

Bulletin 1489 Circuit Breakers

Selection Guide



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Bulletin 1489-A Circuit Breakers

- Energy-limiting design — protects downstream components better than conventional breakers during short circuits
- Field-mountable options for selective applications
- IP2x Finger-Protection (Front)
- North America certifications: UL 489, CSA C22.2 No. 5
- International standards: CE Marked, and IEC (VDE) standards for worldwide acceptance
- Ratings: UL/CSA — max. 480Y/277V AC – up to 14 kA interrupt rating;
IEC — max. 240/415V AC – 15 000 A interrupt rating
- 48V DC rating, 96V DC — 2-pole series
- A positively trip-free mechanism (breaker operation cannot be defeated by holding the handle in the ON position)
- Trip curves: C and D
- Time delay (D Characteristic) for high inrush currents during inductive start-ups such as motors, transformers and power supplies
- Superior shock and vibration resistance capabilities — helps to prevent nuisance tripping
- Mounts on DIN Rail
- Wire connect, line and load (reversible)
- Optional terminals for ring lug terminals

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Standards Compliance

UL 489
 CSA C22.2 No. 5
 EN/IEC 60947-2

Certifications

UL Listed
 CSA Certified
 CE Marked
 VDE Certified

Industrial Circuit Breakers for North American Applications

The Bulletin 1489-A line includes:

- UL 489, CSA C22.2 No. 5
- 240V AC 0.5...40 A
- 480V/277V AC 0.5...32 A
- Miniature Circuit Breaker for EN/IEC Applications
EN/IEC 60947-2
415V AC 0.5...40 A
- SWD (0.5...20 A) Switching Duty for fluorescent lighting applications
- HACR
- 1-pole 48V DC 0.5...40 A
- 2-pole (series) 96V DC 0.5...40 A
- 48V DC 0.5...40 A

Description

Bulletin 1489-A Circuit Breakers for Branch Circuit protection are available in 1-, 2-, and 3-pole construction and are rated 0.5...40 A at 240V AC and 0.5...32 A at 480Y/277V AC for North American applications (UL 489 and CSA C22.2 No. 5). The circuit breakers also have a 1-pole 48V DC, 2-pole (series) 96V DC rating. For EN/IEC applications the products are rated 415V AC, 48V AC 0.5...40 A.

Thermal Magnetic Circuit Breakers

The Bulletin 1489-A Thermal Magnetic Circuit Breakers are general-purpose devices suitable for the majority of industrial, inverse time circuit breaker applications.

They combine thermal and magnetic trip actions and provide accurate overload and short-circuit protection for conductors and connected equipment.

Circuit Breaker Application Information

Selection of a Bulletin 1489 circuit breaker with appropriate circuit protection includes consideration of:

- Circuit Voltage
- Circuit Frequency
- Available Short Circuit Current
- Continuous Current Rating
- Application Considerations
- Special Operating Conditions

The following discussion is based upon National Electric Code and UL requirements. Similar considerations are appropriate for Canadian applications.

Features

- Designed manufactured and listed to UL 489 (CSA 22.2 No. 5)
- Thermal-magnetic protection
- All ratings are HACR rated
- up to 14 kA Interrupting rating
- Finger-safe design (front)
- DIN Rail mounting
- Line and load wire connections
- Optional ring terminal connections (convertible)

Circuit Voltage

The Bulletin 1489-A circuit breakers are rated by voltage class. Applications should not exceed the listed voltage and current range (see Table 1).

Circuit Frequency

The Bulletin 1489-A circuit breakers may be applied to frequencies of 50 Hz and 60 Hz without derating. For applications above 60 Hz, contact Rockwell Automation with specific application information for the derating of the circuit breakers.

Available Short Circuit Current

The Bulletin 1489-A circuit breakers should only be applied in those applications in which the available short-circuit (or fault) current is less than or equal to 10 kA...14 kA (US/Canada) and 15 kA (IEC).

