistive load) 50V DC, 1 A (resistive load)
Reference Temperature	25°C
Ambient Operating Temperature	–40 to +85°C (avoid freezing)
Insulation Resistance	100MΩ minutes (measured with 500V megger)
Dielectric Strength	Between main circuit terminals: 2,000V AC, 1 minute Between main circuit and auxiliary contact: 2,000V AC, 1 minute
Vibration Resistance	100N (approximately 10G), 10 to 55Hz
Shock Resistance	1,000N (approximately 100G)
Life Expectancy	10,000 operations minimum (at 6 operations per minute)
Terminal Style	Main terminal: M5 stud Auxiliary contact/ alarm contact: Quick-connect tab 0.110" terminal
Weight	1-pole/100g 2-pole/200g 3-pole/300g

1. Not suitable for branch circuit protection.

Part Numbering Guide

NRBM series part numbers are composed of 6 part number codes. When ordering an NRBM series part, select one code from each category.
Example: NRBM 1 1 11 F-30A-AA

NRBM	1	1	11	F	—	30A	—	AA
	① Poles	② Internal Circuit	③ Auxiliary and Alarm Contacts	④ Inertia Delay		⑤ Rated Current		⑥ Time Delay

Part Number Codes: NRBM Series

	Description	Part Number Code	Remarks
① No. of Poles	1-pole	1	All multiple circuit breakers are simultaneous throw/simultaneous break. All levers are mechanically interlocked.
	2-pole	2	
	3-pole	3	
② Internal Circuit	Series current trip	1	
③ Auxiliary and Alarm Contacts	Without	00	
	With auxiliary contact	11	Auxiliary contact switches change state with lever and/or overload condition
	With alarm contact	21	Alarm contact switches change state only with overload condition
④ Inertia Delay	Without inertia delay	Blank	
	With inertia delay	F	
⑤ Rated Current	Rated current (series current trip)	1A, 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A, 40A, 50A	
⑥ Time Delay Curve	DC curves	AD, MD	See page N-16 for delay curves. Leave blank for switch only units.
	AC curves	AA, BA, MA	

1. For NRBM series accessories, see page N-16.
2. For NRBM series time delay curves, see page N-16.
3. For NRBM series dimensions, see page N-19.
4. Not suitable for branch circuit protection.
5. UL recognized, applicable standard: UL1077, "Supplementary Protectors."

Information About Circuit Breakers

Time Delay Curve Descriptions

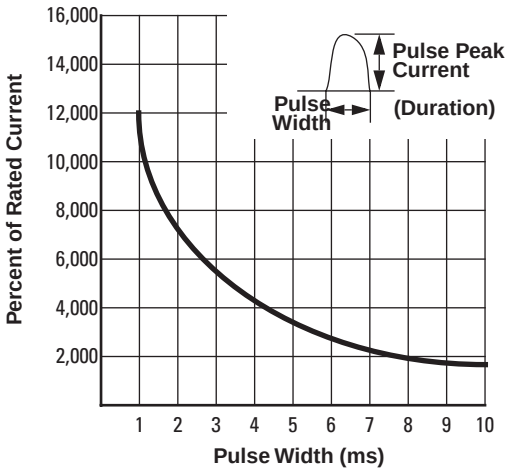
Time Delay Curve	NRBM Application
AD, AA	Common curves used in molded-case circuit breakers.
BA	Response to overcurrent is quite fast. Suited for protection of semiconductor circuits with very little overload tolerance. If overcurrents are expected to flow, fuses may be required according to the circuit 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.

Inertia delay is available with time delay curves AD, MD, AA, BA, and MA.

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



1. 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

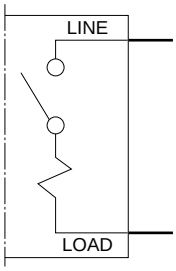
Multi-pole types such as 2- or 3-pole should be assembled by IDEC.
Because of their characteristics, 1-pole breakers cannot be combined to provide multi-pole units.
All multi-pole units are simultaneous break/simultaneous make, with levers mechanically interlocked.

