

Industrial control circuit breakers

Molded-case circuit breakers
Miniature circuit breakers

Supplementary protectors
Hydraulic-magnetic circuit breakers

Comprehensive circuit protection for control panel applications

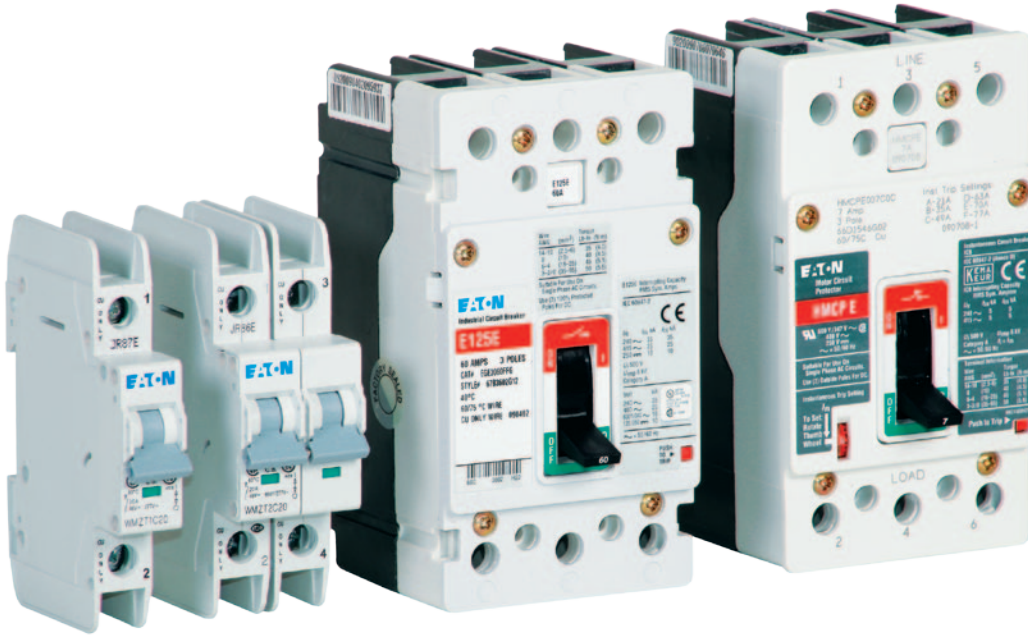


EATON

Powering Business Worldwide

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.

Molded-case circuit breakers—UL 489 Listed

Series G® molded-case circuit breakers are listed for use as branch circuit overcurrent protection and disconnecting means.

- 15 to 2500A
- Up to 200 kAIC at 480V

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

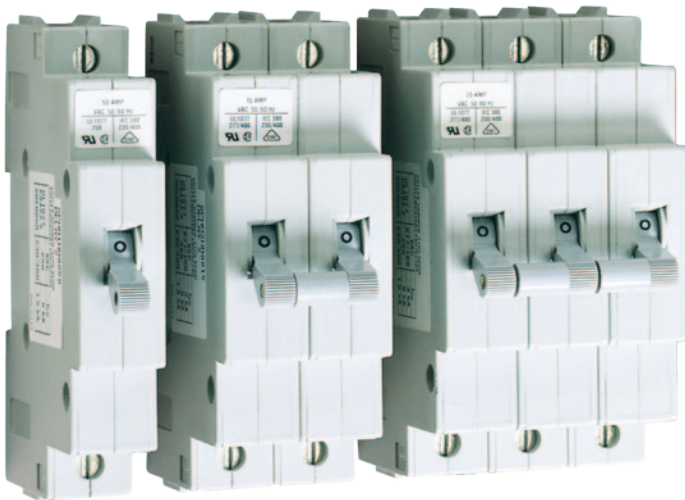
Eaton's WMZT DIN rail mountable miniature circuit breakers offer a complete range from 0.5 to 40A with two levels of short-circuit protection categorized by C and D curves.

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.

UL 1077 supplementary protectors

The complete family of supplementary protectors:
DIN rail mounted



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.

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.