Table 1. Voltage and Current Ranges

Region	Max. Voltage	Current Range [A]
EN/IEC Regions	415V AC	0.5...40
	48V DC	0.5...40
North America (UL 489 & CSA C22.2 No. 5)	240V AC	0.5...40
	480Y/277V AC	0.5...32
	1-pole 48V DC	0.5...40
	2-pole 96V DC	0.5...40

Bulletin 1489-A

Circuit Breaker

Description, Continued

Continuous Current Rating

Standard current ratings are: 0.5, 1, 1.5, 2, 3, 4, 5, 6, 7, 8, 10, 15, 16, 20, 25, 30, 32, 35, and 40 A.

The Bulletin 1489-A circuit breakers are rated in RMS amperes at a 40 °C (104 °F) ambient temperature per the UL 489 (CSA 22.2 No. 5) standard. This temperature is generally used as the average temperature within an industrial enclosure. If a circuit breaker is applied in a temperature that exceeds the 40 °C (104 °F) ambient, then the circuit breaker should be derated. For IEC 60 947-2 standard, the products carry an ambient rating of 30 °C. Follow standard IEC application considerations for temperature rating in different ambient temperatures.

The characteristic trip curves are shown on page 7. The trip bands shown for each breaker represent current tripping limits for a circuit breaker and are within the limits established by UL. For a specific current at 40 °C (104 °F), a circuit breaker will open ("clear the circuit") automatically at some total time that will be within the "Minimum" and "Maximum" time shown on the curves. For example, page 7 shows that a one-pole, 15 A, Bulletin 1489-A circuit breaker trips in not less than 10 s and not more than 120 s on a 30 A current. Because the UL standard defines this time spread, users should not specify exact tripping time. The lower current portion of the curves (upper left) depict the time to trip due to thermal action and reflect overload protection of the wire and connect load. The higher current portion of the curves (lower right) depicts the trip due to magnetic action of the circuit breaker and reflects protection due to short circuit level currents.

Application Considerations

The following is a discussion of application considerations related to North American applications. When applying product to IEC regional requirements, follow IEC practices and guidelines.

The selection of a specific ampere rating for a specific application is dependent on the type of load and duty cycle and is governed by the National Electric Code (Canadian Electric Code) and UL/CSA. In general, the codes require that overcurrent protection is at the current supply and at points where wire sizes are reduced. In addition, the codes state that conductors be protected according to their current carrying capacity. There are specific situations that require application consideration, such as motor circuit, and guidelines for the selection for transformer protection.

The Bulletin 1489-A circuit breakers are "non 100 percent rated" as defined by UL 489, para 7.1.4.2. As such, the circuit breaker's rating should be loaded to no more than 80% if used with continuous loads.

Line and load may be reversed. The Bulletin 1489 circuit breaker may be bottom fed.

Branch Circuits:

Bulletin 1489-A circuit breakers may be used to protect branch circuits. A branch circuit is the wiring portion of a system extending beyond the final overcurrent device protecting the circuit.

Guidelines established in NEC, CEC, UL, and CSA should be used to determine the specific device. For example:

1) Motor Branch Circuit

Bulletin 1489-A circuit breakers are not horsepower rated because they are able to safely interrupt currents far in excess of the locked rotor value for a selected motor. This ability is recognized in the codes and standards and is also established by the UL and CSA tests described in UL 489 and CSA C22.2 No. 5 standards.

The size of a Bulletin 1489 circuit breaker should be determined

following the guidelines for an Inverse Time Circuit Breaker.

References: NEC 430.51 and UL 489. Also see CEC and appropriate Canadian Standards.

2) Transformer Protection

Bulletin 1489-A circuit breakers may be used for transformer protection following the guidelines established.

References: NEC 450 and UL 489. Also see CEC and appropriate Canadian Standards.

3) Heater Load, Lighting, and Other Load Protection

Bulletin 1489-A circuit breakers may be used for protection of heater loads, lighting loads, and other loads following the guidelines established.

References: NEC Article 31 and UL 508A. Also see CEC and appropriate Canadian Standards.

Coordinated Overcurrent Protection

Where an orderly shutdown is required to minimize the hazards to personnel and equipment, a system of coordination based upon the faulted or overloaded circuit is isolated by selective operation of only the overcurrent protective device closest to the overcurrent condition. The user should select devices that meet this requirement.

References: NEC 240.12. Also see CEC.

