Comprehensive circuit protection for control panel applications
UL 489 circuit breakers

The complete family of molded-case and miniature circuit breakers:
DIN rail, individual and front panel mounted

UL 489 Listed performance for branch circuit overcurrent protection and disconnecting means

Molded-case circuit breakers listed under UL® 489 are required to pass stringent short-circuit and switching test requirements. In all cases, interruption must occur successfully without the assistance of a backup device. In no instance are the contacts permitted to weld. Required electrical spacings and clearances are larger, and regular witnessed follow-up tests are mandatory.

When applications call for compliance with the National Electrical Code® (NEC®) and UL requirements for branch circuit protection and disconnecting means, choose from the industry’s most extensive line of UL 489 circuit breaker products and accessories.

Motor protector circuit breakers—UL 489 Listed

Series G motor protector circuit breakers are used to eliminate the need for a separate overload relay by providing superior thermal protection as well as serving as a disconnecting means and supplying motor branch short-circuit protection.

Motor circuit protectors—UL 489 Recognized

Series G HMCP magnetic-only motor circuit protectors are UL recognized for use as motor branch short-circuit protection and disconnecting means and provide a UL listed solution when used with tested combination starters.

Miniature circuit breakers—UL 489 Listed

Eaton’s WMZT DIN rail mountable miniature circuit breakers offer a complete range from 0.5 to 40A with two levels of short-circuit protection categorized by C and D curves.

Export applications

Series G molded-case circuit breakers are also world-class rated to meet IEC 60947-2 standards for export of assembled products that require IEC compliance.
The complete family of supplementary protectors: DIN rail mounted

Eaton exclusively offers selection from two types of DIN rail mounted supplementary protectors:

**WMZS**—supplementary protector current limiting
- Dual rated to IEC 60947-2
- 0.5 to 63A, up to 277/480V
- B, C and D curves

**SPHM**—supplementary protector hydraulic-magnetic
- In conformance with IEC 60950 and EN-60947
- Ambient temperature independent
- 0.1 to 30A at 480 Vac
- 0.1 to 50A at 250/277 Vac

WMZS and SPHM offer unique product technology, providing features to respond to specific equipment and control circuit overcurrent protection requirements. Both products are an attractive and resettable alternative to control circuit fuses.

**Export applications**
WMZS and SPHM supplementary protectors also meet IEC standards. They have the flexibility to be IEC circuit breakers when applications require export of assembled products to areas that require IEC compliance.

**UL 1077 recognized equipment and control circuit protection**
When compliance with the National Electrical Code or UL is required, supplementary protectors are approved for use on circuits where branch circuit protection has already been provided or is not required.
Series G molded-case circuit breakers

Applications
Series G molded-case circuit breakers provide the world’s most comprehensive product solutions for applications from 15 to 2500A at 208 to 690V.

Branch circuit protection
Series G molded-case circuit breakers provide for the protection of cable, and meet or exceed the requirements of the NEC for branch circuit protection.

Disconnecting means
Series G UL 489 molded-case circuit breakers exceed the requirements of the NEC for use as disconnecting means in branch and motor branch circuits.

Circuit breaker mounting
EG-Frame circuit breakers can be DIN rail mounted, or base or front panel mounted. All other Series G frame breakers can be panel mounted.

30 mA ground fault (earth leakage) modules
Eaton offers a UL Listed Earth Leakage Solution consisting of a three- and four-pole 30 mA ground fault (earth leakage) protection module for EG, JG and LG breakers, while not restricting the use of other breaker accessories.

Technology
Series G employs the world’s most advanced molded-case circuit breaker technology. Patented reverse loop contact designs provide for current limiting performance and the highest interrupting ratings in the industry’s most compact breaker sizes.

Standards
Series G molded-case circuit breakers are available in versions that meet all major electrical standards of the world.

UL Listed
Series G molded-case circuit breakers meet NEMA® design standards. They are tested and listed per UL 489, ensuring conformance with the NEC.

CSA® Certified
Series G molded-case circuit breakers are certified in accordance with CSA 22.2 No. 5-02.

IEC 60947-2 CE Mark
Eaton’s world-class Series G molded-case circuit breakers exceed the performance specifications of IEC 60947-2. They carry the CE mark for applications where European compliance is required.

