Contents

Standards

Series C Moulded Case Circuit Breakers are designed to conform with the following international standards:

- Australian Standard AS 2184 and AS 3947-2 Moulded Case Circuit Breakers.
- British Standards Institution Standard BS 4752:
  Part 1, Switchgear and Control Gear
  Part 1, Circuit Breakers.
- International Electrotechnical Commission Recommendations IEC 947.2 Circuit Breakers. CE
- Japanese T-Mark Standard Moulded Case Circuit Breakers.
- National Electrical Manufacturers Association Standards Publication No. AB1-1975 Moulded Case Circuit Breakers.
- South African Bureau of Standards, Standard SABS 156, Standard Specification for Moulded Case Circuit Breakers.
- Swiss Electro-Technical Association Standard SEV 947.2, Safety Regulations for Circuit Breakers.
- Union Technique de l'Electricite Standard NF C 63-120, Low Voltage Switchgear and Control Gear Circuit Breaker Requirements.
- Verband Deutscher Elektrotechnike (Association of German Electrical Engineers) Standard VDE 0660, Low Voltage Switchgear and Control Gear, Circuit Breakers.

General Information

Series C Moulded Case Circuit Breakers provide increased performance in considerably less space than standard circuit breakers or comparable fusible devices. Reduced system costs can also be realized because Series C Circuit Breakers are used in series rated systems, allowing the use of lower interrupting circuit breakers downstream.

Series C Circuit Breakers meet applicable IEC 947-2 standards, have been assigned ultimate and service interrupting ratings per IEC 947-2, and employ adjustable thermal and adjustable magnetic trips.

The Series C family includes seven frame sizes in ratings from 100 to 2500 amperes. Each frame size offers a choice of several interrupting capacities up to 100 kA at 415 volts ac (200 kA at 240 volts ac). This provides greater design flexibility than ever before possible while also helping to save space.

Series C Circuit Breakers virtually eliminate the need for redesign and they can be used to replace older circuit breakers in the same panelboards, feeder pillars, busbar trunking tap-offs, individual enclosures, machine tool control panels, and motor control centres. In most cases, the same connecting straps, studs, and handle mechanisms can be retained and used.

Standard calibration is 40°C. For applications in high ambient temperature conditions, 50°C factory calibration is available.

Series C Circuit Breakers are also provided for dc applications. Interrupting ratings of 35 kA for the 600 ampere frame have been achieved for three-pole breakers in series at 600 volts dc.

The Most Logically Designed Contact Assembly

The flexibility and outstanding performance characteristics of Series C Circuit Breakers are made possible by one of the most logically designed contact assemblies in circuit breaker history. Based on previously patented Westinghouse contact conductor designs, the Series C contact assembly creates a high-speed "blow-open" action when it confronts the electromechanical forces produced by high-level fault currents.

Series C Circuit Breakers are operated by a toggle-type handle that is mechanically trip-free from the handle so that the contacts cannot be held closed against short circuit currents. Tripping due to overload or short circuits is clearly indicated by the position on the handle. This remarkably fast and dependable contact action is designed to enhance safety.

Thorough In-Plant Testing

The quality, dependability, and reliability of every Series C Circuit Breaker is assured by a thorough program of in-plant testing. Two calibration tests are conducted on every pole of every circuit breaker to verify the trip mechanism, operating mechanism, continuity, and accuracy.

ISO Certification

Series C Circuit Breakers are manufactured in ISO certified facilities.

More Interrupting Capacity in Less Space

Series C Circuit Breakers are physically and electrically interchangeable with the "Classic" standard line of Westinghouse moulded case circuit breakers. This means Series C Breakers are ideal for upgrading equipment designs and retrofitting existing installations.

Current Limiting Characteristics

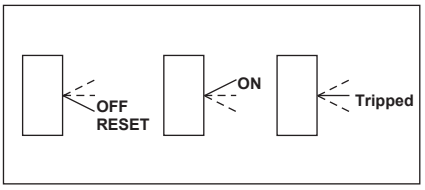
All Series C Circuit Breakers are current limiting because of their high repulsion contact arrangement and incorporation of state-of-the-art arc extinguishing technology.