HACR Rating

Bulletin 1489-A Circuit Breakers are rated as Heating, Air Conditioning and Refrigeration circuit breakers as defined by UL 489, paragraph 6.7 and may be used in this type of application.

SWD Rating

The Bulletin 1489 breakers (0.5 ... 20 A) are rated as SWD and as such may be applied to switch fluorescent lighting loads up to their current and voltage maximum.

Current Limiting

Bulletin 1489-A Circuit Breakers are rated as current limiting circuit breakers as defined by UL 489, paragraph 8.6.

The Bulletin 1489-A line features the ability to achieve short circuit interruptions far more effectively than conventional breakers. In conventional circuit breakers, the short circuit interruption time required is approximately one or two half cycles of an AC sine wave. When the contacts open, the resulting arc continues to burn until the current level passes through zero. The arc may re-ignite because of the insufficient width of the contact gap. The current that flows until the arc is extinguished produces a heating effect proportional to the I^2t value (let-through-energy) of the fault current.

The Bulletin 1489-A device is designed to substantially reduce the amount of let-through-current and the resulting let-through-energy that can damage protected components. The Bulletin 1489 has the ability to interrupt short circuit current within the first half cycle of the fault. Limiting let-through current and energy will protect against the harmful effects of overcurrent and is focused primarily on avoiding the following:

- Excessive Heat
- Mechanical Damage

Both of these factors are proportional to the square of the current. Thermal energy is proportional to the square of the RMS value and magnetic forces are proportional to the square of the peak value. The most effective way to provide protection is to substantially limit let-through-energy. This provides the following advantages

- Far less damage at the location of the short circuit.
- Fast electric separation of a faulty unit from the system, especially power supplies connected in parallel that are switched off when the voltage of the power bus drops below a certain level.
- Far less wear on the miniature circuit breaker itself. This means more safe interruptions.
- Better protection of all components in the short circuit path.
- Far wider range of selective action when used with an upstream protective device. (No nuisance shut downs from feeder line interruptions, causing a blackout in all connected branches.)

The following values are applicable to the whole product range with frequency of 50/60 Hz.

The values were derived from worst case V AC testing of:

D trip 40 A, 240V AC @ 10 kA

D trip 32 A, 480Y/277V AC @ 10 kA

D trip 20 A, 480Y/277V AC @ 14 kA

Current-Limiting at 240V / 10 kA 1p, 2p, 3p $I^2t = 43 \text{ kA}^2\text{s}$ and $I_{peak} = 6.2 \text{ kA}$

Current-Limiting at 480Y/277V / 10 kA 1p, 2p, 3p $I^2t = 60 \text{ kA}^2\text{s}$ and $I_{peak} = 6.2 \text{ kA}$

Current-Limiting at 480Y/277V / 14 kA 1p, 2p, 3p $I^2t = 65 \text{ kA}^2\text{s}$ and $I_{peak} = 7.5 \text{ kA}$

Bulletin 1489-A Ambient Temperature Derating

The standard tripping characteristic for Bulletin 1489-A is Type C. Type C has a magnetic trip activated at 5...10 times the rated current of the circuit breaker. The reference temperature for the thermal tripping characteristics is 40 °C. The Type C characteristic will suit most applications.

In rare occurrences when the Type C characteristic does not fully meet the application, the following additional magnetic trip characteristic is available:

Type D allows for transients approximately twice as high as the standard Type C.

Use the following table and graph to determine the current rating for the breaker if the ambient is significantly different than 40 °C.

Bulletin 1489-A Ambient Temperature Derating Calibration Temperature 40° C (UL) Application below 0° C is for non-condensing atmosphere*