Series G molded-case circuit breakers

UL 489 solution



Featuring the EG: The Industry's Smallest 125A UL Breaker

Earth Leakage Module

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

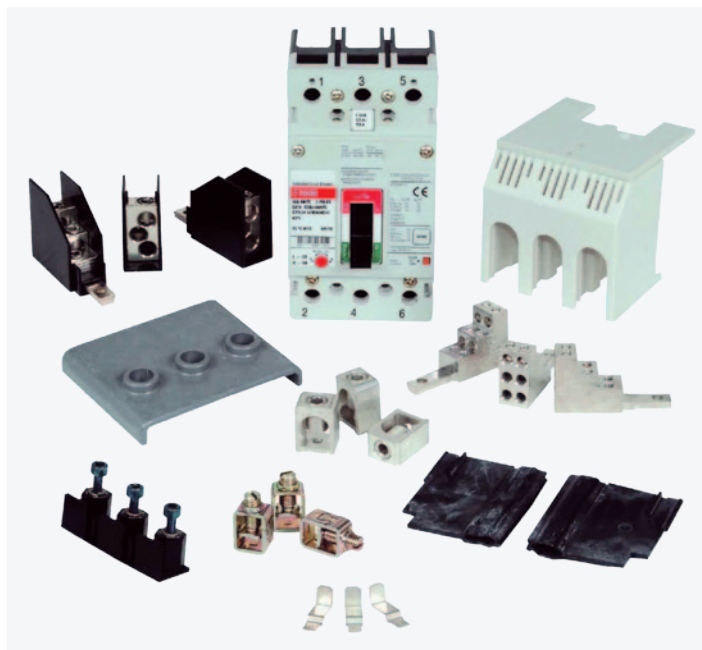
UL 489 solution

Series G breaker frame capabilities

Frame	Maximum Amperes ^①	Maximum Voltages		Maximum Interrupting Ratings						Dimensions in Inches Three Poles		
		NEMA, UL, CSA	IEC 60947-2	UL 240V	UL 480V	UL 600V	IEC 240V	IEC 415V	IEC 690V	H	W	D
E	125	600Y/347	415	200 kA	100 kA	35 kA	200 kA	100 kA	N/A	5.50	3.00	2.99
J	250	600	690	200 kA	200 kA	50 kA	200 kA	200 kA	18 kA	7.00	4.13	3.57
L	600	600	690	200 kA	200 kA	65 kA	200 kA	200 kA	35 kA	10.13	5.48	4.09
N	1200	600	690	200 kA	150 kA	65 kA	200 kA	100 kA	35 kA	16.00	8.25	5.50
R	2500	600	690	200 kA	100 kA	65 kA	200 kA	100 kA	35 kA	16.00	15.50	9.75

① Per UL and CSA listed ratings.

Series G accessories



Termination Options and 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.

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.

Control panel and enclosure accessories



Flex Shaft



Power Distribution Blocks



High Performance Handle with Padlocks



Universal Rotary

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.

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

Feature	Frame/Rating					
	FDMP ①	HFDMP ①	JGMPS	JGMPH	LGMPs	LGMPH
Interruption rating at 240V	65 kA	100 kA	85 kA	100 kA	85 kA	100 kA
Interruption rating at 480V	35 kA	65 kA	35 kA	65 kA	50 kA	65 kA
Interruption rating at 600V	18 kA	25 kA	18 kA	25 kA	25 kA	35 kA
Icu/Ics at 240V	65 kA/33 kA ②	100 kA/50 kA ②	85 kA/85 kA	100 kA/100 kA	85 kA/85 kA	100 kA/100 kA
Icu/Ics at 415V	35 kA/18 kA ②	65 kA/33 kA ②	40 kA/40 kA	70 kA/53 kA	50 kA/50 kA	70 kA/70 kA
100% rated	No	No	Yes	Yes	Yes	Yes
FLA range (A)	40–205	40–205	50–250	50–250	250–630 ③	250–630 ③
Motor class protection ④	5, 10, 15, 20	5, 10, 15, 20	10, 15, 20, 30	10, 15, 20, 30	10, 15, 20, 30	10, 15, 20, 30

① FDMP and HFDMP are part of Eaton's Series C® family.

② IEC ratings available only on FWMP and HFWMP.