Operating Mechanisms

Series C Circuit Breakers have, in their basic version, a toggle handle operating mechanism, which also serves as switching position indicator. As well as ON and OFF, the further position TRIPPED is possible.

The toggle handle snaps into the TRIPPED position if the breaker is tripped by one of its overcurrent, short circuit, shunt or undervoltage releases. Before the circuit breaker can be reclosed following a trip-out, the toggle handle must be brought beyond the OFF position (RESET). The circuit breaker can then be reclosed.

As an additional switching position indicator for F- to R-Frame circuit breakers, there are two windows on the right and on the left of the toggle handle, in which the switching state is indicated by means of the colours red, green and white corresponding to the ON, OFF and TRIPPED positions respectively.



Positions of the Toggle Handle Drive

Panelboards

As both main and branch circuit protection devices (G-, F-, J-, K-, L- and N-Frames).

Feeder Pillars

In distribution systems to provide main and branch circuit protection (F-, J-, K-, L-, N- and R-Frames).

Switchgear

In distribution systems to provide main and branch circuit protection up to 2500 amperes (R-Frame).

Busbar Trunking Tap-Offs

In busbar trunking tap-offs to provide branch circuit protection (F-Frame); and to provide feeder or branch circuit protection (J-, K- and L-Frames).

Individual Enclosures

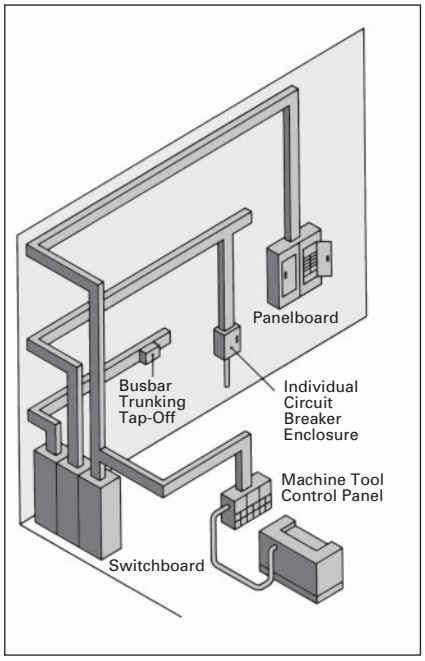
Completely assembled in enclosures to meet specific customer requirements (G-, F-, J-, K-, L-, N- and R-Frames).

Machine Tool Control Panels and Motor Control Centres

Applied for specific equipment requirements (G-, F-, J-, K-, and L-Frames).

Additional Applications

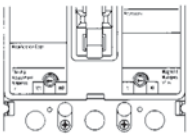
Special versions of each Series C frame are available to provide safe equipment control and protection in mining and other applications. Contact your Cutler-Hammer agent or distributor for additional information.



Typical Series C Applications

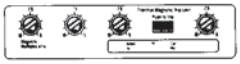
Frame	Continuous Ampere Rating Range	Type of Trip Unit					Moulded Case Switch
		Adjustable Thermal Fixed Magnetic	Fixed Thermal Fixed Magnetic	Adjustable Thermal Adjustable Magnetic	Adjustable Thermal Fixed Magnetic Earth Leakage	Digitrip RMS Electronic Trip Units	
G	16-100		■				
F	16-225	■	■	■	■		■
J	125-250			■	■		■
K	63-400			■	■	■	■
L	315-800			■		■	■
N	400-1250					■	■
R	800-2500					■	■