Device Marked Current Rating [A] @ 40 °C	Ambient Temperature (°C)											
	-25	-20	-10	0	10	20	30	35	40	45	50	55
0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.50	0.5	0.5	0.5
1.0	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0	0.9
1.5	1.9	1.9	1.8	1.7	1.7	1.6	1.6	1.5	1.5	1.5	1.4	1.4
2.0	2.5	2.5	2.4	2.3	2.2	2.2	2.1	2.0	2.0	2.0	1.9	1.9
3.0	3.8	3.7	3.6	3.5	3.4	3.2	3.1	3.1	3.0	2.9	2.9	2.8
4.0	5.0	5.0	4.8	4.6	4.5	4.3	4.2	4.1	4.0	3.9	3.8	3.8
5.0	6.3	6.2	6.0	5.8	5.6	5.4	5.2	5.1	5.0	4.9	4.8	4.7
6.0	7.5	7.4	7.2	7.0	6.7	6.5	6.2	6.1	6.0	5.9	5.8	5.6
7.0	8.8	8.7	8.4	8.1	7.8	7.6	7.3	7.1	7.0	6.9	6.7	6.6
8.0	10.0	9.9	9.6	9.3	9.0	8.6	8.3	8.2	8.0	7.8	7.7	7.5
10.0	12.6	12.4	12.0	11.6	11.2	10.8	10.4	10.2	10	9.8	9.6	9.4
13.0	16.3	16.1	15.6	15.1	14.6	14.0	13.5	13.3	13	12.7	12.5	12.2
15.0	18.8	18.6	18.0	17.4	16.8	16.2	15.6	15.3	15	14.7	14.4	14.1
16.0	20.1	19.8	19.2	18.6	17.9	17.3	16.6	16.3	16	15.7	15.4	15.0
20.0	25.1	24.8	24.0	23.2	22.4	21.6	20.8	20.4	20	19.6	19.2	18.8
25.0	31.4	31.0	30.0	29.0	28.0	27.0	26.0	25.5	25	24.5	24.0	23.5
30.0	37.7	37.2	36.0	34.8	33.6	32.4	31.2	30.6	30	29.4	28.8	28.2
32.0	40.2	39.7	38.4	37.1	35.8	34.6	33.3	32.6	32	31.4	30.7	30.1
40.0	43.9	43.4	42.0	40.6	39.2	37.8	36.4	35.7	35	34.3	33.6	32.9

* Care should be taken for application below 0 °C. These devices are not certified to operate correctly in the presence of ice.

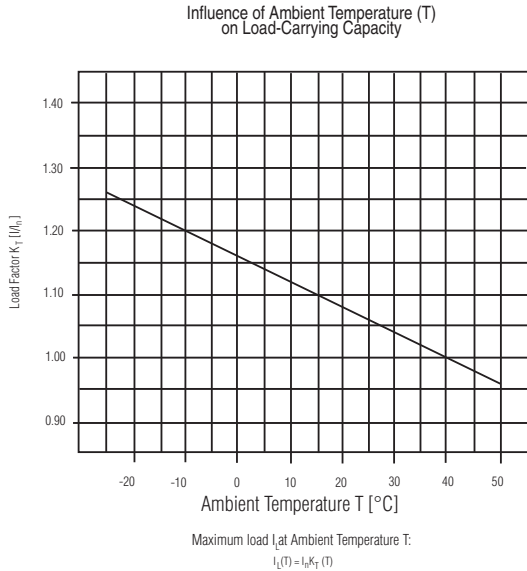
All other specifications for standard Bulletin 1489-A products remain unchanged.

The ambient temperature derating applies to applications of the device as an IEC Miniature Circuit Breaker (MCB), following 60 947-2 and as Circuit Breaker to UL489/CSA 22.2 No 5..

Ambient temperature refers to the free air temperature in contact with the 1489 device

Bulletin 1489-A
Circuit Breaker
 Description, Continued

Ambient Temperature Graph



The 1489-A circuit breaker can function over a wide temperature range (-30...+60 °C). Operation in ambient temperatures below 0 °C is based on a non condensing atmosphere (no ice). Use the graph above or contact your local Rockwell Automation sales office or Allen-Bradley distributor to determine the correction factor based upon ambient

Terminals

Standard wire (cable) connection

The standard configuration of the Bulletin 1489-A is with terminals suitable for connection of stranded copper wire of the wire size #18 ... 8 AWG (1.0 ... 10 mm²). Strip length for the termination is 0.5 in. (12 mm). Terminals are shipped in the open position for ease of installation.

Optional Ring Termination

For the Bulletin 1489-A circuit breakers, an optional terminal configuration (suffix R) is available for use with a ring terminal. This configuration is shipped so that the terminal screw may be unscrewed and withdrawn for the insertion of the ring terminal at proper connection point. The screw is then retightened to provide proper wire termination.

