

UL 489 and UL 1077 DIN rail miniature circuit breakers



EATON

Powering Business Worldwide

UL 489 DIN rail branch circuit breakers

FAZ-NA circuit breakers

PRODUCT OVERVIEW

Optimum and efficient protection



Optimum product quality, tested reliability and safety stand for best protection of personnel, installations and plant. Eaton's FAZ-NA DIN rail mountable circuit breaker is designed for use in branch service applications.

Powerful offering for machine and system builders

The FAZ-NA is available with B, C and D characteristics in accordance with UL® 489, CSA® C22.2 No.5; UL 1077, CSA C22.2 No.235 and IEC 60947-2. These devices are CE marked.

Typical applications

Feeder and branch circuit protection

- Convenience receptacle circuits (internal/external)
- Motor control circuits
- Load circuits leaving the equipment (external)
- HACR equipment (heating, air conditioning, refrigeration) (internal/external)
- PLC I/O points
- Computers
- Power supplies
- Control instrumentation
- Relays
- UPS
- Power conditioners

Features


- Complete range of UL 489 listed DIN rail mounted miniature circuit breakers up to 63 A current rating
- Standard ratings of 10 kAIC up to 277/480 Vac
- Select amperages available at 14 kAIC up to 277/480 Vac and 10 kAIC up to 125 Vdc per pole
- Current limiting design provides fast short-circuit interruption that reduces the let-through energy, which can damage the circuit
- Suitable for branch circuit device protection
- Thermal-magnetic overcurrent protection
 - Three levels of short-circuit protection, categorized by B, C and D curves

- Single-, two-, three- and four-pole configurations available
- Trip-free design—breaker can not be defeated by holding the handle in the ON position
- Captive screws cannot be lost
- SWD (switching duty)—suitable for switching fluorescent lighting loads ($I_n \leq 20$ A)
- Fulfill UL 489, CSA C22.2 No.5 and also IEC 60947-2 Standard
- For use in applications for which UL 1077 or CSA C22.2 No.235 are also allowed
- Field installable shunt trip and auxiliary switch subsequent mounting
- Separate version for ring-tongue connection (Type FAZ-RT), terminal screws can be removed (on both sides)
- Module width of only 17.7 mm (per pole)
- Contact Position Indicator (red/green)
- Easy installation on DIN rail
- Possibility for sealing the toggle in ON or OFF position


FAZ-NA complies with the latest national and international standards

Standards—feeder and branch circuit protection


UL 489

Standard for molded case circuit breakers (MCCB) for feeder and branch circuit protection.	
Products meet the requirements of the National Electrical Code® (NEC®).	


CSA C22.2 No.5

Standard for molded case circuit breakers (MCCB) for feeder and branch circuit protection (corresponds closely to UL 489 Standard).	
Products meet the requirements of the Canadian Electrical Code (CEC).	

RoHS

These devices are RoHS compliant.	
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VDE

These devices are VDE compliant.	
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ABS

These devices are ABS compliant.	
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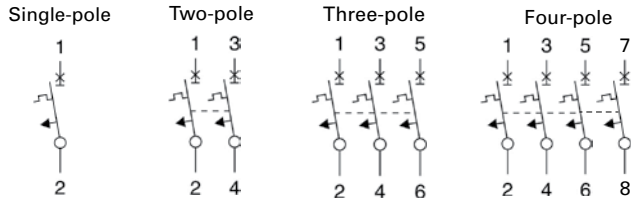
UL 489 DIN rail branch circuit breakers