Electrical Characteristics

			G		F							J		
														
Maximum Rated Current (Amperes)			**100**		**160**	**200**			**225**			**250**		
Breaker Type			**GWF**	**GWF**	**FWF**	**FW**	**HFW**	**FWC**	**FWF**	**HFWF**	**FWCF**	**JW**	**HJW**	**JWC**
Breaker Capacity (kA rms) AC 50-60 Hz														
IEC 947-2	220-240 VAC	I_{cu}	18	65	40	85	100	200	85	100	200	85	100	200
		I_{cs}	9	35	40	85	100	150	85	100	150	85	100	150
	380-415 VAC	I_{cu}		25		40	70	100	40	70	100	40	70	100
		I_{cs}		13		40	70	75	40	70	75	40	70	75
	660-690 VAC	I_{cu}				12	14	18	12	14	18	14	18	22
		I_{cs}				6	7	9	6	7	9	7	9	11
	250 VDC①	I_{cu}		10		10	20	20	10	20	20	10	20	20
		I_{cs}		5		5	10	10	5	10	10	5	10	10
NEMA	240 VAC		65	65	25②	65	100	200	65	100	200	65	100	200
	480 VAC			22		25	65	100	25	65	100	35	65	100
	600 VAC					18	25	35	18	25	35	18	25	35
Number of Poles			1	2, 3	1	2, 3, 4						2, 3, 4		
Ampere Range			16-100A		16-160A	16-225④			16-225③④			125-250A		
Trip Units						 *Adjustable Thermal Magnetic*						 *Adjustable Thermal Magnetic*  *Adjustable Thermal Magnetic*		
	Interchangeable											■		
	Built-in		■		■	■	■	■	■	■	■			
Thermal Magnetic	Fixed Thermal		■		■				■	■	■	■		
	Adjustable Thermal②		Fixed		Fixed	■	■	■				■		
	Magnetic		Fixed		Fixed	Fixed, Opt Adj.			Fixed			Adjustable		
Solid State rms	LS													
	LSI													
	LSG													
	LSIG													
Dimensions (mm)		H	W	D	H	W		D				H	W	D
	1-Pole	123.8	254.4	66.7	152.4	35		86				–	–	–
	2-Pole		50.8			70						–	–	–
	3-Pole		76.2			105						254	105	103
	4-Pole	–	–	–		140							140	
Weight (approximate) Kgs.		1-Pole	2-Pole	3-Pole	1-Pole	2-Pole		3-Pole		4-Pole		3-Pole	4-Pole	
		0.4	0.7	1	0.7	1.8		2.4		3.1		5.2	7.0	

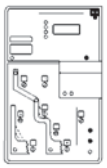
① 2 poles in series.
② At 277 VAC.
③ FWF 16-40A, 415 VAC maximum.
④ FWC 200A and FWCF 175-225A rated 14/7 kA at 690 V.

Electrical Characteristics

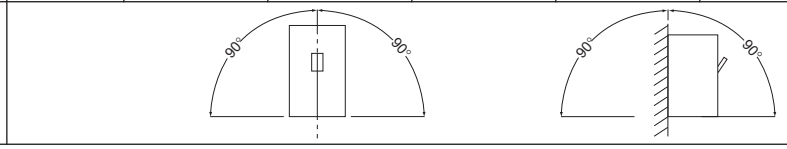
			K			L			
									
Maximum Rated Current (Amperes)			**400**			**630**			**800**
Breaker Type			**KW**	**HKW**	**KWC**	**LW**	**HLW**	**LWC**	**LW**
Breaker Capacity (kA rms) AC 50-60 Hz									
IEC 947-2	220-240 VAC	I_{cu}	85	100	200	85	100	200	65
		I_{cs}	85	100	150	85	100	150	33
	380-415 VAC	I_{cu}	45	70	100	45	70	100	50
		I_{cs}	45	70	75	45	70	75	25
	660-690 VAC	I_{cu}	20	25	35	20	25	35	20
		I_{cs}	10	13	18	10	13	18	10
	250 VDC①	I_{cu}	10	20	20	20	20	20	20
		I_{cs}	5	10	10	10	10	10	10
NEMA	240 VAC		65	100	200	65	100	200	100
	480 VAC		35	65	100	35	65	100	50
	600 VAC		25	35	50	25	35	50	25
Number of Poles			2, 3, 4			2, 3, 4			3
Ampere Range			63-400A			315-630A			700-800A
Trip Units			 *Adjustable Thermal Magnetic*  *Digitrip RMS 310*			 *Adjustable Thermal Magnetic*  *Digitrip RMS 310*			
	Interchangeable		■			■			■
	Built-in					■			■
Thermal Magnetic	Fixed Thermal		■			■			■
	Adjustable Thermal②		■			■			
	Magnetic		Adjustable			Adjustable			Adjustable
Solid State rms②	LS		Standard			Standard			Standard
	LSI		Optional			Optional			Optional
	LSG		Optional③			Optional			Optional
	LSIG		Optional③			Optional			Optional
Dimensions (mm)			H	W	D	H	W		D
	1-Pole		–	–	–	–	–		–
	2-Pole		–	–	–	–	–		–
	3-Pole		258	140	104	630A = 273	210		104
	4-Pole			183		800A = 406	280		
Weight (approximate) Kgs.			3-Pole	4-Pole		3-Pole	4-Pole		
			6.1	7.3		630A = 9.4/800A = 11.3	630A = 11.1/800A = 14.4		