China Compulsory Certified
The China Compulsory Certificate mark (CCC Mark) is a compulsory safety mark for many products sold on the Chinese market.

IEC Third-Party Certification
In addition to self certification to IEC 60947-2 standard, Eaton’s Series G circuit breakers are witness tested by certified third-party IEC test labs. Please check Eaton’s Web site for a list of available certificates.
Series G molded-case circuit breaker accessories
UL 489 solution

Series G breaker frame capabilities

<table>
<thead>
<tr>
<th>Frame</th>
<th>Maximum Amperes</th>
<th>Maximum Voltages</th>
<th>Maximum Interrupting Ratings</th>
<th>Dimensions in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NEMA, UL, CSA</td>
<td>UL 240V</td>
<td>UL 480V</td>
<td>UL 600V</td>
</tr>
<tr>
<td>E</td>
<td>125</td>
<td>600/347</td>
<td>415</td>
<td>200 kA</td>
</tr>
<tr>
<td>J</td>
<td>250</td>
<td>600</td>
<td>690</td>
<td>200 kA</td>
</tr>
<tr>
<td>L</td>
<td>600</td>
<td>600</td>
<td>690</td>
<td>200 kA</td>
</tr>
<tr>
<td>N</td>
<td>1200</td>
<td>600</td>
<td>690</td>
<td>200 kA</td>
</tr>
<tr>
<td>R</td>
<td>2500</td>
<td>600</td>
<td>690</td>
<td>200 kA</td>
</tr>
</tbody>
</table>

1 Per UL and CSA listed ratings.

Series G accessories

Control panel and enclosure accessories

Accessories

Series G breakers are available with a comprehensive range of accessories, including shunt trips, undervoltage releases, alarm lockout and auxiliary switches, multi-wire lug kits, control wire terminal kits, etc., that are field installable.

Flex Shaft handle mechanism

Flex Shaft handle mechanisms make installing and operating enclosure-mounted breakers easier than ever. Installation and adjustment of this flange-mounted mechanism can be accomplished in about 10 minutes or less. Optional early break auxiliary switch handle is available. Use for Type 1, 12, 4 and 4X environments.

High-performance handle mechanism

In addition to its robust design features, the handle mechanism has stand-off support that allows for easy operation with a gloved hand. Use for Type 1, 12, 3R or 4X environments. The high performance external handle can accept padlocks or multi-hasp locks.

Plug-in blocks

Plug-in adapters simplify installation and front removal of circuit breakers. Plug-ins are available for rear connection applications on three- and four-pole circuit breakers. Trip-on drawout interlock kits are included. Stabs for EG, JG and LG plug-ins rotate 90° for flexible installation. Use terminal shields for IP30 protection.

Power distribution blocks

Eaton power distribution blocks are designed for high short-circuit current rating applications when applied with Series G breakers. Available in three-pole open style and single-pole enclosed style with a variety of terminal arrangements and current-carrying capability up to 570A.

Rotary door-mounted handle mechanism

Rotary handle mechanisms are available for EG-, JG-, LG- and NG-Frame breakers. Use for Type 1 and 12 environments. This rugged through-the-door rotary handle mechanism is designed to accommodate a gloved hand.
Motor protector circuit breakers
UL 489 solution