③ 630A is not a UL Listed rating. 600A is the maximum UL or CSA rating for LG breaker.

④ FDMP and HFDMP have adjustable and fixed motor class protection options. JGMP and LGMP have adjustable motor class protection only.

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.



Series G motor circuit protectors EG-Frame, JG-Frame and LG-Frame

UL 489 solution

Motor circuit protection selection chart

Frame Size	Maximum Ratings		Dimensions in Inches		
	Amperes	Volts	Width	Height	Depth
E	84.5	480 Vac, 600Y/347 Vac	5.50	3.00	2.99
J	2500	600 Vac, 250 Vdc	7.00	4.13	3.57
L	6000	600 Vac, 250 Vdc	10.13	5.48	4.09

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.

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.



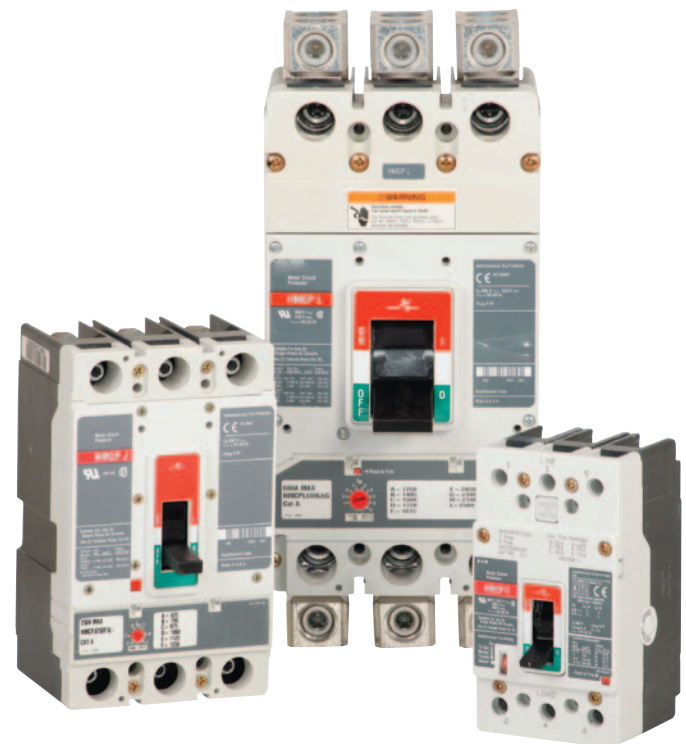
CSA Certified

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



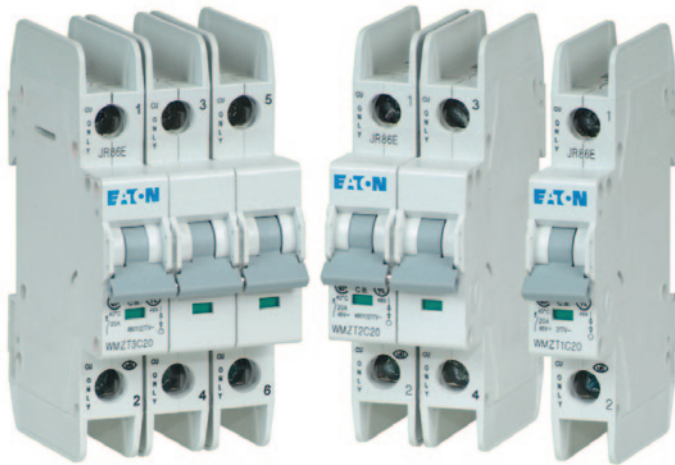
CE Mark

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



WMZT miniature circuit breaker specifications

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

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

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 430-71, 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