Auxiliary and Alarm Contacts

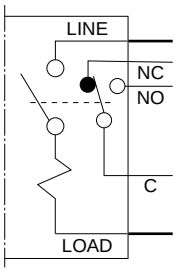
Multi-pole units with auxiliary contacts will have one set of auxiliary contacts on the right-most breaker. Multi-pole units with alarm contacts will have one set of alarm contacts on the left-most breaker.

Internal Circuits and Terminal Arrangements

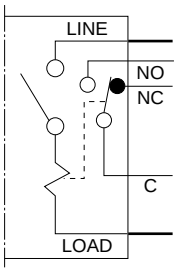
Series Current Trip



Series Current Trip with Auxiliary Contacts



Series Current Trip with Alarm Contacts



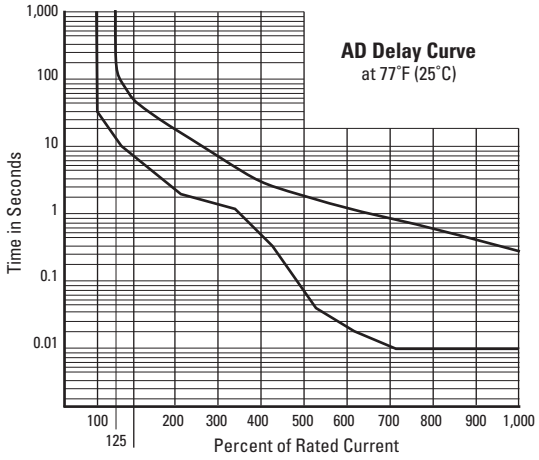
Time Delay Curves (numerical equivalent)

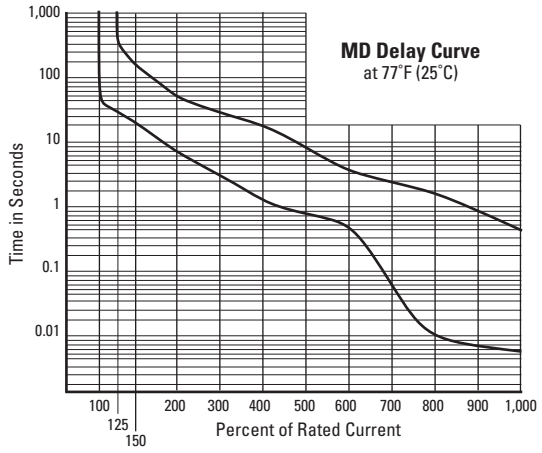
Overcurrent — Time Delay Characteristics (at 25°)

		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	0.14 – 1.4	0.008 – 0.7	0.005 – 0.35
DC	MD	No trip	35 – 400	20 – 180	8 – 60	1.6 – 10	0.6 – 4.5	0.01 – 2	0.007 – 0.5
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
AC (50/60Hz)	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
AC (50/60Hz)	MA	No trip	70 – 900	30 – 260	10 – 70	1.8 – 11	0.5 – 4	0.009 – 1.1	0.006 – 0.2

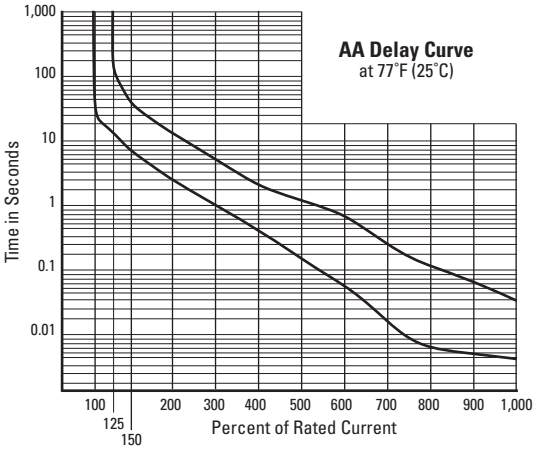
1. All values above are in seconds.
2. Data in this table is equivalent to information presented in following time delay curves.

