

Thermal Magnetic (Inverse Time) Circuit Breakers As Listed to UL 489

These circuit breakers are intended to provide branch, feeder, and main protection, with interrupting ratings from 5,000 to 200,000 amps.

Properly sized inverse time circuit breakers are intended to provide motor branch circuit short-circuit and ground fault protection. They may be used for group motor protection only when the circuit breaker is tested, listed and marked {430.53(C)} for group installation (see 430.53(A) & (B) for exceptions). There are no circuit breakers listed for group motor protection except for HVAC applications, in which case they are marked HACR. They are suitable for use as a motor disconnecting means per NEC® 430.109, as a motor controller (On-Off Function) per NEC® Article 430, Part VII, and as both a motor disconnecting means and motor controller per NEC® 430.111.



Allowed Uses:

- Motor Branch Short-circuit and Ground Fault Protection
- Motor Overload Protection
- Group Motor Protection as the short-circuit and ground fault protective device only when the circuit breaker is tested, listed and marked for group installation. (See 430.53(A) & (B) for exceptions)
- Motor Branch Circuit Disconnecting Means
- Motor Controller

Identification

Circuit Breakers listed to UL489 will contain a marking near the agency symbol. This marking should read circuit breaker or an abbreviation such as Cir. Bkr.



Instantaneous Trip Circuit Breakers (MCPs) As recognized To UL 489

These are circuit breakers without overload (thermal) protection capability. They are intended to provide only branch circuit, short-circuit and ground protection for individual motor branch circuits. They may not be used to provide main, motor feeder, motor overload, general branch circuit or group motor protection. Because they are recognized, not listed, they cannot be used with loose control. NEC® 430.52 requires that they shall only be used as part of a listed combination controller. MCPs are short-circuit tested only in combination with a motor controller and overload device. They are not labeled with an interrupting rating by themselves. Per NEC® 430.109 exception 7, they may be used as a motor disconnecting means when part of a listed combination motor controller.



Allowed Uses:

- Motor Branch Short-circuit and Ground Fault Protection only when listed for use in combination with a specific motor controller/overload device
- Motor Branch Circuit Disconnecting Means
- Motor Controller

Identification

Instantaneous Trip Circuit Breakers recognized to UL489 will contain a recognized or component acceptance marking. This marking indicates that the product can not be used "stand alone" and is limited to certain conditions of use.



Manual Motor Controllers (Manual Motor Protectors) As listed to UL 508



These manual motor starters, sometimes called MMPs, often combine a magnetic short-circuit trip and adjustable motor overload protection. They are intended to provide motor overload protection per NEC® 430.32.

Creepage and clearance distances are typically not as great as required in UL 489, and therefore they cannot be listed as a circuit breaker. MMPs cannot provide motor branch circuit short-circuit and ground fault protection. They need a branch circuit overcurrent device and a motor disconnecting means on the line side for both single motor and group motor applications. Some IEC manual motor protectors have been tested and listed for group motor applications [as the protected (downstream) device, not the protecting (upstream) device] so that several of them may be able to be protected by one larger upstream fuse sized not to exceed the maximum size allowed per the device listing. Devices listed for use in group motor installations will be marked for such use to indicate that the device has undergone the appropriate testing to deem it suitable for such use. Some of these devices are rated with slash voltage limitations (such as 480Y/277V). This limits their use to solidly grounded wye type systems only. Manual motor controllers may be used as a motor controller (On-Off Function) to meet NEC® Article 430 Part VII. Unless otherwise marked, MMPs do not meet requirements for a motor disconnecting means as required in NEC® 430.109. If it is marked "Suitable as Motor Disconnect" it shall be permitted to serve as a motor disconnecting means if it is located between the final motor branch-circuit, short-circuit and ground fault protective device and the motor. This marking and listing is optional, so a review of the device markings will be required if it is intended to be used for this purpose.

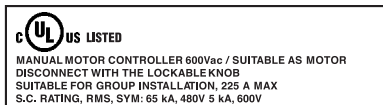
Allowed Uses:

- Motor Overload Protection
- Group motor applications as the protected (downstream) device only when the device is tested, listed and marked and the upstream fuse (protecting device) is sized within the maximum allowed per the device's listing.
- Motor Controller
- "At the Motor" Disconnect if marked "Suitable as motor Disconnect" and located between the motor branch circuit short-circuit and ground fault protective device and the motor.

