



# MOLDED CASE CIRCUIT BREAKERS

## Replacement Circuit Breakers

### REPLACEMENT CAPABILITIES, *Continued*

Types MC, MCC, MCA, MCCA, MARK 75® Types HMC, HMCC, HMCA, HMCCA SELTRONIC™ with Solid State Trip Units, 600 Volts AC, 50/60 Hz

#### Complete Breaker Requires Frame, Rating Plug, and Terminals

Frame Only			
Poles <sup>①</sup>	Standard (Long Delay and Short Time)	Short Time Only <sup>②</sup>	Long Delay, Short Time and Adjustable Short Delay Time (.08-.28 seconds)
Catalog Numbers			



MC, 600 Volts AC

#### Breakers for Standard Application

##### Types MC and MCA (400 to 800 Amperes)

2	MC2800F	MC2800FM	MCA2800F
3	MC3800F	MC3800FM	MCA3800F

##### MARK 75® Types HMC and HMCA (400 to 800 Amperes)

2	HMC2800F	HMC2800FM	HMCA2800F
3	HMC3800F	HMC3800FM	HMCA3800F

Type MC800 Molded Case Switch: Refer to Page 55

#### Breakers for Application at 100% Rating

##### Types MCC and MCCA (400 to 800 Amperes)

3	MCC3800F	MCCA3800F
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##### MARK 75® Types HMCC and HMCCA (400 to 800 Amperes)

3	HMCC3800F	HMCCA3800F
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#### Types MCG, MCGG, MCGA, MCGGA and MARK 75® Types HMCG, HMCCG, HMCGA, HMCCGA SELTRONIC™ with Built-in Ground Fault Protection

Complete Breaker Requires Frame, Rating Plug and Terminals – Extra Current Transformer Included for Neutral. <sup>③④</sup> See Page 58 For Optional Indicator Kit.

Frame Only			Ground Fault Characteristics	
Poles	Standard (Long Delay, Short Time and Ground Fault Trip)	Long Delay, Short Time, Adjustable Short Delay Time and Ground Fault Trip	Pick-up Setting Amperes	Time Setting
Catalog Numbers				

#### Breakers for Standard Applications

##### Types MCG and MCGA (400 to 800 Amperes)<sup>⑤</sup>

3	MCG3800F	MCGA3800F	80-800	3.5-30 Cy
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##### MARK 75® Types HMCG and HMCGA (400 to 800 Amperes)<sup>⑤</sup>

3	HMCG3800F	HMCGA3800F	80-800	3.5-30 Cy
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#### Breakers for Applications at 100% Rating

##### Types MCGG and MCGGA (400 to 800 Amperes)<sup>⑤</sup>

3	MCGG3800F	MCGGA3800F	80-800	3.5-30 Cy
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##### MARK 75® Types HMCCG and HMCCGA (400 to 800 Amperes)<sup>⑤</sup>

3	HMCCG3800F	HMCCGA3800F	80-800	3.5-30 Cy
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① 2-pole breakers are supplied in 3-pole frames with current-carrying parts omitted from center pole.

② UL Inc. recognized component.

③ Available without extra CT for neutral. Order by description as similar to above except without neutral CT or external CT Terminal connections same price.

Note the standard ground fault unit above can also be used without the neutral CT.

④ Order two of the desired terminals for each pole of the breaker and two for the neutral CT.

⑤ For applications other than standard residual scheme, see Application Data 29-160.



## PRODUCT DESCRIPTION

Molded case circuit breakers are designed to provide circuit protection for low-voltage distribution systems. They are described by NEMA as, "... a device for closing and interrupting a circuit between separable contacts under both normal and abnormal conditions," and furthermore as, "... a breaker assembled as an integral unit in supporting an

enclosed housing of insulating material." The NEC describes them as, "... a device designed to open and close a circuit by non-automatic means, and to open the circuit automatically on a predetermined overload of current, without injury to itself when properly applied within its rating." Circuit breakers protect against overloads in conductors and protects against short

circuits in connected apparatus, such as motors and motor starters. Circuit breakers are designed for use in panelboards, switchboards, motor control centers, control panels, combination starters, individual enclosures, and bus duct plug-in units.

## PRODUCT HISTORY

### Originally a Westinghouse Product

The need for molded case circuit breakers came about in 1918 when numerous applications for electrical motors resulted in a demand for a device that would ensure safe operation and, at the same time, protect electrical circuits.