Motor circuit protection selection chart

<table>
<thead>
<tr>
<th>Feature</th>
<th>Frame/Rating</th>
<th>FDMP</th>
<th>HFDMP</th>
<th>JGMPH</th>
<th>JGMPH</th>
<th>LGMPH</th>
<th>LGMPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interruption rating at 240V</td>
<td>65 kA</td>
<td>100 kA</td>
<td>85 kA</td>
<td>100 kA</td>
<td>85 kA</td>
<td>100 kA</td>
<td></td>
</tr>
<tr>
<td>Interruption rating at 480V</td>
<td>35 kA</td>
<td>65 kA</td>
<td>35 kA</td>
<td>65 kA</td>
<td>65 kA</td>
<td>65 kA</td>
<td></td>
</tr>
<tr>
<td>Interruption rating at 600V</td>
<td>18 kA</td>
<td>25 kA</td>
<td>18 kA</td>
<td>25 kA</td>
<td>25 kA</td>
<td>35 kA</td>
<td></td>
</tr>
<tr>
<td>Icu/Ics at 240V</td>
<td>65 kA/33 kA</td>
<td>100 kA/50 kA</td>
<td>85 kA/85 kA</td>
<td>100 kA/100 kA</td>
<td>85 kA/85 kA</td>
<td>100 kA/100 kA</td>
<td></td>
</tr>
<tr>
<td>Icu/Ics at 415V</td>
<td>35 kA/18 kA</td>
<td>65 kA/33 kA</td>
<td>40 kA/40 kA</td>
<td>70 kA/53 kA</td>
<td>50 kA/50 kA</td>
<td>70 kA/70 kA</td>
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<tr>
<td>100% rated</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>FLA range (A)</td>
<td>40–205</td>
<td>40–205</td>
<td>50–250</td>
<td>50–250</td>
<td>250–430</td>
<td>250–630</td>
<td></td>
</tr>
<tr>
<td>Motor class protection</td>
<td>5, 10, 15, 20</td>
<td>5, 10, 15, 20</td>
<td>10, 15, 20, 30</td>
<td>10, 15, 20, 30</td>
<td>10, 15, 20, 30</td>
<td>10, 15, 20, 30</td>
<td></td>
</tr>
</tbody>
</table>

Motor protector circuit breakers
UL 489 solution

Applications
MPCBs can be used with a contactor to eliminate need for overload relay and still create manual motor control based on NEC standards. This UL 489 Listed device meets requirements for motor branch protection by incorporating disconnecting means, branch short-circuit protection and overload protection in applications from 50 to 630A and 240 to 690V.

Features
MPCBs provide phase unbalance protection, phase loss protection, hot trip/cold trip, high load alarm to warn of potential faults, field installable and interchangeable accessories, and Class 10, 15, 20, 30 protection.

Accessories
A comprehensive range of accessories is available: shunt trips, undervoltage releases, alarm lockout and auxiliary switches, and pre-trip alarms.

Handle mechanisms
Handle mechanisms facilitate the use of MPCBs in applications where external operation of enclosure mounted units is required.

Standards
UL Listed
All Eaton MPCBs are UL 489 Listed.

CSA Certified
Motor protector circuit breakers comply with CSA 22.2, meeting the requirements for motor protector circuit breakers.

CE Mark
Eaton’s JG- and LG-Frame MPCBs meet the performance specifications of IEC 60947-2. They carry the CE mark for applications where European compliance is required.
Applications

The NEC permits the use of adjustable instantaneous-only circuit breakers (MCPs) in motor branch circuits as part of a listed combination motor controller. The MCP and motor controller act in concert. The MCP provides the disconnecting means and short-circuit protection, and the motor controller provides the overload protection.

Adjustable instantaneous trip

MCPs have no thermal element. The instantaneous trip characteristic is adjustable, providing for placement of the trip setting just above motor inrush. The MCP clears low-level faults quickly, ignores motor starting currents and improves coordination with motor overload relays.

HMCP

The HMCP is available in Series G-, EG-, JG- and LG-Frames to suit larger motor applications requiring higher continuous current and short-circuit performance.

Accessories

A comprehensive range of accessories is available: shunt trips, undervoltage releases and alarm lockout and auxiliary switches, both field and factory installable.

Handle mechanisms

Series G handle mechanisms facilitate the use of Series G MCPs in applications where external operation of enclosure mounted units is required.

Motor circuit protection selection chart

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Maximum Ratings</th>
<th>Dimensions in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amperes</td>
<td>Volts</td>
</tr>
<tr>
<td>E</td>
<td>84.5</td>
<td>480 Vac, 600Y/347 Vac</td>
</tr>
<tr>
<td>J</td>
<td>2500</td>
<td>600 Vac, 250 Vdc</td>
</tr>
<tr>
<td>L</td>
<td>6000</td>
<td>600 Vac, 250 Vdc</td>
</tr>
</tbody>
</table>

Standards

UL Recognized

All Eaton MCPs are UL 489 Recognized and Listed for use with Eaton’s IEC or NEMA motor starters (XT and Freedom Series starters). Additional UL Listing combinations with numerous other control products have been obtained.

CSA Certified

Motor circuit protectors comply with CSA 22.2, meeting the requirements for motor circuit protectors.