FAZ-NA circuit breakers

TECHNICAL DATA

Miniature circuit breakers FAZ-NA for 480 and 240 Vac

Connection diagrams



Miniature circuit breakers FAZ-NA

Description

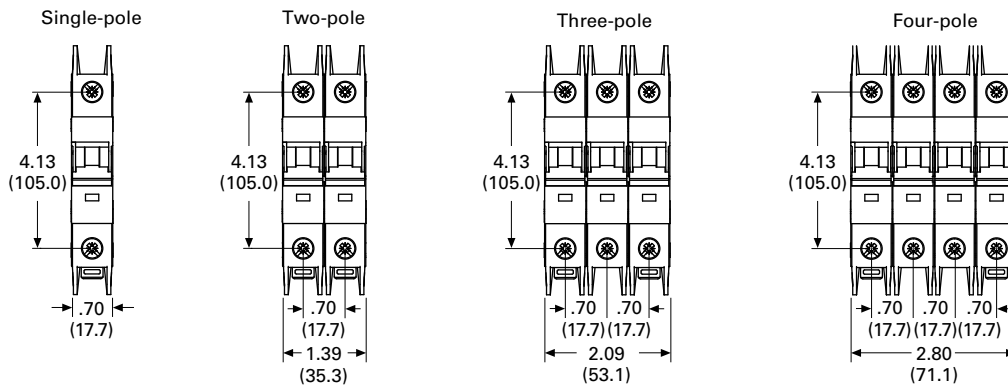
Electrical

Design according to	UL 489, CSA C22.2 No.5, IEC 60947-2
Rated voltage FAZ-NA UL/CSA	10 kAIC at 277/480 V from 0.5 A to 32 A 14 kAIC at select amperages B and C Curves (15–25 A), D Curve (13–20 A)
UL/CSA UL/CSA IEC 947-2	10 kAIC at 240 Vac for 35 A to 63 A 10 kAIC at 48 Vdc per pole 15 kAIC at 240/415 Vac
Rated voltage FAZ-NA-DC UL/CSA	10 kAIC at 125 Vdc per pole (two poles maximum) 10 kAIC at 250 Vdc with two poles connected in series
Rated frequency	50/60 Hz
Characteristic	B, C, D
Endurance	≥ 20,000 Operations
Line voltage connection	Suitable for reverse feed
Mechanical	
Frame size	45 mm
Device height	105 mm
Device width	17.7 mm per pole
Terminal protection	Finger and hand touch safe according to BGV A3, OVE-EN 6
Mounting	Quick fastening with two lock-in positions on IEC/EN 60715
Upper and lower terminals	Open mouth/lift terminals
Terminal capacity	One wire AWG 18–6 Two wires AWG 18–10
Terminal fastening torque	AWG 18-21: 21 lb-in AWG 10-8: 25 lb-in AWG 6: 36 lb-in
Mounting	Independent of position
Calibration temperature	
UL 489, CSA C22.2 No.5	40 °C
IEC 60947-2	30 °C