During this period, individual motors were used for the first time in industrial plants to operate machine tools and in private homes to operate appliances. Plant electricians were constantly changing fuses blown during motor start-ups because of the lack of properly designed fuses for motor circuit protection. Homes experienced similar problems when electrical circuits were overloaded. Inspectors were concerned about fire hazards because of plug fuses being bridged with pennies and the installation of fuses with too high of an ampere rating.

Inspection authorities became involved and attempted to find a solution to the problem. Meetings with switch manufacturers were initiated in an effort to find a

solution. Switch manufacturers were asked to develop a switching device that would interrupt a circuit under prolonged overload conditions. The device would have to be safe, reliable and tamperproof. It should also be resettable so as to be reusable after an interruption without replacing any parts. This search for better circuit protection resulted in many different but unacceptable approaches to the problem. These early meetings and subsequent efforts prepared the groundwork for the eventual development of the molded case circuit breaker.

After intensive research and development, Westinghouse produced the DE-ION arc extinguisher for use in large oil circuit breakers. Although too large in its initial form to be practical for small circuit breakers, the arc extinguisher was eventually modified into a usable size. The first compact, workable circuit breaker was developed in 1923 when the

modified arc extinguisher was coupled with a thermal tripping mechanism. It was not until four years later, however, that Westinghouse research engineers found the ideal combination of materials and design that permitted circuit breakers to interrupt fault currents of 5000 amperes at 120 volts AC or DC. One year later, Westinghouse placed the first circuit breaker on the market. Its acceptance was instantaneous.

Since that initial introduction in 1927, Westinghouse continued to be at the forefront of circuit breaker technology with an unprecedented series of circuit protective enhancements and introductions as chronicled below. In 1994 the Eaton Corporation, another World Class technology leader, acquired the Westinghouse Distribution and Control Business Unit and integrated it with Cutler-Hammer forming a powerful, new combination, poised to meet the challenges of the next 100 years.

## MAJOR PRODUCT INTRODUCTION

	1920	1930	1940	1950	1960	1970	1980	1990	Present	
<b>1923</b> First compact, workable circuit breaker developed by Westinghouse	[Timeline bar from 1923 to Present]									
<b>1927</b> Westinghouse introduced the first complete circuit breaker line, rated 10-600 amps, 600 volts	[Timeline bar from 1927 to Present]									
<b>1939</b> Along with ordering information and style numbers, the various maximum current ratings came to be known by frame designations:	[Timeline bar from 1939 to Present]									
	50 Ampere	E Frame								
	100 Ampere	F Frame (Non-interchangeable Trip)								
	100 Ampere	G Frame								
	225 Ampere	K Frame								
	600 Ampere	L Frame								
<b>1970</b> <b>Motor Circuit Protector ("MCP") introduced</b> – First sensitive, low level protection designed specifically for motor circuits							[Timeline bar from 1970 to Present]			
<b>1973</b> <b>"SELTRONIC" introduced</b> – First molded case circuit breaker with an electronic trip unit								[Timeline bar from 1973 to Present]		
<b>1979</b> <b>"Current Limit-R Circuit Breaker" introduced</b> – First true current limiting circuit breaker									[Timeline bar from 1979 to Present]	
<b>1982</b> <b>"Series C" Family introduced</b> – New World Class standard meeting increasing interrupting requirements without sacrificing compact size	[Timeline bar from 1982 to Present]									
<b>1994</b> Westinghouse Distribution and Control Business Unit (DCBU) acquired by Eaton, integrated with Cutler-Hammer (The Cutler-Hammer line of molded case circuit breakers was sold when merged with Westinghouse)	[Timeline bar from 1994 to Present]									
<b>1995</b> <b>"OPTIM" Family introduced</b> – First truly programmable molded case circuit breaker	[Timeline bar from 1995 to Present]									



## REPLACEMENT CAPABILITIES

### Series C Molded Case Circuit Breakers

#### When and Where to Use:

- Generally a first choice wherever physically and electrically practical
- Where communications, energy and power quality monitoring are desired
- As a direct replacement or add-on to already installed Series C product
- Where ampere rating flexibility is desired. (Interchangeable trip units are available.)