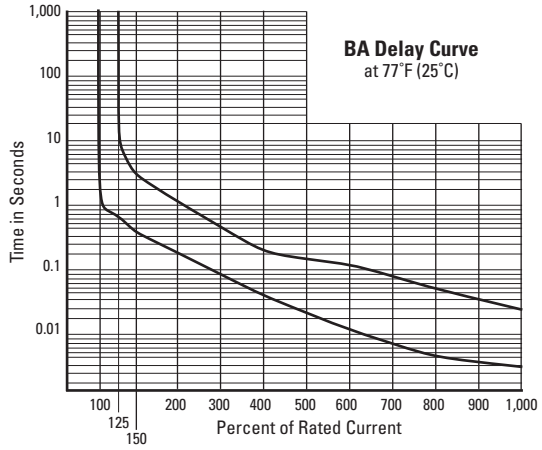
DC Time Delay Curves

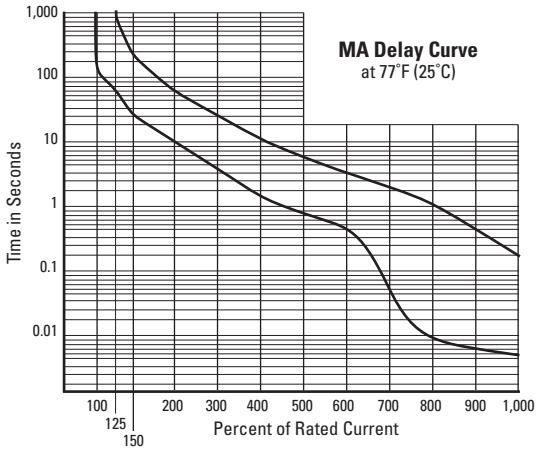




AC (50/60Hz) Time Delay Curves: NRBM Series







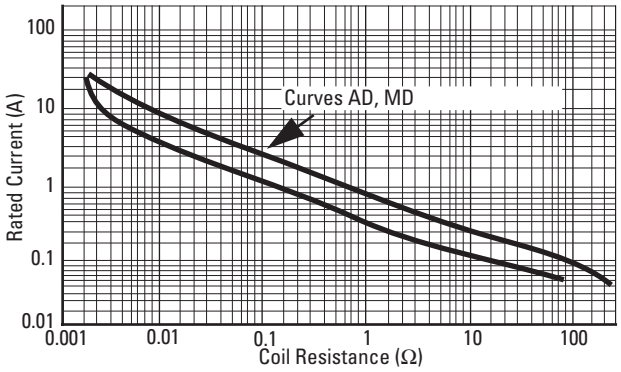
Resistance and Impedance Characteristics

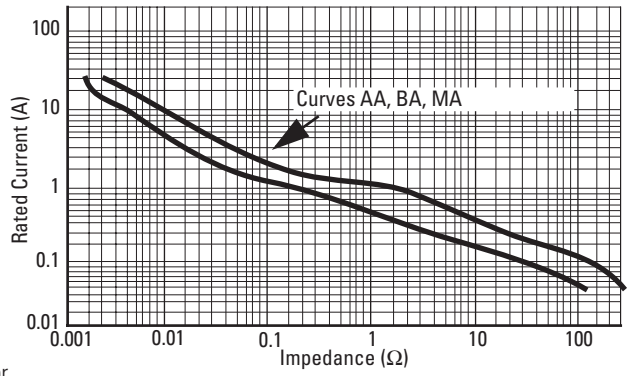
Coil Data for series Current Trip at 25°C

Rated Current	DC Resistance	AC Impedance (50/60Hz)
	Curves AD, MD	Curves AA, BA, MA
1A	1Ω	1.1Ω
2A	0.227Ω	0.245Ω
3A	0.091Ω	0.11Ω
5A	0.035Ω	0.039Ω
7.5A	0.015Ω	0.018Ω
10A	0.0088Ω	0.0124Ω
15A	0.005Ω	0.0065Ω
20A	0.003Ω	0.0047Ω
25A	0.0023Ω	0.0032Ω
30A	0.0019Ω	0.0031Ω
40A	0.0018Ω	0.002Ω
50A	0.0014Ω	0.0016Ω