Identification

Manual motor protectors as listed to UL508 will contain a marking near the agency

symbol. This marking should read manual motor controller or an abbreviation such as Man. Mtr. Cntrl. Manual motor controllers listed for use within group motor applications, as the downstream, protected overload/controller device, will be marked for such use along with the required maximum size for the upstream fuses. Manual motor controllers, additionally listed for use as a motor disconnecting means, will be marked "Suitable as Motor Disconnect."



Integrated Starters As Listed To UL 508

Integrated starters are a factory assembled combination of an IEC manual motor controller (manual motor protector), as just previously discussed, and an IEC contactor. Application requirements are the same as manual motor controllers including the need for a branch circuit overcurrent protective device and disconnecting means upstream. See the description above, for manual motor controllers, for application requirements and device identification.

Self-Protected Type E Combination Starters As Listed To UL 508

Self-protected combination starters are often called "Coordinated protected starters" and "Type E" starters. They are intended to provide motor overload and motor branch circuit short-circuit and ground fault protection by combining a magnetic short-circuit trip and adjustable motor overload in one package. A "Type E" starter is a listed combination starter suitable for use without additional branch circuit short-circuit protection and is limited to single motor circuits. A self protected, type E, combination starter marked with a slash voltage rating is limited to use on **solidly grounded wye type systems only** per the device listing. Creepage and clearance on the line terminals has to be to branch circuit dimensions as UL 489 and UL 98 devices. A self protected type E combination motor starter marked for use with a terminal kit, shall be installed with a terminal kit to ensure line terminal spacings are adequate. Accessory parts may need to be added to off-the-shelf, self-protected type E combination motor starters, in order for the device to be suitable for use. Self-Protected Type E Combination Starters are suitable for use as a motor disconnecting means per NEC® 430.109, as a motor controller (On-Off Function) per NEC® Article 430, Part VII, and as both a motor disconnecting means and motor controller per NEC® 430.111.

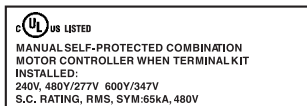


Allowed Uses:

- Motor Branch Circuit Short-circuit and Ground Fault Protection
- Motor Overload Protection
- Motor Branch Circuit and "at the motor" Disconnecting Means
- Motor Controller

Identification

Self-Protected Type E combination starters as listed to UL 508 will contain a marking near the agency symbol. This marking should read self-protected combination motor controller. In addition, Self-Protected Type E combination starters which are limited in application to solidly grounded wye type systems will be marked with a slash voltage rating such as 480Y/277 or 600Y/347.



Supplementary Overcurrent Protective Devices For Use in Motor Control Circuits

Branch Circuit vs. Supplementary Overcurrent Protective Devices

Branch circuit overcurrent protective devices (OCPD) can be used everywhere OCPD are used, from protection of motors and motor circuits and group motor circuits, to protection of distribution and utilization equipment. Supplemental OCPD can only be used where proper protection is already being provided by a branch circuit device, by exception [i.e., 430.72(A)], or if protection is not required. Supplemental OCPD can often be used to protect motor control circuits but they cannot be used to protect motors or motor circuits. A very common misapplication is the use of a supplementary overcurrent protective device such as a UL 1077 mechanical overcurrent device for motor branch circuit short-circuit and ground fault protection. Supplemental OCPDs are incomplete in testing compared to devices that are evaluated for branch circuit protection. **THIS IS A SERIOUS MISAPPLICATION AND SAFETY CONCERN!!** Caution should be taken to assure that the proper overcurrent protective device is being used for the application at hand. Below is a description of popular supplementary overcurrent protective devices.

Most supplemental overcurrent protective devices have very low interrupting ratings. Just as any other overcurrent protective device, supplemental OCPDs must have an interrupting rating equal to or greater than the available short-circuit current.

Supplemental Fuses As Listed or Recognized To The UL/CSA/ANCE Tri-national 248-14 Standard

These are fuses that can have many voltages and interrupting ratings within the same case size. Examples of supplemental fuses are 1/2" X 1 1/2", 5 x 20mm, and 1/2" x 1 1/4" fuses. Interrupting ratings range from 35 to 100,000 amps.



Supplementary Protectors (Mini-Breakers) As Recognized To UL 1077



With applications similar to supplemental fuses, these supplementary protectors, often referred to as mini-circuit breakers, cannot be used as a branch circuit protective device. As such they cannot provide motor, motor circuit, or group motor protection. They can only be used for protecting an appliance or other electrical equipment where branch circuit

overcurrent protection is already provided, or is not required. They typically have creepage and clearance distances that are less than those in UL 489, so they cannot be listed as a circuit breaker or used as a motor disconnecting means to meet the requirements of NEC® 430.109. Interrupting ratings are quite low. Those devices that are short-circuit tested in series with a fuse must be applied with a fuse on their line side.