Dimensions

Miniature circuit breakers

FAZ-NA



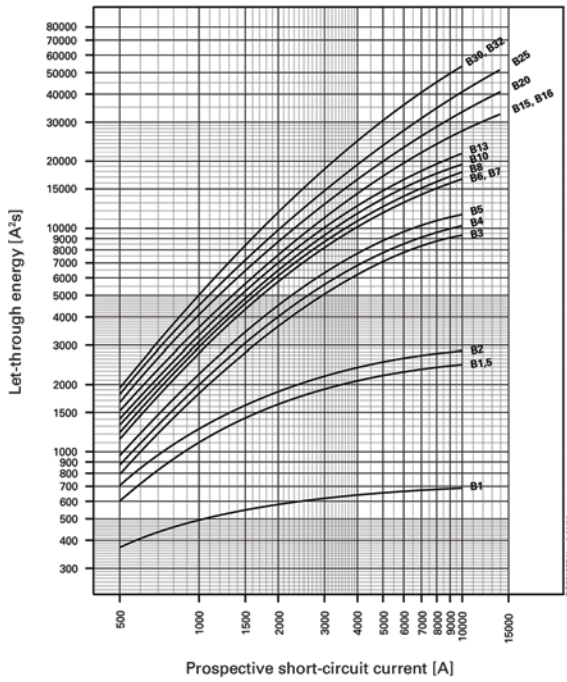
UL 489 DIN rail branch circuit breakers

FAZ-NA circuit breakers

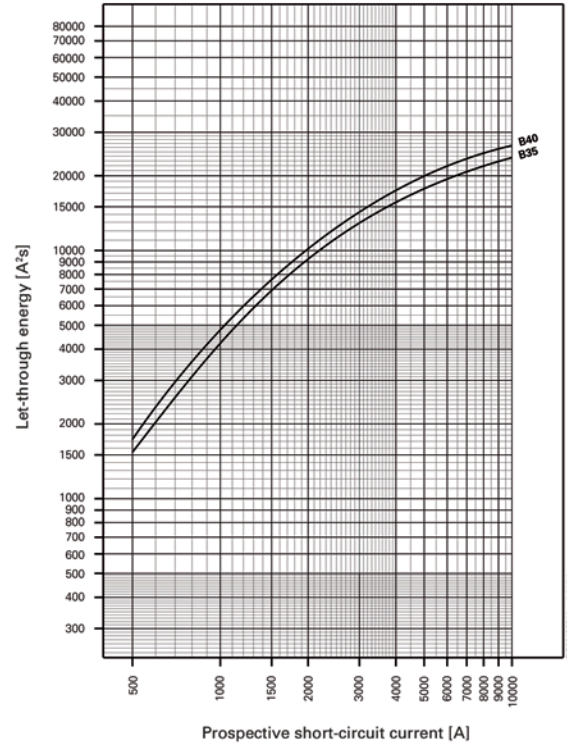
TECHNICAL DATA

Let-through energy

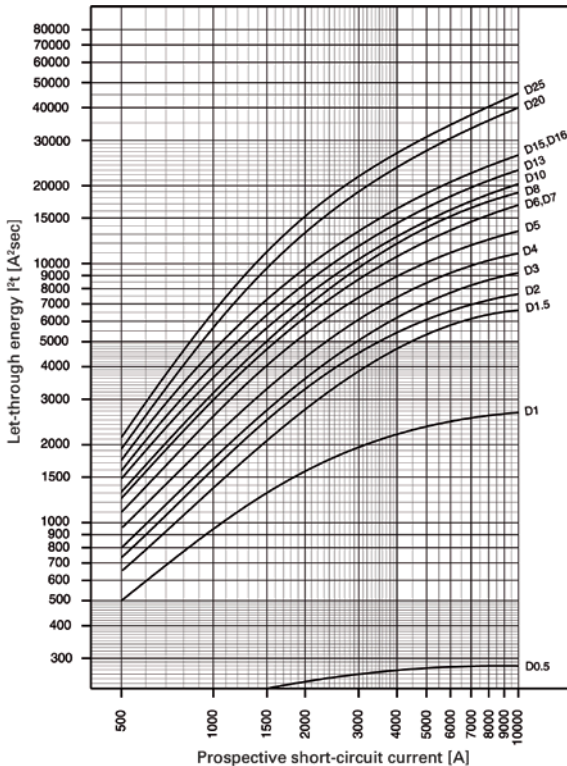
Characteristic B (1–32 A), 277 V



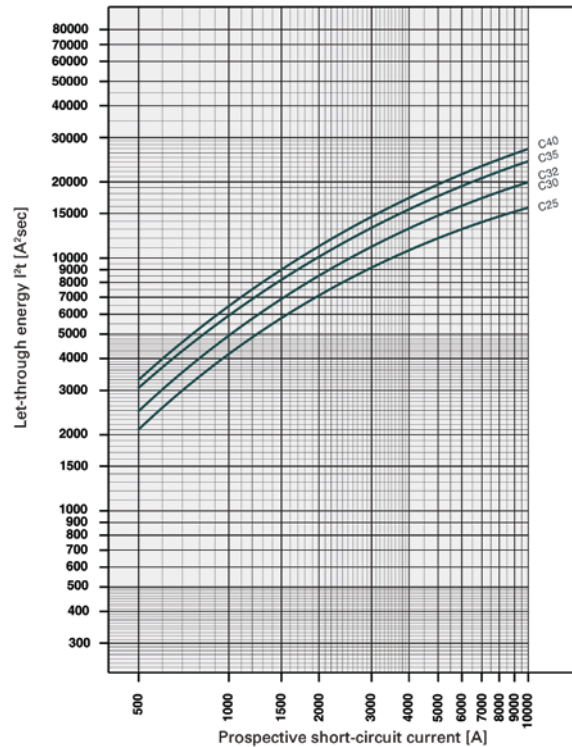
Characteristic B (35–63 A), 240 V



Characteristic C (0.5–32 A), 277 V



Characteristic C (35–63 A), 240 V

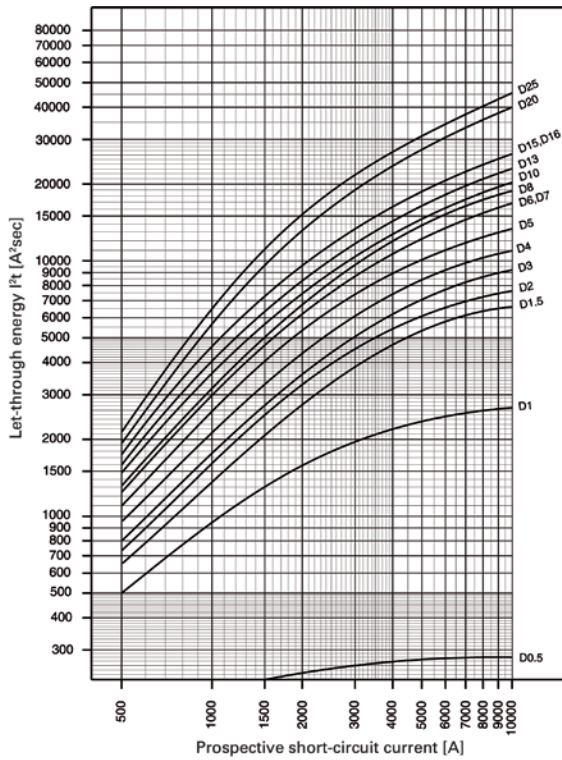


UL 489 DIN rail branch circuit breakers

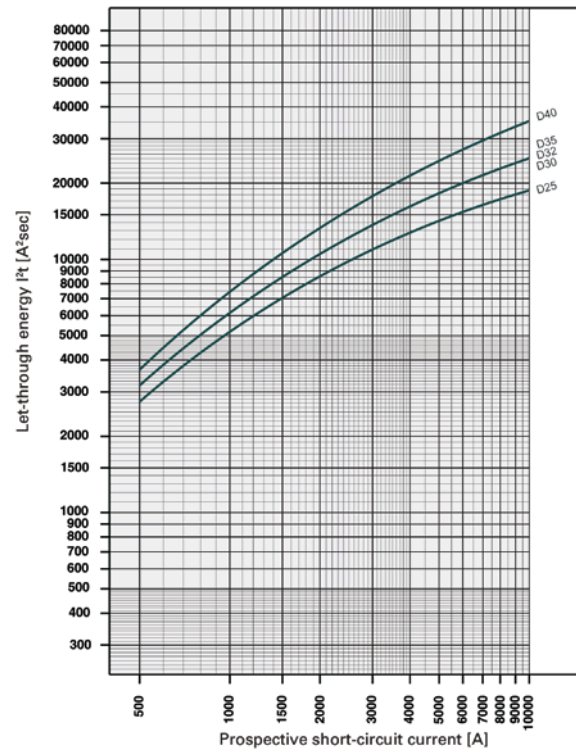
FAZ-NA circuit breakers

TECHNICAL DATA

Characteristic D (0.5–32 A), 277 V



Characteristic D (35–63 A), 240 V



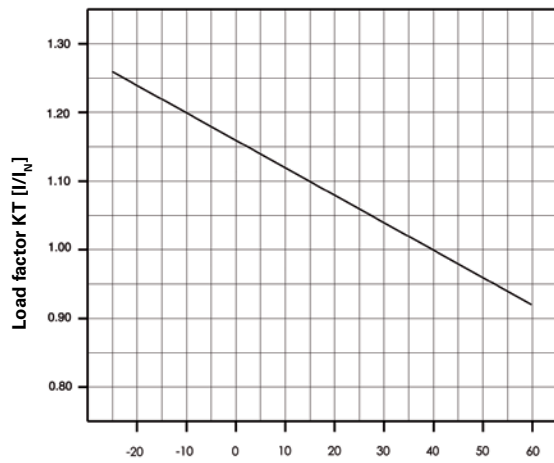
UL 489 DIN rail branch circuit breakers

FAZ-NA circuit breakers

TECHNICAL DATA

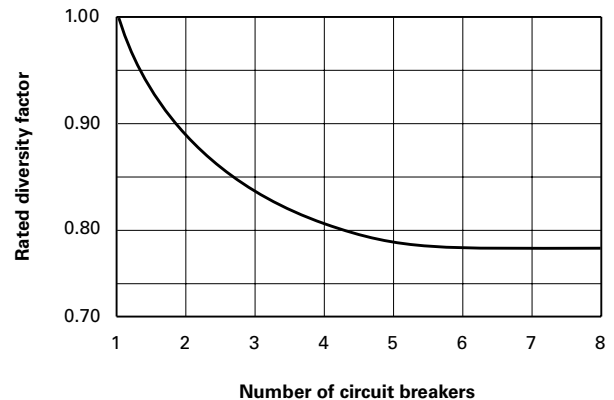
Influence of ambient temperature T on load carrying capacity