① 2 poles in series.
② For AC use only.
③ 4-pole ground fault not available.

Electrical Characteristics

			N			R	
							
Maximum Rated Current (Amperes)			**800, 1250**			**1600, 2000, 2500**	
Breaker Type			**NW**	**HNW**	**NWC**	**RW**	**RWC**
Breaker Capacity (kA rms) AC 50-60 Hz							
IEC 947-2	220-240 VAC	I_{cu}	85	100	200	135	200
		I_{cs}	85	100	100	100	100
	380-415 VAC	I_{cu}	50	70	100	70	100
		I_{cs}	50	50	50	50	50
	660-690 VAC	I_{cu}	20	25	35	25	35
		I_{cs}	10	13	18	13	18
	250 VDC	I_{cu}					
		I_{cs}					
NEMA	240 VAC		65	100	200	125	200
	480 VAC		50	65	100	65	100
	600 VAC		25	35	35	50	65
Number of Poles			2, 3, 4			3, 4	
Ampere Range			400-1250A			800-2500A	
Trip Units			 *Standard*  *Digitrip RMS 310*			 *Digitrip RMS 310 Trip Unit*  *Digitrip RMS Trip Units* ■ *RMS 510* ■ *RMS 610* ■ *RMS 810* ■ *RMS 910*	
	Interchangeable						
	Built-in		■			■	
Thermal Magnetic	Fixed Thermal						
	Adjustable Thermal						
	Magnetic						
Solid State rms②	LS		Standard			Standard (LI is Optional in Digitrip 510, 610, 810 and 910)	
	LSI		Optional			Optional	
	LSG		Optional			Optional (LIG is Optional in Digitrip 510, 610, 810 and 910)	
	LSIG		Optional			Optional	
Dimensions (mm)			H	W	D	H	W	D
	1-Pole		–	–	–	–	–	–
	2-Pole		–	–	–	–	–	–
	3-Pole		406	210	104	406	394	229
	4-Pole			280			508	
Weight (approximate) Kgs.			3-Pole		4-Pole	3-Pole		4-Pole
			21.3		28.3	47		54

