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. Supplementary 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. Supplementary 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. Supplementary OCPD 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 \( \frac{3}{8}'' \times 1 \frac{3}{8}'', 5 \times 20\text{mm}, \) and \( \frac{3}{8}'' \times 1 \frac{3}{8}'' \) 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\(^\text{®} \) 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.

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\(^\text{®} \) 430.109, as a motor controller (On-Off Function) per NEC\(^\text{®} \) Article 430, Part VII, and as both a motor disconnecting means and motor controller per NEC\(^\text{®} \) 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
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](http://www.cooperbussmann.com)

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**Motor Circuit Protection Device Selection Chart & Supplemental Protectors**

**Warning**

Supplemental Protectors are NOT suitable for Motor Branch Circuit Protection

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<td>Yes¹</td>
<td>Yes</td>
<td>No</td>
<td>Yes⁶,⁷</td>
<td>No</td>
<td>No</td>
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<tr>
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<td>No</td>
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<td>Yes</td>
<td>Yes⁹</td>
<td>Yes⁹</td>
<td>Yes</td>
<td>Yes⁹</td>
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<td>Motor Overload</td>
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<td>Yes³</td>
<td>Yes¹⁰</td>
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<tr>
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<td>Yes</td>
<td>Yes⁴</td>
<td>Yes</td>
<td>No</td>
<td>Yes⁴</td>
<td>No</td>
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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.
7. Additional Terminal Kit Often Required.
8. If Slash Voltage Rated, Limited to Solidly Grounded Wye Systems ONLY.
10. Class 10 Overload Protection Only.

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