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

Coil Resistance at 25°C



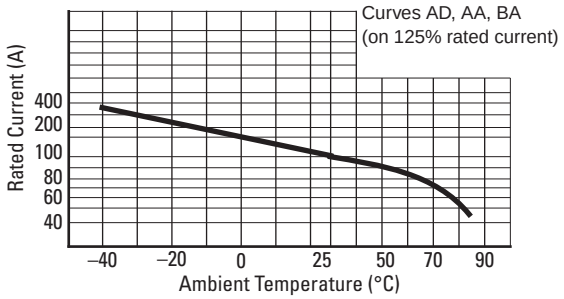


Voltage Drop Due to Coil Resistance or Impedance

The internal resistance or impedance of a circuit breaker tends to be larger for a smaller rated current. Therefore, when circuit breakers of 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.

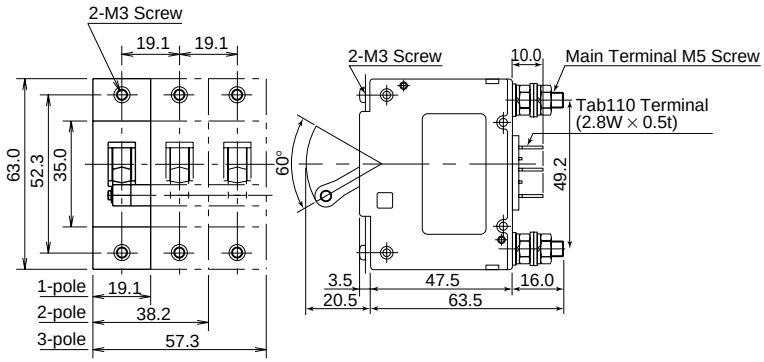
Time Delay Curve and Ambient Temperature

Since NRBM 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-16, are at 25°C. Time delay curves can be corrected.



Dimensions: NRBM Series

NRBM

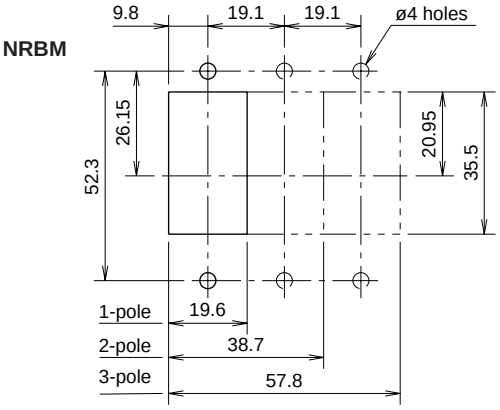


Panel Cut-Outs

NRBM Series

All drawings are not to scale unless scale is indicated.

NRBM



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.

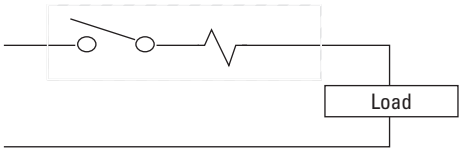
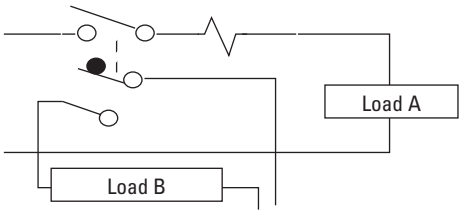
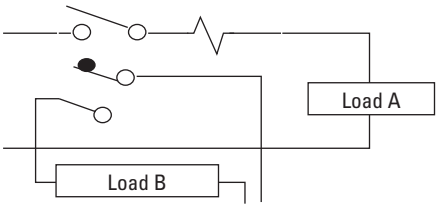
When a current load passes through the coil winding, it creates a magnetic field. As long as the current load is either at or below the nominal rating of the breaker, the metal core will remain stationary.

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).