#### Advantages:

- Most current molded case circuit breaker technology
- Higher interrupting capacities in each frame size
- Smaller and lighter for a given frame size than other options
- Generally less expensive than other replacement breaker options
- Readily available throughout range / High levels of stock
- Available from stock
- One year warranty

### Current Production Replacement Circuit Breakers

#### When and Where to Use:

- As a direct, one-for-one replacement of current production pre-Series C product
- Where you know the catalog/style number but not the physical or electrical specifics about the application

#### Advantages:

- Ease of selection and certainty of replacement
- Guaranteed to be both a physical and electrical duplicate of original
- Still in production
- Newly manufactured
- UL listed
- Available from stock
- One year warranty

### Replacement of Out-of-Production Panelboard or Motor Control Center Molded Case Circuit Breakers

#### When and Where to Use:

- When replacing out-of-production circuit breakers in an existing Panelboard or MCC

#### Advantages:

- Newly manufactured and tested to the latest applicable standards
- Both physically and electrically interchangeable with the circuit breakers that they are designed to replace
- UL listed
- Available from stock in most frame sizes
- One year warranty

### Factory Reconditioned Molded Case Circuit Breakers

#### When and Where to Use:

- Where Series C and other replacement breaker options are either not available or not workable
- Where it is not feasible to modify or upgrade gear but there is a need to replace or add a circuit breaker

#### Advantages:

- Though not UL listed, these breakers are reconditioned and tested by Cutler-Hammer at the factory according to the original manufacturing and engineering standards to which the breakers were built
- Available for all styles of out-of-production circuit breakers (E, F, G, J, K, L, M, P)
- Knowledge that these breakers are both safe and reliable
- Labeled "Reconditioned Circuit Breaker, Resold By Cutler-Hammer"

### Service for Molded Case Circuit Breakers

#### When and Where to Use:

- Where circuit breaker has sustained minor physical damage to a handle, lug, etc., that otherwise would be fully functional
- Large frame circuit breaker (600A and above) that has experienced some normal wear, but is in generally good condition, as an economically driven alternative to new

#### Advantages:

- Prevents loss of circuit breakers due to minor damage
- Reduces overall breaker costs
- Prevents use of potentially unreliable third party refurbishers
- Includes full one year Cutler-Hammer Warranty
- Ensures reliability through dealing with the original manufacturer with a long and well-recognized tradition of product safety, integrity and quality
- Provides a simple and convenient solution



# MOLDED CASE CIRCUIT BREAKERS

## Replacement Circuit Breakers

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### REPLACEMENT CAPABILITIES, *Continued*

#### Type PB and PBF Accessories and Modifications

##### Special Breakers<sup>①</sup> Magnetic Only, Front Adjustable<sup>②</sup> Trip Unit Only

Contin- uous Ampere Rating	Magnetic Trip Range, Amperes <sup>③</sup>		2-Poles <sup>④</sup>	3-Poles
	Low	High		
<b>For Rear Connected Type PB Breakers</b>				
2000	1500	5000	PB25000TM	PB35000TM
2000	2000	6000	PB26000TM	PB36000TM
2000	2500	7000	PB27000TM	PB37000TM
2000	3000	8000	PB28000TM	PB38000TM
2000	3500	10000	PB210000TM	PB310000TM
2000	4000	12000	PB212000TM	PB312000TM
2500	4000	12000	373D488G08	373D488G09
<b>For Front Connected Type PBF Breakers</b>				
2000	1500	5000	PBF25000TM	PBF35000TM
2000	2000	6000	PBF26000TM	PBF36000TM
2000	2500	7000	PBF27000TM	PBF37000TM
2000	3000	8000	PBF28000TM	PBF38000TM
2000	3500	10000	PBF210000TM	PBF310000TM
2000	4000	12000	PBF212000TM	PBF312000TM

##### Magnetic Only Breakers<sup>⑤</sup>

For description, refer to Application Data 29-160. To order a complete breaker, select trip unit, plus frame and connectors.

Type PB breakers meet the requirements for Class 25a circuit breakers as defined by Federal Specification W-C-375b.

##### Underwriters' Laboratories, Inc. Listed Interrupting Ratings

Max. Volts	Amperes
240 AC	150,000 Asym., 125,000 Sym.
480 AC	115,000 Asym., 100,000 Sym.
600 AC	115,000 Asym., 100,000 Sym.
250 DC <sup>⑥</sup>	75,000 Amperes <sup>⑥</sup>

For all 3-phase Delta, grounded B phase applications, contact your local Cutler-Hammer Field Sales Office.

##### Special Calibrations<sup>⑦</sup>

Special calibration price additions apply to ampere ratings not listed as standard, or for ambients other than 40°C or 50°C. For frequencies other than 0-60 Hz AC, refer to Cutler-Hammer. See Application Data 29-160 for information regarding special conditions.