CE Mark

Eaton HMCPs meet the performance specifications of IEC 60947-2. They carry the CE mark for applications where European compliance is required.
WMZT miniature circuit breakers
UL 489 solution

Applications
WMZT miniature circuit breakers are suitable for branch circuit protection while providing thermal-magnetic overcurrent protection in applications from 0.5 to 40A.

Technology
WMZT employs a current limiting design to provide fast short-circuit interruption to reduce the let-through energy categorized by C and D curves. The trip-free design cannot be defeated by holding the handle in the ON position.

Accessories
A comprehensive range of accessories is available: trip indicating contacts, auxiliary contacts, shunt trips, padlock hasps and bus bars.

Standards

- **UL Listed**
  WMZT miniature circuit breakers meet NEMA design standards. They are tested and listed per UL 489, ensuring conformance with the NEC.

- **CSA Certified**
  WMZT miniature circuit breakers are certified in accordance with CSA 22.2 No. 5.

- **CE Mark**
  Eaton’s world-class WMZT miniature circuit breakers exceed the performance specifications of IEC 60947-2. They carry the CE mark for applications where European compliance is required.

- **RoHS Certified**
  WMZT miniature circuit breakers

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**WMZT miniature circuit breaker specifications**

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design according to</td>
<td>UL 489, CSA C22.2 No.5, IEC 60947-2</td>
</tr>
<tr>
<td>WMZT</td>
<td></td>
</tr>
<tr>
<td>UL/CSA</td>
<td>10 kAIC at 277/480V from 0.5 to 32A</td>
</tr>
<tr>
<td>UL/CSA</td>
<td>10 kAIC at 240 Vac for 40A</td>
</tr>
<tr>
<td>UL/CSA</td>
<td>10 kAIC at 48 Vdc per pole</td>
</tr>
<tr>
<td>IEC 947-2</td>
<td>15 kAIC at 240/415 Vac</td>
</tr>
<tr>
<td>WMZD</td>
<td></td>
</tr>
<tr>
<td>UL/CSA</td>
<td>10 kAIC at 125 Vdc per pole (two poles max.)</td>
</tr>
<tr>
<td></td>
<td>10 kAIC at 250 Vdc with two poles connected in series</td>
</tr>
<tr>
<td>WMZH</td>
<td></td>
</tr>
<tr>
<td>UL/CSA</td>
<td>14 kAIC at 277/480V at listed amperages</td>
</tr>
<tr>
<td>IEC 947-2</td>
<td>15 kAIC at 240/415 Vac</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Characteristics</td>
<td>C, D</td>
</tr>
<tr>
<td>Endurance</td>
<td>≥ 20,000 operations</td>
</tr>
<tr>
<td>Line voltage connection</td>
<td>Suitable for reverse feed</td>
</tr>
</tbody>
</table>
WMZS current limiting supplementary protector
UL 1077 solution

Applications
WMZS supplementary protectors are IEC current limiting type circuit breakers that provide thermal-magnetic protection in applications from 0.5 to 63A.

Control circuits
WMZS current limiting performance and current ratings below 10A provide an attractive, resettable alternative to fuses in protecting control circuits:
- Motor control circuits (per NEC 450-71, Part F)
- Control circuit transformers
- PLC I/O points
- Contactor coils
- Relays

Standards
WMZS supplementary protectors exceed the requirements of UL 1077 and IEC 60947-2, and carry the following approval marks:

UL Recognized
For applications in the United States where NEC and UL requirements apply, supplementary protectors are intended for use where branch circuit protection has been provided or is not required in accordance with NFPA® 70 (NEC).

CE Mark
WMZS protectors carry the CE mark.

CSA Certified
WMZS supplementary protectors comply with CSA 22.2 No. 235, meeting the requirements for supplementary protectors.

RoHS Certified

Technology
The current limiting design includes a magnetic coil and plunger assembly that acts to quickly trip the breaker during short-circuit conditions. Arc runners channel the arc into the arc chutes, extinguishing the arc before it would otherwise reach current zero, reducing the damaging short-circuit current and the resultant let-through energy to the connected circuit or equipment.