This unique terminal may be field converted to open the wire termination to allow standard wire termination of the converted terminal.

Bus Bars

For the Bulletin 1489-A circuit breakers, UL Recognized bus bars and UL Listed feeder terminals are available for group connection of

circuit breakers. They are available in 1-, 2-, and 3- pole configurations for connection of multiple circuit breakers.

Lock-out Attachment

A sturdy lock-out attachment may be added to a circuit breaker. This lock-out may be padlocked so that the circuit breaker is locked in the off position.

Shunt Trip

A shunt trip may be added to a circuit breaker to allow the device to be tripped from a remote source. One version is for tripping voltages of 12...110V AC (12...60V DC) and another for tripping voltages of 110...415V AC (110...230V DC).

Auxiliary Contacts

An auxiliary contact module may be added to a circuit breaker to provide pilot duty contacts to indicate the position of circuit breaker, off or on. This contact changes state when the circuit breaker is operated either manually or electrically.

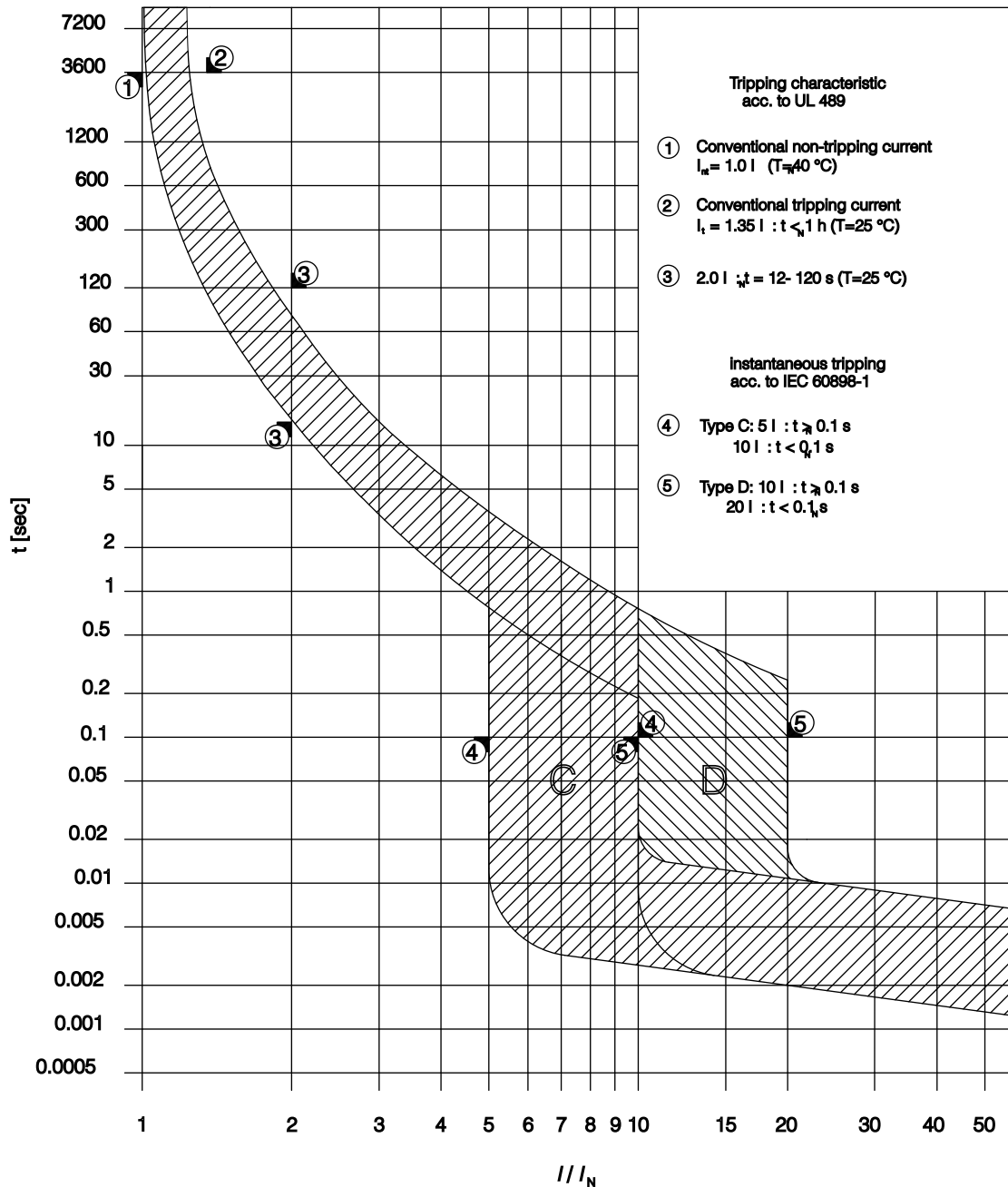
Signal Contacts

A signal/auxiliary contact module may be added to a circuit breaker to provide auxiliary contact information off and on and signal contact pilot duty contacts. With signal contacts, the contacts change state only when the circuit breaker changes state from On to Off because of an electrical operation. The module contains one signal contact, form C contact (N.O. and N.C contact with common) and one auxiliary contact (N.O. and N.C contact with common).

Time-Current Characteristic Bulletin 1489

Type C and D

Ambient Temperature 40 °C



Circuit Breaker

Catalog Number Explanation

Bulletin 1489 Cat. No. Explanation

Examples given in this section are for reference purposes. This basic explanation should not be used for product selection; not all combinations will produce a valid catalog number.

$$1489 - \frac{A}{a} \frac{1}{b} \frac{C}{c} \frac{005}{d} \frac{R}{e}$$

a

Body Style	
Code	Description
A	Standard configuration, AC Device
D	Standard configuration, DC Device

b

Poles	
Code	Description