Device market current rating I_n (A) at 40 °C	I_n (A) at higher ambient temperature							
	15 °C	20 °C	25 °C	30 °C	40 °C	50 °C	55 °C	60 °C
0.5	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
1.0	1.1	1.1	1.1	1.0	1.0	1.0	0.9	0.9
1.5	1.7	1.6	1.6	1.6	1.5	1.4	1.4	1.4
2.0	2.2	2.2	2.1	2.1	2.0	1.9	1.9	1.8
3.0	3.3	3.2	3.2	3.1	3.0	2.9	2.9	2.8
4.0	4.4	4.3	4.2	4.2	4.0	3.8	3.8	3.7
5.0	5.5	5.4	5.3	5.2	5.0	4.8	4.7	4.6
6.0	6.6	6.5	6.4	6.2	6.0	5.8	5.6	5.5
7.0	7.7	7.6	7.4	7.3	7.0	6.7	6.6	6.4
8.0	8.8	8.6	8.5	8.3	8.0	7.7	7.5	7.4
10.0	11.0	10.8	10.6	10.4	10.0	9.6	9.4	9.2
13.0	14.3	14.0	13.8	13.5	13.0	12.5	12.5	12.0
15.0	16.5	16.2	15.9	15.6	15.0	14.4	14.1	13.8
16.0	17.6	17.3	17.0	16.6	16.0	15.4	15.0	14.7
20.0	22.0	21.6	21.2	20.8	20.0	19.2	18.8	18.4
25.0	27.5	27.0	26.5	26.0	25.0	24.0	23.3	23.0
30.0	33.0	32.4	31.8	31.2	30.0	28.8	28.2	27.6
32.0	35.2	34.6	33.9	33.3	32.0	30.7	30.1	29.4
40.0	44.0	43.2	42.4	41.6	40.0	38.4	37.6	36.8
50.0	55.0	54.0	53.0	52.0	50.0	48.0	47.0	46.0
63.0	69.3	68.0	66.8	65.5	63.0	60.5	59.2	58.0