WMZS construction
The WMZS internal construction ensures current limiting performance and compliance with IEC standards.
- Visual Contact Position Indicator Window:
  Red = On and Green = Off
- Three-position handle:
  1 = On, 0 = Off, Center = Tripped
- Quick snap-on clip for secure installation and easy removal from DIN rail
- Interphase insulation barriers on multi-pole units comply with UL 1077 electrical clearance requirements
- Captive posidrive terminal screws offer finger and back-of-hand protection (IP2)

Current limiting interruption performance

![Current Limiting Technology in a DIN Rail Mounted Compact IEC Circuit Breaker](image)
**WMZS current limiting supplementary protector**

**UL 1077 solution**

### Accessories

**Lock-off devices**

To lock off any WMZS protector, use padlockable device Catalog Number WMZPLK.

**Bus bar systems**

Bus bars are available for use with or without auxiliary contacts. The bars can be fed from line or load side.

**Trip indicating contact**

Auxiliary/trip indicating contact is field installable to the left side of a WMZS or shunt trip and is selectable between auxiliary and trip indicating modes. Use Catalog Number WMZSAUXTRIP.

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**Technical data**

<table>
<thead>
<tr>
<th>Description</th>
<th>B Curve</th>
<th>C Curve</th>
<th>D Curve</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical</strong></td>
<td>[Table]**</td>
<td>[Table]**</td>
<td>[Table]**</td>
</tr>
<tr>
<td>Approvals</td>
<td>UR (UL 1077), CSA (CSA 22.2 No. 235), CE</td>
<td>[Table]**</td>
<td>[Table]**</td>
</tr>
<tr>
<td>Standards</td>
<td>IEC/EN 60947-2</td>
<td>[Table]**</td>
<td>[Table]**</td>
</tr>
<tr>
<td>Short-circuit trip response</td>
<td>3 x 5 Iₜ</td>
<td>5 x 10 Iₜ</td>
<td>10 x 20 Iₜ</td>
</tr>
</tbody>
</table>

**Supplementary Protectors—UL/CSA**

| Current range | 6–63A | 0.5–63A | 0.5–40A |

**Maximum voltage ratings—UL/CSA**

| Single-pole | 277 Vac | 48 Vdc | 480Y/277 Vac | 96 Vdc |
| Two-, three-pole | 277 Vac | 48 Vdc | 480Y/277 Vac | 96 Vdc |

**Thermal tripping characteristics**

| Single-pole | 1.35 x Iₜ @ 40°C | 1.45 x Iₜ @ 40°C | 1.35 x Iₜ @ 40°C |
| Multi-pole | 1.35 x Iₜ @ 40°C | 1.45 x Iₜ @ 40°C | 1.45 x Iₜ @ 40°C |

**Short-circuit ratings (at maximum voltage)**

| Single-pole | 10 kA (5 kA for 40A device) | 10 kA (5 kA for 40A device) | 10 kA (5 kA for 40A device) |
| Two-, three-pole | 10 kA (5 kA for 40A device) | 10 kA (5 kA for 40A device) | 10 kA (5 kA for 40A device) |
| Two poles in series | 10 kA @ 96 Vdc | 10 kA @ 96 Vdc | 10 kA @ 96 Vdc |

**Miniature Circuit Breaker—IEC**

| Current range | 6–63A | 0.5–63A | 0.5–40A |

**Maximum voltage ratings—IEC 60947-2**

| Single-pole | 230 Vac | 48 Vdc | 230/400 Vac |
| Two-, three-pole | 230/400 Vac | 48 Vdc |

**Maximum voltage ratings—IEC 60898**

| Single-pole | 240 Vac | 48 Vdc |
| Two-, three-pole | 240/415 Vac | 48 Vdc |

**Thermal tripping characteristics**

| Single-pole | >1 hour @ 1.05 x Iₜ | >1 hour @ 1.05 x Iₜ | >1 hour @ 1.05 x Iₜ |
| Multi-pole | <1 hour @ 1.3 x Iₜ | <1 hour @ 1.3 x Iₜ | <1 hour @ 1.3 x Iₜ |

**Interrupting ratings (at maximum voltage)**

| IEC 60974-2 | 15 kA | 15 kA | 15 kA |
| IEC 60868 | 10 kA | 10 kA | 10 kA |
| Operational switching capacity | 7.5 kA | 7.5 kA | 7.5 kA |
| Maximum back-up fuse (gL/gG) | 125A | 125A | 125A |
| Rated impulse withstand—U₉00 | 4000 Vac | 4000 Vac | 4000 Vac |
| Rated insulation voltage—U | 440 Vac | 440 Vac | 440 Vac |
Supplementary protector type SPHM hydraulic-magnetic
UL 1077 solution

Applications
SPHM supplementary protectors provide magnetic-only overcurrent protection for applications from 0.1 to 50A at 250/277V, 0.1 to 30A at 480 Vac and 0.1 to 63A at 80 Vdc.