##### 50°C Calibration<sup>⑧</sup>

Add suffix "V" to catalog number for complete breaker or trip unit only, when ordering breakers to be used in 50°C ambients.

For CSA, see information below.

##### Canadian Standards Association (CSA) Listing

Most standard thermal magnetic molded case circuit breakers listed with Underwriters' Laboratories, Inc., and having a UL label are also listed with CSA and may be marked with the CSA monogram.

#### Bus Bar Connections<sup>⑦</sup>



##### Bus Bar Connections<sup>⑦</sup> "T" Connector (For Cu/Al Bus)

**Two required per pole.** For rear bus connection of breakers thru 2000 amperes. Accepts up to four bus bolts. May be rotated 90°.

Catalog Number
BA2000PB



##### "C" Connector (For Cu/Al Bus)

**Two required per pole.** For rear bus connection of 2500 ampere breakers.

Breaker Amperes	Catalog Number
2500	BA2500PB



##### Cable Connector

Fits "T" Connector and 2000 ampere front connected breakers. Accepts four 400-600 MCM copper cables.

Catalog Number
505C706G04

- ① Not listed with Underwriters' Laboratories, Inc.
- ② Frames, connectors, dimensions and shipping weights are same as thermal magnetic breakers.
- ③ Set on high side, adjustable to lower limits.
- ④ 2-pole breakers are supplied in 3-pole frames with current carrying parts omitted from center pole.
- ⑤ Based on NEMA test procedure.
- ⑥ 50°C or higher calibration not available for 2500 ampere trip units.
- ⑦ Shipped separately from breaker.



### REPLACEMENT CAPABILITIES, *Continued*

#### Type MC Accessories and Modifications

For CSA, see page 41.

Type MC SELTRONIC™ breakers meet requirements for Class 21a, and MARK 75®. Type HMC meet Class 23a as defined by Federal Spec. W-C-375b.

#### UL Listed Interrupting Capacity, RMS Symmetrical Amperes<sup>①</sup>

Breaker	AC Volts		
	240	480	600
MC, MCG	42000	30000	22000
HMC, HMCG	65000	50000	25000

#### Field Mountable Attachments<sup>②③④⑤</sup>

Description	Style Number
Provision to trip flux tranfer shunt trip from external source: 32 to 120 Volts DC to 60 Hz <sup>⑥</sup> .....	1371D72G22
240 to 600 Volts AC, 50/60 Hz <sup>⑦</sup> .....	1371D72G32
Provision to trip flux transfer shunt trip from external source, plus 1A-1B Auxiliary Switch: 32 to 120 Volts DC to 60 Hz <sup>⑥</sup> .....	1371D72G15
240 to 600 Volts AC, 50/60 Hz <sup>⑦</sup> .....	1371D72G25
Provision to trip flux tranfer shunt trip from external 24-Volt DC source .....	1370D85G01
1A-1B Auxiliary Switch .....	1371D72G03

#### Terminals

##### Two Terminals Required per Pole<sup>⑧</sup>

Max. Amps	Catalog Number	No. of Cables, Wire Range, Type
<b>Al/Cu Pressure Terminals</b>		
600	TA700MA1 <sup>⑨</sup>	(2) #1-500 MCM
800 (Std.)	TA800MA2 <sup>⑨</sup>	(3) 3/0-400 MCM
800	TA801MA <sup>⑨</sup>	(2) 500-750 MCM
<b>Optional Copper Pressure Terminals</b>		
600	T600MA1	(2) 2/0-500 MCM
800	T800MA1	(3) 3/0-300 MCM

#### Rating Plugs

Select from page 53.

#### Additional Accessories and Modifications

Refer to pages 58-68.

- ① Interrupting capacities shown do not apply to molded case switches.
- ② Does not void listing of UL listed breakers.
- ③ Only one of the attachments may be mounted per breaker.
- ④ For other possible combinations, refer to factory.
- ⑤ Molded case switches do not use standard SELTRONIC™ attachments and should be ordered by description.
- ⑥ Rated 48 volts minimum for ground fault applications requiring tripping at 55% of voltage.
- ⑦ Not for Ground Fault Applications.
- ⑧ Also used on breakers with ground fault and on separately mounted neutral current transformers.
- ⑨ Type Al/Cu pressure terminal.