Current Limiting Technology in a DIN Rail Mounted Compact IEC Circuit Breaker

Technology

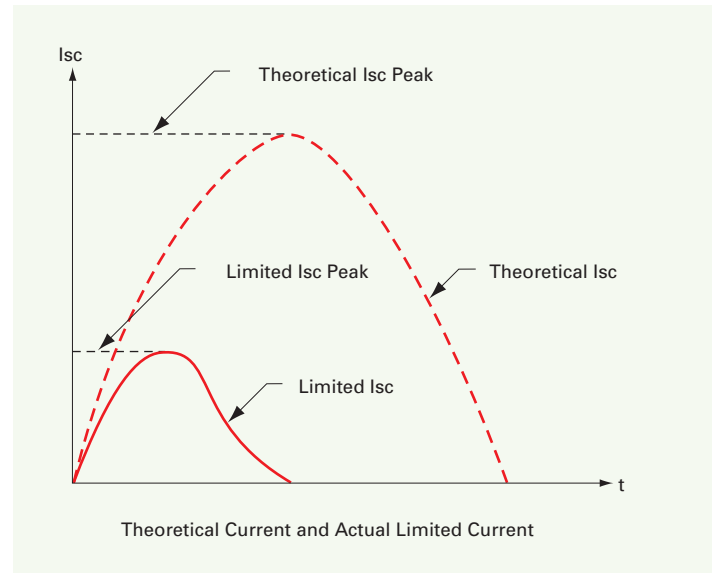
The current limiting design includes a magnetic coil and plunger assembly that acts to quickly trip the breaker during short-circuit conditions. Arc runners channel the arc into the arc chutes, extinguishing the arc before it would otherwise reach current zero, reducing the damaging short-circuit current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



WMZS current limiting supplementary protector

UL 1077 solution

Technical data

Description	B Curve	C Curve	D Curve
Electrical			
Approvals	UR (UL 1077), CSA (CSA 22.2 No. 235), CE		
Standards	IEC/EN 60947-2		
Short-circuit trip response	$3 \times 5 I_n$	$5 \times 10 I_n$	$10 \times 20 I_n$
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	277 Vac 48 Vdc	277 Vac 48 Vdc
Two-, three-pole	480Y/277 Vac	480Y/277 Vac	480Y/277 Vac
Two-pole	96 Vdc	96 Vdc	96 Vdc
Thermal tripping characteristics			
Single-pole	$1.35 \times I_n @ 40^\circ\text{C}$	$1.35 \times I_n @ 40^\circ\text{C}$	$1.35 \times I_n @ 40^\circ\text{C}$
Multi-pole	$1.45 \times I_n @ 40^\circ\text{C}$	$1.45 \times I_n @ 40^\circ\text{C}$	$1.45 \times I_n @ 40^\circ\text{C}$
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 Vac 48 Vdc	230 Vac 48 Vdc
Two-, three-pole	230/400 Vac	230/400 Vac	230/400 Vac
Maximum voltage ratings—IEC 60898			
Single-pole	240 Vac 48 Vdc	240 Vac 48 Vdc	240 Vac 48 Vdc
Two-, three-pole	240/415 Vac	240/415 Vac	240/415 Vac
Thermal tripping characteristics			
Single-pole	$>1 \text{ hour} @ 1.05 \times I_n$	$>1 \text{ hour} @ 1.05 \times I_n$	$>1 \text{ hour} @ 1.05 \times I_n$
Multi-pole	$<1 \text{ hour} @ 1.3 \times I_n$	$<1 \text{ hour} @ 1.3 \times I_n$	$<1 \text{ hour} @ 1.3 \times I_n$
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— U_{imp}	4000 Vac	4000 Vac	4000 Vac
Rated insulation voltage— U_i	440 Vac	440 Vac	440 Vac

Accessories

Lock-off devices

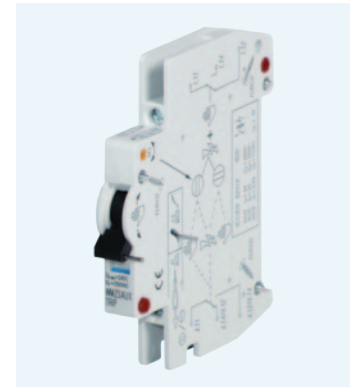
To lock off any WMZS protector, use padlockable device Catalog Number WMZPLK.

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.



Trip Indicating Contact

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

SPHM protectors meet MIL standard for vibration (MIL-STD-202 Method 204) and shock (MIL-STD-202, Method 213).

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.