Equipment and control circuit protection
Long, medium and short delay overcurrent curves provide for close overcurrent protection in applications like:
• Electronics
• Motor control circuits (per NEC 430-71, Part F)
• Control circuit transformers
• PLC I/O points
• Contactor coils
• Relays

Precise overload protection
Protection is not affected by ambient temperatures (–40 to +85°C). The protector will hold 100% rated current, eliminating nuisance tripping at higher ambients, and will not allow higher than rated current at lower ambients.

Immediate reset
The protector can be reset (closed) immediately after an overcurrent trip, maximizing continuity to the affected circuit.

High inrush tolerance
Half cycle immunity to high inrush is available at 8, 18 or 25 times the continuous current rating for high inrush applications like electronic power supplies.

High vibration and shock

Standards
SPHM supplementary protectors exceed the requirements of UL 1077 and IEC 60950 and carry the following approval marks:

UL Recognized
For applications where NEC and UL requirements apply, supplementary protectors are intended for use where branch circuit protection has been provided or is not required.

VDE Approved
For export applications where IEC requirements apply, SPHM supplementary protectors can be applied as circuit breakers that exceed the requirements of IEC 60950.

CE Mark
SPHM protectors carry the CE mark in accordance with Low Voltage Directive (LVD) (73/23/EEC).

RoHS Compliant
SPHM protectors submit to limiting the presence of hazardous chemicals in accordance with the Restriction on Hazardous Substances (RoHS) directive 2002/95/EC.

Technology
The hydraulic-magnetic design includes an iron core that moves against a spring in an oil-filled tube. A current-carrying magnetic coil wraps around the tube assembly. During overload conditions, the magnetic flux generated by the coil moves the core through the oil enough to overcome the spring force and trip the breaker. The result is overcurrent protection that is purely current-sensitive and resistant to changes in ambient temperature.

Hydraulic-magnetic design
**Supplementary protector hydraulic-magnetic**

**UL 1077 solution**

**SPHM construction**

The SPHM hydraulic-magnetic construction ensures precise overcurrent protection independent of ambient temperature and resistant to shock and vibration.

- Two-position handle: 1 = On, 0 = Off (tripped)
- Spring clip for secure installation and easy removal from DIN rail
- Hydraulic-magnetic tube provides precise overcurrent protection
- Integral auxiliary switch available
- Overcurrent curves, long, medium or short delay—time characteristic curves are available as short, medium or long delay
- Integral auxiliary switch (optional selection)—one auxiliary switch (a or b) can be factory installed per pole—a separate pole for auxiliary is not required. Contact Eaton for price adder

**SPHM approvals VDE, UL, CSA**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of Poles</th>
<th>Rating Operating Voltage $U_e$</th>
<th>Rating Current $I_n$</th>
<th>Interrupting Capacity $I_{cu} = I_{cs}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN 60947-2  Certified CENELEC</td>
<td>SPHM</td>
<td>1</td>
<td>230V 50/60 Hz</td>
<td>0.1–63A</td>
</tr>
<tr>
<td></td>
<td>SPHM</td>
<td>2–4</td>
<td>400V 50/60 Hz</td>
<td>0.1–63A</td>
</tr>
<tr>
<td></td>
<td>SPHM</td>
<td>1–2</td>
<td>80 Vdc</td>
<td>0.1–63A</td>
</tr>
</tbody>
</table>

| UL 1077 CSA C22.2 | SPHM  | 1–4 | 250 Vac | 0.1–50A | 5000A |
| SPHM  | 1–4 | 277 Vac | 0.1–50A | 5000A |
| SPHM  | 3   | 480 Vac | 0.1–30A | 3000A |
| SPHM  | 1–4 | 65 Vdc | 0.1–50A | 5000A |
| SPHM  | 1–4 | 80 Vdc | 0.1–50A | 5000A |
| SPHM  | 1–4 | 80 Vdc | 51–63A | 5000A |