Maximum load I_L at ambient temperature T: $I_L(T) = I_N K_T(T)$

Load carrying capacity of adjoining miniature circuit breakers



Power Loss at I_n

I_n [A]	Characteristic B				Characteristic C				Characteristic D			
	Single-pole P [W]	Two-pole P [W]	Three-pole P [W]	Four-pole P [W]	Single-pole P [W]	Two-pole P [W]	Three-pole P [W]	Four-pole P [W]	Single-pole P [W]	Two-pole P [W]	Three-pole P [W]	Four-pole P [W]
0.5	—	—	—	—	1.6	3.2	4.7	—	1.6	3.2	4.8	—
1	1.1	2.2	3.4	4.8	1.1	2.2	3.4	4.8	0.8	1.5	2.3	3.2
1.5	2.2	4.4	6.6	8.8	1.3	2.6	3.9	5.2	1.0	2.1	3.1	4.4
2	1.4	2.8	4.3	5.6	1.4	2.8	4.3	5.6	1.0	2.1	3.1	4.4
3	2.1	4.2	6.4	8.8	1.2	2.4	3.6	4.8	1.2	2.4	3.6	4.8
4	1.4	2.9	4.3	5.6	1.4	2.9	4.3	6.0	1.4	2.9	4.3	6.0
5	1.8	3.7	5.5	7.6	1.9	3.7	5.6	6.4	1.5	2.9	4.4	6.0
6	1.7	3.5	5.2	7.2	1.2	2.3	3.5	4.8	1.2	2.3	3.5	4.8
7	2.0	4.0	6.0	8.0	1.4	2.8	4.3	5.6	1.4	2.8	4.3	5.6
8	2.0	3.9	5.9	8.4	1.4	2.8	4.2	5.2	1.2	2.4	3.7	5.2
10	1.8	3.6	5.3	7.2	1.8	3.6	5.3	6.0	1.5	3.0	4.5	6.0
13	2.4	4.7	7.1	10.0	2.4	4.7	7.1	10.0	2.0	4.1	6.1	8.0
15	1.9	3.8	5.6	8.0	1.9	3.8	5.6	8.0	1.5	3.1	4.6	8.0
16	2.1	4.3	6.4	9.2	2.1	4.3	6.4	9.2	1.7	3.5	5.2	9.2
20	2.9	5.8	8.7	13.2	2.9	5.8	8.7	13.2	1.8	3.7	5.5	8.8
25	3.1	6.2	9.3	11.2	3.1	6.2	9.3	11.2	2.6	5.1	7.7	10.0 ^o
30	3.0	6.0	9.0	12.0	3.0	6.0	9.0	12.0	2.7	5.4	8.1	10.8
32	3.4	6.8	10.2	14.0	3.4	6.8	10.2	14.0	3.1	6.2	9.3	12.0
35	4.0	8.1	12.1	16.0	3.7	7.4	11.0	14.8	3.8	7.6	11.3	15.2
40	4.0	8.1	12.1	13.6	4.0	8.1	12.1	13.6	3.9	7.8	11.6	12.4
50	4.4	8.8	13.2	17.6	4.4	8.8	13.2	17.6	—	—	—	—
63	5.5	11.0	16.5	22.0	5.5	11.0	16.5	22.0	—	—	—	—

Miniature circuit breaker application

FAZ circuit breakers

PRODUCT OVERVIEW

Applying branch circuit breakers and supplementary protectors in North America



The Eaton series offer two types of miniature circuit breakers for use in North America. The first version, FAZ-NA(RT), fully complies with the molded-case circuit breaker standard UL 489 and the Canadian equivalent CSA 22.2 No. 5-09, which states that devices within that range can be applied legitimately as feeder and branch circuit protective devices per the U.S. and Canadian electrical codes.

A second version, FAZ, is recognized per UL 1077 and certified per CSA C22.2 No. 235 as a supplementary protector and can be fully used per the NEC and CEC Codes in that capacity. For international purposes, the entire FAZ family is CE marked and in full conformity with the applicable IEC standards for miniature circuit breakers, EN/IEC 60898 and EN/IEC 60947-2.

Both FAZ and FAZ-NA(RT) are offered in various ampere ranges and tripping characteristics. This paper will focus on the main technical aspects of the entire line and should assist in the proper selection and application of all versions.

Characteristics of IEC-style miniature circuit breakers

Because FAZ miniature circuit breakers are IEC-style devices, it is important to understand their inherent characteristics before examining them in the context of UL/CSA requirements.

- IEC-style miniature circuit breakers are thermal-magnetic, inverse time protective devices, with both a fixed thermal and a fixed magnetic trip setting
- They are toggle operated, and like all modern circuit breakers, feature a “trip-free” mechanism; this means that the tripping action works independently of the handle position for safety purposes
- They all mount on a standard 35 mm DIN rail and share a common single pole width of 17.5 mm
- Most comply with EN/IEC 60898 and EN/IEC 60947-2, which are the relevant international performance and testing standards for low voltage (<1000 V) circuit breakers in Europe and the rest of the IEC world
- Outside North America, they can be used in both residential and industrial applications as feeder and branch circuit protective devices
- In North America, most European miniature circuit breakers are only UL recognized and CSA certified as “supplementary protectors,” meaning that they cannot be utilized as feeder or branch circuit protective devices per the local electrical codes. This commonly restricts their use to applications where “closer” protection is desired than that offered by a branch circuit protection device
- Some variations, like the FAZ-NA(RT) line have been specially designed to meet UL and CSA requirements for molded-case circuit breakers and are marked accordingly. This makes them suitable for feeder and branch circuit protection applications in North America

Supplementary protectors

As mentioned, the standard FAZ line fulfills all of the criteria per code of “supplementary overcurrent protective devices,” or “supplementary protectors,” as they are better known.

What is the definition of a supplementary protector per North American standards?

A supplementary protector is a manual reset device designed to open the circuit automatically on a predetermined value of time versus current or voltage within an appliance or other electrical equipment. It may also be provided with manual means for opening or closing the circuit. (Source: UL 1077)

In the United States (and similarly in Canada) the NEC 2005 further defines supplementary protectors as devices intended to provide limited overcurrent protection for specific applications, such as lighting fixtures and appliances. This limited protection is in addition to the protection provided in the required branch circuit by the branch circuit overcurrent protective device.

Clearly, the underlying message in those definitions is that supplementary protectors are not branch circuit overcurrent protective devices per code, and neither are they tested that way per UL and CSA standards. They cannot replace the primary protective role performed by listed and certified molded case circuit breakers and fuses.