Hydraulic-Magnetic Technology in a DIN Rail Mounted Compact IEC Circuit Breaker

Precise and Accurate Overcurrent Performance Independent from Ambient Temperature

High Resistance to Shock and Vibration

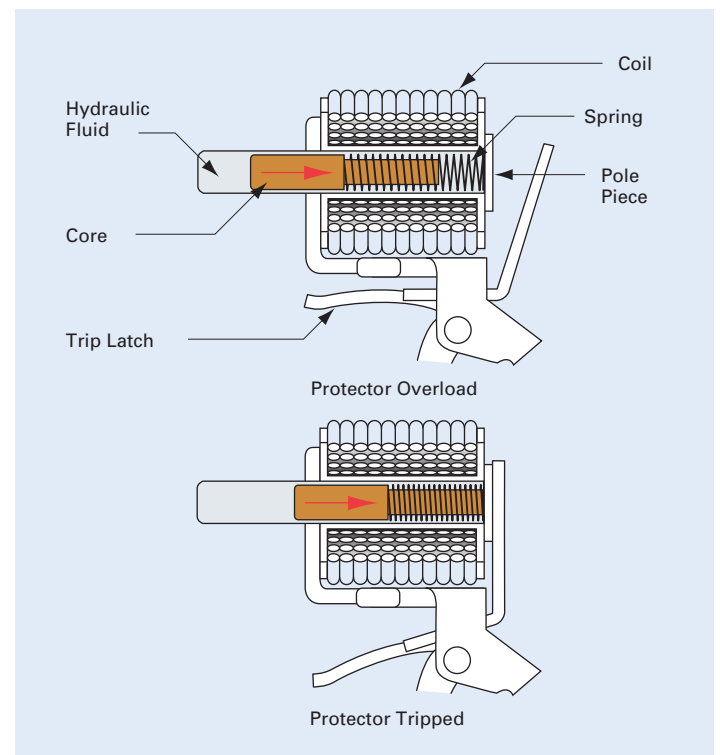


Integrally Mounted Auxiliary Switch (optional)

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

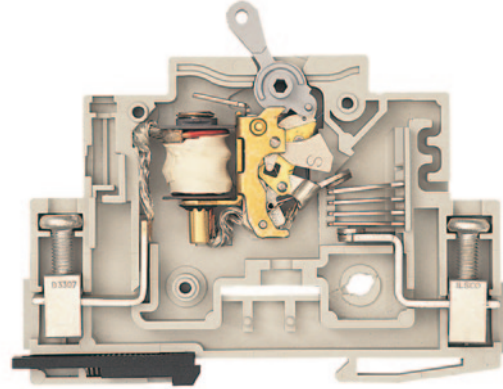


Supplementary protector hydraulic-magnetic UL 1077 solution

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

	Type	Number of Poles	Rating Operating Voltage U_e	Rating Current I_n	Interrupting Capacity $I_{cu} = I_{cs}$
EN 60947-2 ① Certified CENELEC	SPHM	1	230V 50/60 Hz	0.1–63A	1500A
	SPHM	2–4	400V 50/60 Hz	0.1–63A	1500A
	SPHM	1–2	80 Vdc	0.1–63A	3000A
UL 1077 CSA C22.2	SPHM	3	250 Vac	0.1–50A	5000A ②
	SPHM	1–4	277 Vac	0.1–50A	5000A ②
	SPHM	3	480 Vac	0.1–30A	3000A ②
	SPHM	1–4	65 Vdc	0.1–50A	5000A ③
	SPHM	1–4	80 Vdc	0.1–50A	5000A ②
	SPHM	1–4	80 Vdc	51–63A	5000A ④

① Rating insulation voltage (U_i): 400 Vac.
Working shock strength voltage (U_{imp}): 8 kV, $T_1/T_2 = 1.2/50 \mu s$.
Working category: A.

② Series fuse required: I_n fuse between 15A and 4 times I_n of the protector.

③ Series fuse not required.

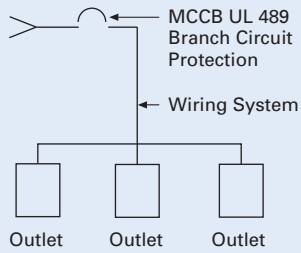
④ Series fuse required. I_n Fuse maximum 200A.