**Notes**

1. Rating insulation voltage (Ui): 400 Vac.
   Working shock strength voltage (Uimp): 8 kV, T1/T2 = 1.2/50 μs.
   Working category: A.
2. Series fuse required: In fuse between 1SA and 4 times $I_n$ of the protector.
3. Series fuse not required.
4. Series fuse required. $I_n$ Fuse maximum 200A.
**NEC branch circuit**

**NEC Article 210**
The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s) where:
- Overcurrent device: Branch circuit protector
- Outlet(s): Point on the wiring system at which current is taken to supply utilization equipment

**Typical supplementary overcurrent protection**

**NEC Article 240-10**
Where supplementary overcurrent protection is used … it shall not be used as a substitute for branch circuit overcurrent devices or in place of the branch circuit protection in Article 210.

**NEC motor branch circuits**

**NEC Article 430**
Requires that each motor branch circuit contain the following components or functions:

1. Disconnecting Means (MCCB, MCP or Switch)
2. Branch Short-Circuit Protection (MCCB, MCP or Fuse)
3. Motor Controller (Contactor)
4. Motor Overload Protection (Overload Relay)

**Typical group motor circuit**

**NEC 430-112**

**NEC 430-53(c)**
A single short-circuit and ground fault protective device is permitted for a group of motors if each motor controller and each motor overload device is listed for group installations with a specified rating of fuse or inverse time circuit breaker, or both.

**Typical motor control circuit**

**NEC 430 Part F**
Applies to the particular conditions of motor control circuits.

**Definition of Motor Control Circuit**
The circuit of a control apparatus or system that carries the electric signals directing the performance of the controller, but does not carry the main power current.
A Guide to Industrial Control Circuit Breaker Selection and the Requirements of the National Electrical Code

<table>
<thead>
<tr>
<th>Standards and Approvals</th>
<th>IEC Standard Marks and Standards</th>
<th>Number of Poles</th>
<th>Current Range (Min.–Max.)</th>
<th>UL Voltage Ratings (Volts AC)</th>
<th>Interrupting Ratings at Maximum UL Voltage (kA)</th>
<th>Branch Circuit Disconnecting Means</th>
<th>Branch Short-Circuit Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Molded-case circuit breakers (MCCB)</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>1–4</td>
<td>15–180A</td>
<td>220–480 Vac 125/250 Vdc</td>
<td>35 kA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Series G E-Frame</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>2–4</td>
<td>20–250A</td>
<td>220–600 Vac 125/250 Vdc</td>
<td>50 kA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Series G J-Frame</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>3–4</td>
<td>100–630A</td>
<td>220–600 Vac 125/250 Vdc</td>
<td>65 kA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Series G L-Frame</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>2–4</td>
<td>400–1200A</td>
<td>220–600 Vac</td>
<td>65 kA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Series G N-Frame</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>3–4</td>
<td>800–2500A</td>
<td>220–600 Vac</td>
<td>65 kA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Series G R-Frame</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>3–4</td>
<td>250–630A</td>
<td>220–600 Vac</td>
<td>35 kA</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Motor protector circuit breaker (MPCB)</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>3</td>
<td>3–800A</td>
<td>600 Vac 250 Vdc</td>
<td>Listed Combination</td>
<td>Listed Combination</td>
</tr>
<tr>
<td><strong>Series G</strong></td>
<td>UL 489 Recognized</td>
<td>IEC 60947-2</td>
<td>1–3</td>
<td>0.5–40A</td>
<td>277/480 Vac</td>
<td>10 kA UL/CSA</td>
<td>Listed Combination</td>
</tr>
<tr>
<td><strong>Miniature circuit breakers (MCB)</strong></td>
<td>UL 489 Listed</td>
<td>IEC 60947-2</td>
<td>1–3</td>
<td>0.5–63A</td>
<td>277/480 Vac</td>
<td>10 kA</td>
<td>Listed Combination</td>
</tr>
<tr>
<td><strong>Supplementary protectors (SP)</strong></td>
<td>UL 1077 Recognized</td>
<td>IEC 60947-2</td>
<td>1–4</td>
<td>0.1–50A</td>
<td>250 Vac</td>
<td>5 kA</td>
<td>Listed Combination</td>
</tr>
<tr>
<td><strong>WMZT</strong></td>
<td>UL 1077 Recognized</td>
<td>IEC 60947-2</td>
<td>0.1–10A</td>
<td>277 Vac</td>
<td>5 kA</td>
<td>Listed Combination</td>
<td></td>
</tr>
<tr>
<td><strong>WMZS</strong></td>
<td>UL 1077 Recognized</td>
<td>IEC 60947-2</td>
<td>0.1–8A</td>
<td>480 Vac</td>
<td>3 kA</td>
<td>Listed Combination</td>
<td></td>
</tr>
<tr>
<td><strong>Manual motor controller</strong></td>
<td>UL 508 Listed</td>
<td>IEC 60947-4-1</td>
<td>3</td>
<td>0.16–65A</td>
<td>220–600 Vac</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Type F</strong></td>
<td>UL 508 Listed</td>
<td>IEC 60947-4-1</td>
<td>1–4</td>
<td>0.1–50A</td>
<td>250 Vac</td>
<td>5 kA</td>
<td>Listed Combination</td>
</tr>
<tr>
<td><strong>MMC</strong></td>
<td>UL 508 Listed</td>
<td>IEC 60947-4-1</td>
<td>0.1–10A</td>
<td>277 Vac</td>
<td>5 kA</td>
<td>Listed Combination</td>
<td></td>
</tr>
<tr>
<td><strong>Type F</strong></td>
<td>UL 508 Listed</td>
<td>IEC 60947-4-1</td>
<td>0.1–25A</td>
<td>480 Vac</td>
<td>3 kA</td>
<td>Listed Combination</td>
<td></td>
</tr>
</tbody>
</table>