Identification

Supplemental protectors as recognized to UL 1077 will contain a recognition mark rather than a listing mark.



Devices for Motor Circuits

Motor Circuit Protection Device Selection Chart & Supplemental Protectors

Warning Supplemental Protectors are NOT suitable for Motor Branch Circuit Protection

Supplemental protectors are being used for motor branch circuit protection in numerous applications throughout the industry. This is a **MISAPPLICATION** and the urgency of the matter is prompting the creation of safety notices, articles, and technical bulletins to alert the users of this misapplication. Supplemental protectors are not suitable for branch circuit protection and cannot be used for this purpose per 240.10 of the National Electrical Code®. Supplemental protectors are intended to be used as a component of an end product such as commercial appliances, kitchen appliances, luminaires (lighting fixtures), etc. They are offered in a wide variety of performance characteristics, voltage ratings, and interrupting ratings and therefore each supplemental protector is only allowed to be used under specific conditions. Supplemental protectors are UL recognized to UL1077, Supplemental protectors for use in Electrical Equipment, for this reason. A recognized or restricted product is not field installable and therefore an investigation assuring application of the product within its conditions of acceptability is required.

Why Are They Being Misapplied?

Here are some of the popular reasons why:

- Supplemental protectors look very similar to Molded Case Circuit Breakers leading to the assumption that they provide the same protection
- Supplemental protectors are often labeled as circuit breakers or Miniature Circuit Breakers (MCB) in literature
- Many of these devices are rated as a circuit breaker per IEC and confusion over North American and IEC ratings leads to misapplication

So What Do I Need To Do?

In order to correct the application, suitable protection for the motor branch circuit needs to be provided. The simplest correction to this problem is the replacement of the misapplied supplemental protector with a device that is suitable for branch circuit protection.

- **A WORD OF CAUTION:** The supplemental protector can only be used in an end product that is evaluated as an assembly. If the equipment does not go through an investigation, there is no assurance that the supplemental protector is being used for its intended use within its conditions of acceptability. Therefore the replacement of this device is the safest approach.















So What Can I Use?

NEC® 430.52 provides a list of acceptable devices for motor branch circuit protection. Among the list of acceptable devices are time delay and fast acting branch circuit fuses.

Summary

Supplemental protectors are being misapplied on numerous occasions. Many reasons lead to this misapplication including mistaking supplemental protectors as North American circuit breakers. The key to properly identifying supplemental protectors is to look for the recognition mark. If the device you are using has a recognition mark, more than likely it is a supplemental protector and replacement is necessary for a proper installation.

For more in-depth discussion, download Tech Talk 3 and Supplement from www.cooperbussmann.com

Motor Circuit Protection Device Selection Chart	UL248 Fuses and Disconnect	UL489 Circuit Breaker	IEC Manual Motor Controller (Manual Motor Protector)	Self Protected Type E Combo Starter	Magnetic Motor Starter	Manual Motor Controller (UL508 Switch)	Instantaneous Trip Circuit Breaker	UL1077 Supplemental Protector
Allowed Uses Per 2002 NFPA79 and NEC®								
 Motor Circuit and Controller Disconnect	Yes ¹	Yes	No	Yes ^{6,7}	No	No	Yes ^{5,6}	No
 Motor Branch Short Circuit and Ground Fault Protection	Yes	Yes ⁸	No	Yes ^{6,8}	No	No	Yes ^{5,6}	No
 Motor Controller	Yes ²	Yes	Yes ⁹	Yes ⁹	Yes	Yes ⁹	No	No
 Motor Overload	Yes	Yes ³	Yes ¹⁰	Yes ¹⁰	Yes	No	No	No
 Motor Disconnect	Yes ²	Yes	Yes ⁴	Yes	No	Yes ⁴	No	No
	1. When used in conjunction with a UL98 Fusible Switch. 2. Where used in conjunction with a UL98 or UL508 fusible switch. If UL508 switch, see footnote 4		3. Often cannot be sized close enough. 4. Must be located on the load side of motor branch short-circuit protective device, marked "Suitable as Motor Disconnect," and be provided with a lockable handle.		5. When used in conjunction with a motor starter as part of a listed and labeled combination motor controller. 6. Limited to single motor circuit applications. 7. Additional Terminal Kit Often Required.		8. If Slash Voltage Rated, Limited to Solidly Grounded Wye Systems ONLY. 9. Additional Contactor Required for Remote Control. 10. Class 10 Overload Protection Only.	