Electrical Characteristics

Technical Data	G-Frame	F-Frame	J-Frame	K-Frame	L-Frame	N-Frame	R-Frame
Maximum Rated Current I_n Depending on the Version	100A	160/205/225A	200/250A	315/400A	500/630/800A	800/1250A	1600/2000/2500A
Rated Insulation Voltage U, According to IEC 947-2 Main Conducting Paths Auxiliary Circuits	 750 VAC 690 VAC	 750 VAC 690 VAC	 750 VAC 690 VAC	 750 VAC 690 VAC	 750 VAC 690 VAC	 750 VAC 690 VAC	 750 VAC 690 VAC
Rated Impulse Withstand Voltage U_{imp} Main Conducting Paths Auxiliary Circuits	 8 kV 4 kV	 8 kV 4 kV	 8 kV 4 kV	 8 kV 4 kV	 8 kV 4 kV	 8 kV 4 kV	 8 kV 4 kV
Rated Operational Voltage U_e IEC NEMA	 440 VAC 480 VAC	 690 VAC① 600 VAC	 690 VAC 600 VAC	 690 VAC 600 VAC	 690 VAC 600 VAC	 690 VAC 600 VAC	 690 VAC 600 VAC
Permissible Ambient Temperature	-20 to +70°C	-20 to +70°C	-20 to +70°C	-20 to +70°C	-20 to +70°C	-5 to +60°C	-5 to +60°C
Permissible Load for Various Ambient Temperatures Close to the Circuit Breaker, Related to the Rated Current of the Circuit Breaker	–	③ ④	③ ④	③ ④	③ ④	–	–
■ Circuit Breakers for Plant Protection							
– At 40°C	100%	100% 100%	100% 100%	100% 100%	100% 100%	100%	100%
– At 50°C	96%	96% 92%	96% 94%	96% 92%	96% 91%	91%	100%
– At 55°C	93%	93% 87%	94% 90%	93% 87%	93% 86%	85%	100%
– At 60°C	91%	91% 83%	92% 87%	90% 84%	90% 82%	81%	100%
– At 70°C	86%	86% 73%	88% 80%	85% 75%	84% 70%	–	–
■ Circuit Breakers for Motor Protection							
– At 40°C	–	100/100%	–	100%	100%	–	–
– At 50°C	–	100/96%	–	100%	100%	–	–
– At 55°C	–	100/90%	–	100%	100%	–	–
– At 60°C	–	100/86%	–	100%	100%	–	–
– At 70°C	–	100/77%	–	87%	90%	–	–
■ Circuit Breakers for Starter Combinations and Isolating Circuit Breakers							
– At 40°C	–	100%	100%	100%	100%	100%	100%
– At 50°C	–	100%	100%	100%	100%	91%	100%
– At 55°C	–	96%	96%	96%	95%	85%	100%
– At 60°C	–	91%	82%	90%	90%	81%	100%
– At 70°C	–	86%	88%	85%	84%	–	–
Rated Short Circuit Breaking Capacity (DC) Not for Circuit Breakers for Motor Protection (Time Constant τ = 10 rms) 1 Conducting Path / 2 Conducting Paths in Series / 3 Conducting Paths in Series For F to L up to: 250 VDC / 440 VDC / 660 VDC NEMA (Time Constant τ = 8 rms) 1 Conducting Path / 2 Conducting Paths in Series 250 VDC / – – / 250 VDC	 – – 10 kA (5rms)	 20 kA Max. 10 kA 22 kA	 20 kA Max. 10 kA 22 kA	 20 kA Max. 10 kA 22 kA	 20 kA Max. 10 kA 22 kA	 –② –② –②	 –② –② –②
Main Switch Characteristics According to IEC 947-2 in Combination with Lockable Rotary Drives	–	Yes	Yes	Yes	Yes	Yes	Yes
Rated Short Circuit Breaking Capacity According to IEC 947-2 (at AC 50/60 Hz)	Rated Short Circuit Breaking Capacity See Table on Pages 4-5-6						
Endurance (Operating Cycles)	10,000	10,000	10,000	8,000	8,000	3,000	3,000
Maximum Switching Frequency	300 1/h	300 1/h	240 1/h	240 1/h	240 1/h	60 1/h	20 1/h
Conductor Cross Sections and Terminal Types for Main Conductors	Box Terminals	Box Terminals	Box Terminals	Box Terminals	Flat Bar Terminals	Flat Bar Terminals	Flat Bar Terminals
■ Solid or Stranded	2.5 to 50 mm^2	2.5 to 70/95 mm^2	50 to 150 mm^2	95 to 240 mm^2	–	–	–
■ Finely Stranded with End Sleeve	–	2.5 to 50/70 mm^2	35 to 120 mm^2	70 to 150 mm^2	–	–	–
■ Busbar	–	–	–	–	800A	Optional	Optional
Tightening Torque for Box Terminals	5.1 Nm	5/9 Nm	20 Nm	42 Nm	31 Nm	31 Nm	–
Tightening Torque for Busbar Connection Pieces	–	4.5/4.5 Nm	15 Nm	30 Nm	6 Nm	50 Nm	37 Nm
Conductor Cross Sections for Auxiliary Circuits with Terminal Connection or Terminal Strip							
■ Solid	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	Up to 2x4 mm^2	Up to 2x4 mm^2
■ Finely Stranded with End Sleeve	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	0.75 to 2.5 mm^2	Up to 2x2.5 mm^2	Up to 2x2.5 mm^2
■ With Brought-out Cable Ends	–	0.82 (AWG 18) mm^2	0.82 (AWG 18) mm^2	0.82 (AWG 18) mm^2	0.82 (AWG 18) mm^2	0.82 (AWG 18) mm^2	0.82 (AWG 18) mm^2
■ Tightening Torque for Fitting Screws	–	0.8 to 1.4 Nm	0.8 to 1.4 Nm	0.8 to 1.4 Nm	0.8 to 1.4 Nm	0.8 to 1.4 Nm	0.8 to 1.4 Nm
Power Loss per Circuit Breaker at Maximum Rated Current I_n (The Power Losses of the Undervoltage Releases ("r" Releases) Must Be Observed if Necessary) at Three-Phase Symmetrical Load)							
■ For Plant Protection	–	60 W	75 W	175 W	255 W	87/210 W	220/270/400 W
■ As Isolating Circuit Breaker	–	45 W	75 W	107 W	160 W	87/210 W	220/270/400 W
■ For Starter Combinations	–	45 W	45 W	107 W	160 W	–	–
■ For Motor Protection	–	60 W	–	75 W	120 W	–	–
Permissible Mounting Position							