NEC branch circuit

NEC Article 210

The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s) where:

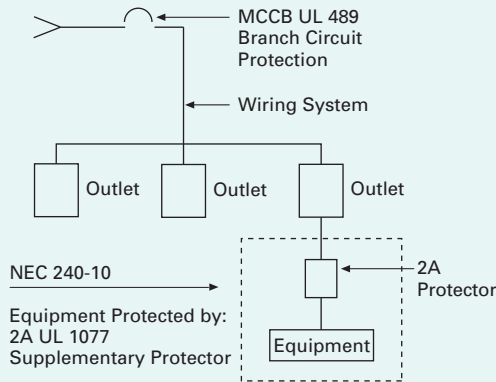
- Overcurrent device: Branch circuit protector
- Outlet(s): Point on the wiring system at which current is taken to supply utilization equipment



Typical supplementary overcurrent protection

NEC Article 240-10

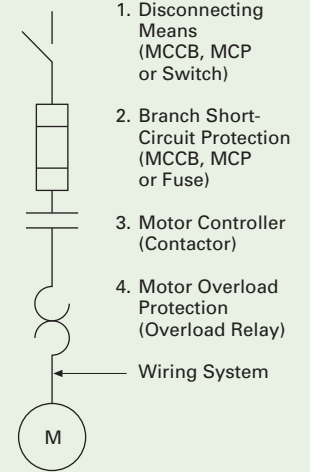
Where supplementary overcurrent protection is used ... it shall not be used as a substitute for branch circuit overcurrent devices or in place of the branch circuit protection in Article 210.



NEC motor branch circuits

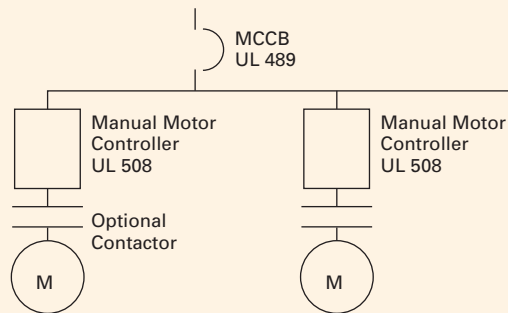
NEC Article 430

Requires that each motor branch circuit contain the following components or functions:



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.