1 Contact Eaton for DC voltage ratings.
2 125A maximum rated per UL.
3 UL Listed for use with Eaton motor starters.
4 Series fuse required. f, fuse between 15A and 4 times I, of the protector.

**EATON CORPORATION** Industrial control circuit breakers
### NEC 420 Motor Branch Circuit

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Group circuit disconnecting means and overcurrent protection</td>
<td>Yes with adapter</td>
<td>Eaton motor starters</td>
<td>Mounting hardware and lugs included for your convenience</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Group circuit disconnecting means and overcurrent protection</td>
<td>Yes with adapter</td>
<td>Eaton motor starters</td>
<td>Other accessory options include alarm switch, auxiliary switch, undervoltage release, safety devices, shunt trip, terminations</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Group circuit disconnecting means and overcurrent protection</td>
<td>Yes with adapter</td>
<td>Eaton motor starters</td>
<td>Breaker can be reset after a trip condition, unlike fusible switches, reducing downtime and eliminating the need for replacement</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Group circuit disconnecting means and overcurrent protection</td>
<td>Yes with adapter</td>
<td>Eaton motor starters</td>
<td>Removes need for separate overload relay</td>
</tr>
<tr>
<td>Listed Combination ©</td>
<td>Listed Combination ©</td>
<td>Flex Shaft, rotary or close-coupled</td>
<td>Flex Shaft, rotary or close-coupled</td>
<td>Listed</td>
<td>Listed Combination ©</td>
<td>Listed Combination ©</td>
<td>listed for use with Eaton motor starters</td>
<td>Eaton motor starters</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes standard mounting</td>
<td>Ideal for feeder and branch circuit protection applications</td>
<td>Eaton motor starters</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes standard mounting</td>
<td>Current limiting interruption ideal for replacing fuses in control circuits</td>
<td>Eaton motor starters</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes standard mounting</td>
<td>Precise overload protection regardless of ambient temperature</td>
<td>Eaton motor starters</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes standard mounting</td>
<td>Provides a complete motor protection solution by combining disconnect function, overload protection, short-circuit protection and remote operation in one compact unit</td>
<td>Eaton motor starters</td>
<td></td>
</tr>
</tbody>
</table>

Refer to Page 13 for circuit breaker selection drawings

- NEC branch circuit
- Typical group motor circuit
- Typical supplementary overcurrent protection
- Typical motor control circuit
- NEC motor branch circuits
Eaton’s Electrical Sector is a global leader in power distribution, power quality, control and automation, and monitoring products. When combined with Eaton’s full-scale engineering services, these products provide customer-driven PowerChain™ solutions to serve the power system needs of the data center, industrial, institutional, public sector, utility, commercial, residential, IT, mission critical, alternative energy and OEM markets worldwide.

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