That explains, in part, their status by UL as “recognized only” devices. Supplementary protectors will never bear a UL listing mark, simply because their suitability as protective devices is dependent on a number of acceptability conditions that can vary from make to make and ultimately define the manner in which they can be properly applied per code. The manufacturer should be consulted in all cases when evaluating the suitability of “recognized only” components such as UL 1077 supplementary protectors.

FAZ protectors are not subject to any specific restrictions in this respect, other than, like all supplementary protectors, they must never be used as a substitute for true listed and certified primary overcurrent protective devices.

Where can supplementary protectors be used effectively per code standards?

Eaton series FAZ supplementary protectors can be used in a number of significant areas. To more clearly illustrate potential applications, however, let's first present the NEC's definition of a branch circuit:

The circuit conductors between the final overcurrent device protecting the circuit and the outlets. (Source: NEC)

A branch circuit is that portion of the electrical distribution system that extends beyond the final branch circuit overcurrent protective device and is intended to serve lighting, appliance, motors, and/or other individual loads.

Typically, the branch circuit overcurrent protective device (BOPD) will be either a listed molded-case circuit breaker or a fuse. Supplementary protectors, such as FAZ devices from the Eaton series, can therefore be added to any of these branch circuits to “supplement” the branch circuit protection. Examples of applications ideally suited for these devices can include:

- Any type of OEM electrical equipment that is fed from a service panel board and that often requires additional protection for sensitive internal circuitry and components (test and medical equipment, copiers and printers, computers and power supplies, etc.)
- The need for manual reset devices with optional accessories such as auxiliary contacts and voltage trips to accomplish fuseless protective circuit designs and enhance operational diagnostics
- Isolation and protection of control cable, coils, contacts, and circuit elements of motor control circuits tapped from the load side of the branch circuit protective device (per NEC 430.72)
- Protection of control circuit transformers, especially in the secondary where the manual reset protector can be used to isolate, as well as protect, secondary circuit conductors and loads

IEC-based miniature circuit breakers, such as the entire FAZ line, are much more than just conventional supplementary protectors from an internal design point of view and can provide an ideal means to enhance the protective capabilities of any circuit.

- As mentioned, they are in full compliance with the pertinent EN/IEC standards (EN/IEC 60898, EN/IEC 60947-2) for miniature circuit breakers and can thus be applied, outside of North America, as full-fledged stand-alone overcurrent protective devices in both residential and industrial applications
- As this typical let-through current curve shows, they are highly current limiting devices that appreciably limit the amount of let-through current and destructive energy within their ratings to minimize damage levels to downstream loads and circuits

Circuit breakers that are classified as “current limiting” have the ability to clear damaging short-circuit currents within the first half-cycle of the fault, resulting in better overall protection for all circuit components.

- They come in a variety of tripping characteristics, which is ideal when customizing protection to match specific load requirements. FAZ supplementary protectors offer a total of six different protection characteristics for this purpose: B, C, D, K, S, and Z tripping characteristics
- They feature a number of electrical accessories to enhance the performance and diagnostic capabilities of control panels, as well as a means to facilitate panel mounting and wiring

Miniature circuit breaker application

FAZ circuit breakers

PRODUCT OVERVIEW

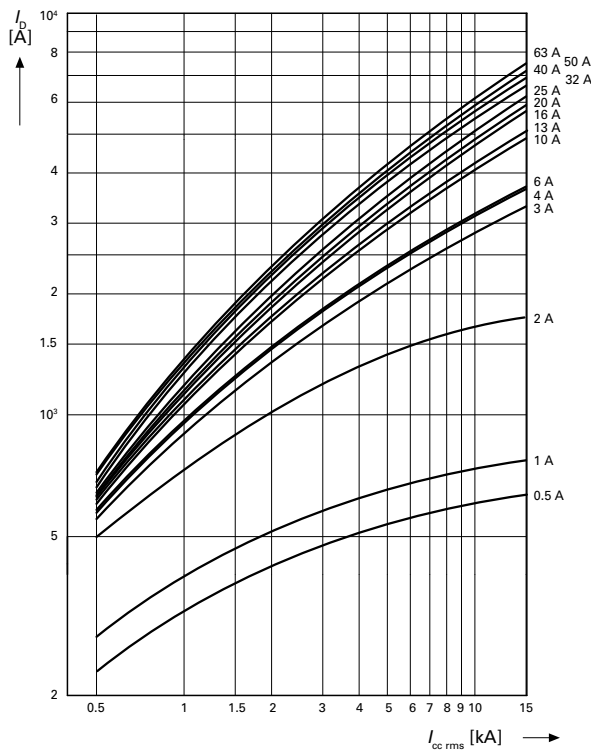
Typical let-through curve profile of a current-limiting device

- The X axis shows the prospective short-circuit current levels
- The Y axis indicates the actual let-through values (let-through current in the example shown) at those prospective fault ratings for each FAZ device plotted

As can be interpreted from the bend in the plotted curves, each device acts to limit the damaging let-through energy (and current) at those values of short-circuit current.

By design, all Eaton series FAZ supplementary protectors and miniature molded-case circuit breakers are current-limiting protective devices.

Characteristic B and C



Tripping characteristics

Miniature circuit breakers are thermal-magnetic, inverse-time tripping devices. From a thermal point of view, all FAZ protectors are calibrated to trip at the same level, which is 135% of the device's fixed current rating for single-pole and 145% for multi-pole at an ambient reference temperature of 40 °C.