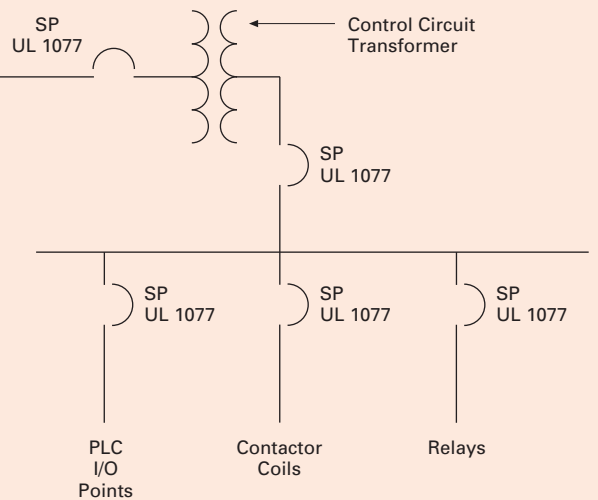
Typical motor control circuit

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

For Direct Application to NEC, See Color Coordinated Bases	Standards			Product Ratings				NEC 210 Branch Circuit Application	
	UL Standards and Approvals	IEC Standard Marks and Standards	Number of Poles	Current Range Amperes (Min.–Max.)	UL Voltage Ratings (Volts AC)	Interrupting Ratings at Maximum UL Voltage (kA) ❶	Branch Circuit Disconnecting Means	Branch Short-Circuit Protection	
Molded-case circuit breakers (MCCB) UL 489 Listed thermal-magnetic protection	Series G E-Frame	UL 489 Listed	IEC 60947-2	1–4	15–160A ❷	220–480 Vac 125/250 Vdc	35 kA	Yes	Yes
	Series G J-Frame	UL 489 Listed	IEC 60947-2	2–4	20–250A	220–600 Vac 125/250 Vdc	50 kA	Yes	Yes
	Series G L-Frame	UL 489 Listed	IEC 60947-2	3–4	100–630A	220–600 Vac 125/250 Vdc	65 kA	Yes	Yes
	Series G N-Frame	UL 489 Listed	IEC 60947-2	2–4	400–1200A	220–600 Vac	65 kA	Yes	Yes
	Series G R-Frame	UL 489 Listed	IEC 60947-2	3–4	800–2500A	220–600 Vac	65 kA	Yes	Yes
Motor protector circuit breaker (MPCB) UL 489 Listed	Series G	UL 489 Listed	IEC 60947-2	3	250–630A	220–600 Vac	35 kA	Yes	Yes
Motor circuit protector (MCP) UL 489 Recognized	Series G	UL 489 Recognized		3	3–600A	600 Vac 250 Vdc		Listed Combination ❸	Listed Combination ❸
Miniature circuit breakers (MCB) UL 489 Listed thermal-magnetic protection	WMZT	UL 489 Listed	IEC 60947-2	1–3	0.5–40A	277/480 Vac	10 kA UL/CSA 15 kA IEC 60947		
Supplementary protectors (SP) UL 1077 Recognized supplementary overcurrent protection	WMZS Thermal-magnetic protection	UL 1077 Recognized	IEC 60947-2	1–3	0.5–63A	277/480 Vac	10 kA		
	SPHM Hydraulic-magnetic protection	UL 1077 Recognized	IEC 60947-2 IEC 60950 VDE 0660	1–4	0.1–50A 0.1–50A 0.1–30A	250 Vac 277 Vac 480 Vac	5 kA ❹ 5 kA ❹ 3 kA ❹		
Manual motor controller UL 508 Listed Type F	MMC	UL 508 Listed Type F	IEC 60947-4-1	3	0.16–65A	220–600 Vac		Yes	Yes

❶ Contact Eaton for DC voltage ratings.

❷ 125A maximum rated per UL.

❸ UL Listed for use with Eaton motor starters.

❹ Series fuse required. I_n fuse between 15A and 4 times I_n of the protector.

NEC 420 Motor Branch Circuit					Miscellaneous				
Branch Circuit Overload Protection	Supplementary Overcurrent Protection	Motor Branch Circuit Disconnecting Means	Motor Branch Short-Circuit Protection	Motor Branch Overload Protection	Multi-Motor (Group) Motor Circuits	Motor Control Circuit Overcurrent Protection	Handle Mechanism	Breaker DIN Rail Mount	Product Notes and Unique Features
Yes		Yes	Yes		Group circuit disconnecting means and overcurrent protection	Yes	Flex Shaft, rotary or close-coupled	Yes with adapter	Mounting hardware and lugs included for your convenience Other accessory options include alarm switch, auxiliary switch, undervoltage release, safety devices, shunt trip, terminations Breaker can be reset after a trip condition, unlike fusible switches, reducing downtime and eliminating the need for replacement
Yes		Yes	Yes	Group circuit disconnecting means and overcurrent protection	Yes	Flex Shaft, rotary or close-coupled			
Yes		Yes	Yes	Group circuit disconnecting means and overcurrent protection	Yes	Flex Shaft, rotary or close-coupled			
Yes		Yes	Yes	Group circuit disconnecting means and overcurrent protection	Yes	Flex Shaft or rotary			
Yes		Yes	Yes	Group circuit disconnecting means and overcurrent protection	Yes	Flex Shaft or rotary			
Yes		Yes	Yes	Yes	Group circuit disconnecting means and overcurrent protection	Yes	Flex Shaft, rotary or close-coupled		Eliminates need for separate overload relay
		Listed Combination ③	Listed Combination ③				Flex Shaft, rotary or close-coupled		Listed for use with Eaton motor starters
				Yes		Yes		Yes standard mounting	Ideal for feeder and branch circuit protection applications
	Yes					Yes		Yes standard mounting	Current limiting interruption ideal for replacing fuses in control circuits
	Yes					Yes		Yes standard mounting	Precise overload protection regardless of ambient temperature
Yes		Yes	Yes	Yes		Yes		Yes standard mounting	Provides a complete motor protection solution by combining disconnect function, overload protection, short-circuit protection and remote operation in one compact unit

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

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