1	1-Pole
2	2-Pole
3	3-Pole

c

Trip Curve	
Code	Trip Curve
B	Trip Curve B
C	Trip Curve C
D	Trip Curve D

d

Rated Current (I_n)	
Code	Current [A]
005	0.5
010	1
015	1.5
020	2
030	3
040	4
050	5
060	6
070	7
080	8
100	10
130	13
150	15
160	16
200	20
250	25
300	30
320	32
350	35
400	40

e

Factory Modifications	
Code	Description
blank	Standard Terminal
R	Ring Terminal

Product Selection

Bulletin 1489-A AC Miniature Circuit Breakers

Bulletin 1489 1-Pole AC Miniature Circuit Breakers

No. of Poles	EN/IEC Maximum Voltage	Trip Curve	UL/CSA Max. Volt.	Rated Current [A]	Standard Wire Configuration Cat. No.	Ring Terminal Configuration Cat. No.				
1	415V AC, 48V DC	C	277V AC, 48V DC	0.5	1489-A1C005	1489-A1C005R				
				1	1489-A1C010	1489-A1C010R				
				1.5	1489-A1C015	1489-A1C015R				
				2	1489-A1C020	1489-A1C020R				
				3	1489-A1C030	1489-A1C030R				
				4	1489-A1C040	1489-A1C040R				
				5	1489-A1C050	1489-A1C050R				
				6	1489-A1C060	1489-A1C060R				
				7	1489-A1C070	1489-A1C070R				
				8	1489-A1C080	1489-A1C080R				
				10	1489-A1C100	1489-A1C100R				
				13	1489-A1C130	1489-A1C130R				
				15	1489-A1C150	1489-A1C150R				
				16	1489-A1C160	1489-A1C160R				
				20	1489-A1C200	1489-A1C200R				
				25	1489-A1C250	1489-A1C250R				
				30	1489-A1C300	1489-A1C300R				
				32	1489-A1C320	1489-A1C320R				
							240V AC, 48V DC	35	1489-A1C350	1489-A1C350R
								40	1489-A1C400	1489-A1C400R
				D	277V AC, 48V DC	0.5	1489-A1D005	1489-A1D005R		
						1	1489-A1D010	1489-A1D010R		
						1.5	1489-A1D015	1489-A1D015R		
						2	1489-A1D020	1489-A1D020R		
						3	1489-A1D030	1489-A1D030R		
						4	1489-A1D040	1489-A1D040R		
						5	1489-A1D050	1489-A1D050R		
						6	1489-A1D060	1489-A1D060R		
						7	1489-A1D070	1489-A1D070R		
						8	1489-A1D080	1489-A1D080R		
						10	1489-A1D100	1489-A1D100R		
						13	1489-A1D130	1489-A1D130R		
						15	1489-A1D150	1489-A1D150R		
						16	1489-A1D160	1489-A1D160R		
						20	1489-A1D200	1489-A1D200R		
						25	1489-A1D250	1489-A1D250R		
						30	1489-A1D300	1489-A1D300R		
						32	1489-A1D320	1489-A1D320R		
							240V AC, 48V DC	35	1489-A1D350	1489-A1D350R
								40	1489-A1D400	1489-A1D400R