Note: Higher ambient temperatures, as well as density of mounting groups, can all be accommodated but may be subject to de-rating factors. Please consult technical data for further information and appropriate curves.

It is the response time of the magnetic trip that differentiates each characteristic and for which an identifying letter is assigned. The IEC 898 standard only specifically covers the B, C, and D characteristics. The rest can vary from brand to brand, but essentially follow a uniform convention.

The following magnetic response times apply to each of the characteristic letters referenced in Eaton series FAZ part numbers:

- B: Instantaneous response of 3–5x I_n (I_n = fixed current rating of each unit)—ideally suited for resistive loads, such as conductors or heaters
- C: Instantaneous response of 5–10x I_n —ideally suited for inductive loads, such as motors and solenoids
- D: Instantaneous response of 10–20x I_n —ideally suited for highly inductive loads, such as lighting and higher efficiency motors
- K: Instantaneous response of 8–12x I_n —ideally suited for highly inductive loads, similar to D but with a narrower range
- S: Instantaneous response of 13–17x I_n —ideally suited for highly inductive loads, especially in control circuits with coils and light filaments
- Z: Instantaneous response of 2–3x I_n —very low instantaneous setting to provide tighter protection for loads that are more sensitive to the effects of overcurrents

Typical “inverse time” tripping characteristic of a miniature circuit breaker

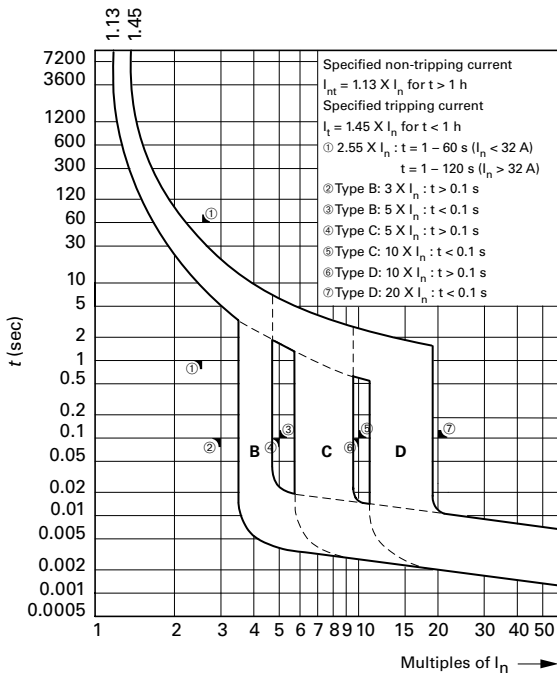
- “Inverse time” refers to the device's tripping characteristic; as the curve shows, the higher the current, the lower the tripping time
- The trip response on the thermal portion is uniform throughout the line
- The instantaneous response differs, depending on the characteristic selected. (i.e., B, C, or D)
- Tripping is very quick (less than a half-cycle) in the upper range of overcurrents (bottom right) due to the current-limiting design of the Eaton series miniature circuit breakers

Miniature circuit breaker application

FAZ circuit breakers

PRODUCT OVERVIEW

Typical FAZ miniature circuit breaker characteristic



FAZ-NA(RT) miniature circuit breakers

As previously mentioned, we have expanded our FAZ line of miniature circuit breakers to include a version that is listed and certified as a molded-case circuit breaker (UL 489 and CSA No. 5).

This line is rated up to 40 A and comes in single-, two-, and three-pole versions with instantaneous trip characteristics B, C and D. Of course, the line is also in conformity with the IEC standard for molded-case circuit breakers, IEC 60947-2, and can therefore be universally applied.

The NEC defines a circuit breaker as follows:

A device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent *without damage to itself when properly applied within its rating.*

Note the text in italics. In the eyes of the code, that definition sets circuit breakers apart from any other protective device and establishes their role as primary overcurrent protective switches in all types of electrical circuits. UL listing (and CSA Certification) requires additionally that regular testing on circuit breakers be conducted by UL and CSA at the manufacturer's plant to monitor construction and verify their performance.

The Eaton series new miniature molded-case circuit breaker line includes two types: the FAZ-NA with traditional box terminals for multiple wires, and the FAZ-RT which accommodates ring-tongue terminals.

The advantages of a current-limiting device

As already mentioned, all Eaton series FAZ devices are current-limiting by design. In the case of the UL 489 devices, they are also classified by UL/CSA in that manner and are marked on the label.