# MOLDED CASE CIRCUIT BREAKERS

## Replacement Circuit Breaker Accessories

### ACCESSORIES, Continued

#### Extended Line Terminal Shields



Low Resolution Photo

For shielding line side terminal connections. One shield required per breaker. Order separately when needed. Sold only in lots of 10, including hardware.

Breaker Frame	Style Number
JB, KB, HKB	1266C07G01
MA, HMA, MC, HMC	208B966G01
NB, HNB, NC, HNC	208B966G02
LAB, LA, (Saf-T-Vue®)	314C420G02
JA, KA, LB, LBB (Saf-T-Vue®)	314C420G04
LAB, LA, HLA, LC, HLC	314C420G05
DA	314C420G06
JA, KA, HKA, LB, LBB, HLB (Standard Breaker)	314C420G06
EB, EHB, FB, HFB	625B229G08

#### Base Mounting Hardware

No charge when ordered with breaker. Order separately when needed.

Description	Style Number
<b>1-pole Breakers</b>	
EB, EHB, HFB	624B375G01
EB, EHB, HFB	624B375G02
<b>2- and 3-pole Breakers</b>	
LAB, LA, HLA, LC, HLC	21C6782G05
MA, NB, HMA, HNB, MC, HMC, NC, HNC	1091716
PB, PC, PCC	624B375G22
DA, JA, KA, HKA, LB, LBB, HLB	21C6782G22
EB, EHB, FB, HFB, MCP	21C6782G18
JB, KB, HKB	673B125G12
CA 2-pole	21C6782G28
CA 3-pole	21C6782G29

#### Handle Locks



##### Non-Padlockable

For prevention of unintentional operation of breaker. Fits over breaker handle and may be removed.

##### Padlockable

For prevention of unauthorized operation of breaker. Is non-removable once installed on breaker. Meets Underwriters' Laboratories, Inc. and California Code requirements.

**Note:** All breakers are trip free and will trip with handle locks attached. Cannot be used when handle extension is used.

Breaker Frame	Style Number
<b>Non-Padlockable</b>	
CA, EB, EHB, FB, HFB	1720360
LAB, LA, LC, HLC, MA, NB, HLA, HMA, HNB, MC, HMC, NC, HNC	1720101
GB, GC, GHB, GHC	1294C01H01
DA, JA, KA, HKA, LB, LBB, HLB	29B2721H04
<b>Padlockable</b>	
CA	506C438G01
EB, EHB, FB, HFB	765A754G01
DA, JA, KA, LB, LBB, HKA, HLB	673B796G02
JB, KB, HKB	673B796G01
LAB, LA, HLA, LC, HLC	373B591G02
MA, HMA, MC, HMC	6591C30G02 – OFF
MB, HMB, NC, HNC	6591C30G05 – ON/OFF
NA, HNA, NC, HNC	6591C30G01 – OFF
NB, HNB, NC, HNC	6591C30G04 – ON/OFF
PB, PC	6591C30G03 – OFF

#### Fuse Mounting Base for PB Breakers

For 2000 amp non-automatic breakers only.



Catalog Number
FMB2000PB

For use with non-automatic, 3-pole circuit breaker. Includes fuse mounting base and hardware to mount standard Class L current limiting fuses, 801 - 2000A (fuses not included).

For complete installation, order:

1. Front connected, non-automatic PB breaker. (Order similar to standard front connected, except omit load conductor extensions)
2. Fuse mounting base.
3. Fuses (from distributor).

#### Cable Connectors

The fuse mounting base will accept the following terminals for front cable connection (omit "T" connectors from rear connected breakers).

Style Number	Wire Range, Type No. of Cables
672B655G01	3 3/0-400 MCM Cu
180C046G03	4 400-500 MCM Cu

#### Molded Type Handle Extension

##### For LAB, LA, HLA Breakers

Style Number
372B399G01

##### For MA, HMA, MC, HMC Breakers

Style Number
1251C65G01

##### For NB, HNB, NC, and HNC Breakers

Style Number
1251C65G01

##### For PB, PC, and PCC Breakers

Style Number
6635C78G02

① Not Underwriters' Laboratories, Inc. listed.  
 ② One of style 625B229G08 is one package of 10.  
 ③ Individually mounted.  
 ④ Group mounted.  
 ⑤ Included with frame at no charge.  
 ⑥ Interrupters used with fuse mounting base will accept all standard PB accessories. See Dimension Sheet 29-171 for mounting details.