Bulletin 1489-A
Circuit Breaker
 Product Selection

Bulletin 1489-A 2-Pole AC Miniature Circuit Breakers

No. of Poles	EN/IEC Maximum Voltage	Trip Curve	UL/CSA Max. Volt.	Rated Current [A]	Standard Wire Terminal Cat. No.	Ring Terminal Configuration Cat. No.
2	415V AC	C	480Y/277V AC, 96V DC	0.5	1489-A2C005	1489-A2C005
				1	1489-A2C010	1489-A2C010R
				1.5	1489-A2C015	1489-A2C015R
				2	1489-A2C020	1489-A2C020R
				3	1489-A2C030	1489-A2C030R
				4	1489-A2C040	1489-A2C040R
				5	1489-A2C050	1489-A2C050R
				6	1489-A2C060	1489-A2C060R
				7	1489-A2C070	1489-A2C070R
				8	1489-A2C080	1489-A2C080R
				10	1489-A2C100	1489-A2C100R
				13	1489-A2C130	1489-A2C130R
				15	1489-A2C150	1489-A2C150R
				16	1489-A2C160	1489-A2C160R
				20	1489-A2C200	1489-A2C200R
				25	1489-A2C250	1489-A2C250R
				30	1489-A2C300	1489-A2C300R
				32	1489-A2C320	1489-A2C320R
				35	1489-A2C350	1489-A2C350R
				40	1489-A2C400	1489-A2C400R
		0.5	1489-A2D005	1489-A2D005R		
		1	1489-A2D010	1489-A2D010R		
		1.5	1489-A2D015	1489-A2D015R		
		2	1489-A2D020	1489-A2D020R		
		3	1489-A2D030	1489-A2D030R		
		4	1489-A2D040	1489-A2D040R		
		5	1489-A2D050	1489-A2D050R		
		6	1489-A2D060	1489-A2D060R		
		7	1489-A2D070	1489-A2D070R		
		8	1489-A2D080	1489-A2D080R		
		10	1489-A2D100	1489-A2D100R		
		13	1489-A2D130	1489-A2D130R		
		15	1489-A2D150	1489-A2D150R		
		16	1489-A2D160	1489-A2D160R		
		20	1489-A2D200	1489-A2D200R		
		25	1489-A2D250	1489-A2D250R		
		30	1489-A2D300	1489-A2D300R		
		32	1489-A2D320	1489-A2D320R		
		35	1489-A2D350	1489-A2D350R		
		40	1489-A2D400	1489-A2D400R		
		D	240V AC, 96V DC	0.5	1489-A2D005	1489-A2D005R
				1	1489-A2D010	1489-A2D010R
				1.5	1489-A2D015	1489-A2D015R
				2	1489-A2D020	1489-A2D020R
				3	1489-A2D030	1489-A2D030R
				4	1489-A2D040	1489-A2D040R
				5	1489-A2D050	1489-A2D050R
				6	1489-A2D060	1489-A2D060R
				7	1489-A2D070	1489-A2D070R
				8	1489-A2D080	1489-A2D080R
				10	1489-A2D100	1489-A2D100R
				13	1489-A2D130	1489-A2D130R
				15	1489-A2D150	1489-A2D150R
				16	1489-A2D160	1489-A2D160R
				20	1489-A2D200	1489-A2D200R
				25	1489-A2D250	1489-A2D250R
				30	1489-A2D300	1489-A2D300R
				32	1489-A2D320	1489-A2D320R
				35	1489-A2D350	1489-A2D350R
				40	1489-A2D400	1489-A2D400R