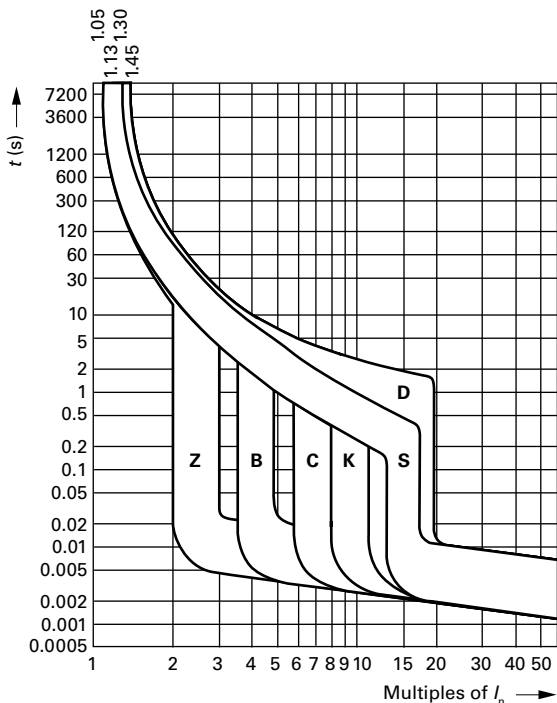
A circuit breaker that is marked as a current-limiting device is one that does not use a fusible element and, when operating within its current-limiting range, limits the let-through energy (I^2t) to less than the energy of a half-cycle wave of the available symmetrical current.

The label on FAZ-NA(RT) devices lists the actual let-through energy ($I^2t = 60 \text{ kA}^2 \text{ s}$) and peak let-through current (6.2 kA) at the maximum interrupting rating of 10 kA.

Current-limiting circuit breakers substantially reduce the amount of damage sustained by downstream components in the event of a high short-circuit fault by clearing the fault in the shortest amount of time possible due to the quick separation of its contacts and ensuing extinction of the arc current.

HACR and SWD

FAZ-NA(RT) circuit breakers are also marked "HACR" for use in heating, air conditioning, and refrigeration applications. In addition, the abbreviation "SWD" on the label indicates that the devices are suitable for switching fluorescent lighting loads on a regular basis.



Miniature circuit breaker application

FAZ circuit breakers

TECHNICAL DATA

Short-circuit markings on FAZ devices

Below is a tabulated summary of short-circuit rating values that apply to the FAZ line of supplementary protectors and molded-case circuit breakers.

It is important to keep in mind that short-circuit markings on FAZ supplementary protectors (UL 1077) and FAZ-NA(RT) molded-case circuit breakers (UL 489) must not be interpreted in the same manner.

Supplementary protectors have short-circuit markings in association with upstream primary overcurrent protective devices. Conversely, molded-case circuit breakers are primary overcurrent protective devices, and their ratings thus refer to their short-circuit interrupting capability.

Short-circuit rating values for FAZ supplementary protectors and branch circuit breakers

Description	Trip characteristic	Maximum amperes	Maximum voltage	Short-circuit rating (kA)
FAZ supplementary protectors (UL 1077)				
Single-pole	B ① and C	0.5–35	277 Vac	10
		40–63	277 Vac	5
		0.5–63	48 Vdc	10
	D	0.5–40	277 Vac	5
			48 Vdc	10
Two-, three-pole	B ① and C	0.5–35	480Y/277 Vac ②	10
		40–63	480Y/277 Vac ②	5
Two-poles in series		6–25	96 Vdc	10
Two-, three-pole	D	0.5–40	480Y/277 Vac ②	5
Two-poles in series			96 Vdc	10
FAZ-NA(RT) branch circuit breakers (UL 489)				
Single-pole	B and C	15–25	480Y/277 Vac	14
Two-, three-, four-pole	B and C	15–25	480Y/277 Vac	14
Single-pole	D	13–20	480Y/277 Vac	14
Two-, three-, four-pole	D	13–20	480Y/277 Vac	14
FAZ-NA-L (RT-L) branch circuit breakers (UL 489)				
Single-pole	B ① and C	0.5–63	240 Vac	10
	D	0.5–40	240 Vac	10
Two-, three-, four-pole	B ① and C	0.5–63	240 Vac	10
	D	0.5–40	240 Vac	10
Single-pole	B and C	15–25	240 Vac	14
Two-, three-, four-pole	B and C	15–25	240 Vac	14
Single-pole	D	13–20	240 Vac	14
Two-, three-, four-pole	D	13–20	240 Vac	14
Description	Trip characteristic	Maximum amperes	Maximum voltage	Short-circuit interrupting rating (kA)
FAZ-NA(RT) branch circuit breakers (UL 489)				
Single-pole	B ① and C	0.5–32	480Y/277 Vac ②	10
		40–63	240 Vac	10
	D	0.5–32	480Y/277 Vac ②	10
		0.5–40	240 Vac	10
Single-pole	B ① and C	0.5–63	48 Vdc	10
	D	0.5–40	48 Vdc	10
Two-, three-, four-pole	B ① and C	0.5–32	480Y/277 Vac ②	10
		40–63	240 Vac	10
	D	0.5–32	480Y/277 Vac ②	10
		0.5–40	240 Vac	10
Two-pole	B ① and C	0.5–63	96 Vdc	10
	D	0.5–40	96 Vdc	10
FAZ-NA-DC branch circuit breakers (UL 489)				
Single-pole	C	2–40	125 Vdc	10
Two-poles in series	C	2–40	250 Vdc	10

① Supplementary protectors and branch circuit breakers with trip characteristic B start at 1 A.

② A circuit breaker with a 480Y/277 Vac rating can be applied in a solidly grounded circuit where the nominal voltage of any conductor to ground does not exceed the lower value of the circuit breaker's rating (e.g., 277 Vac) and the nominal voltage between any two conductors does not exceed its higher value (480 Vac).



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