① With circuit breakers with rated currents 40A: U_e maximum 415V.
② Not suitable for DC switching.
③ Thermal overload release set to the upper value, resp. fixed-setting thermal overload releases.
④ Thermal overload release set to the lower value.

Electrical Characteristics

Technical Data	G-Frame	F-Frame	J-Frame	K-Frame	L-Frame	N-Frame	R-Frame
Auxiliary Switches							
Rated Thermal Current I_{th}	6A	6A	6A	6A	6A	6A	6A
Rated Making Capacity	10A	20A	20A	20A	20A	20A	20A
AC (AC-15)							
– Rated Operational Voltage	240V	230/400/690V	230/400/690V	230/400/690V	230/400/690V	230/400/690V	230/400/690V
– Rated Operational Current	6A	6/3/0.25A	6/3/0.25A	6/3/0.25A	6/3/0.25A	6/3/0.25A	6/3/0.25A
DC (DC-13)							
– Rated Operational Voltage	24	24/125/240V	24/125/240V	24/125/240V	24/125/240V	24/125/240V	24/125/240V
– Rated Operational Current	5	6/0.5/0.15A	6/0.5/0.15A	6/0.5/0.15A	6/0.5/0.15A	6/0.5/0.15A	6/0.5/0.15A
		4	4	4	4	4	4
Back-up Fuse	6A	6/4/4A	6/4/4A	6/4/4A	6/4/4A	6/4/4A	6/4/4A
Miniature Circuit Breaker	6A	6/4A	6/4A	6/4A	6/4A	6/4A	6/4A
Releases							
Undervoltage Releases (“r” Releases)							
Response Voltage:							
– Drop (Breaker Tripped) U_s	35-70%	35-70%	35-70%	35-70%	35-70%	35-70%	35-70%
– Pickup (Breaker May Be Switched on) U_s	85-110%	85-110%	85-110%	85-110%	85-110%	85-110%	85-110%
Power Consumption in Continuous Operation at:							
– AC 50/60 Hz 12V	–	2.5 VA	1.9 VA	1.9 VA	1.9 VA	1.9 VA	2.9 VA
– AC 50/60 Hz 24V	5.3 VA	1.4 VA	3.9 VA	3.9 VA	3.9 VA	2.4 VA	3.1 VA
– AC 50/60 Hz 48-60V	1.5 VA	1.2-1.9 VA	2.5-3.8 VA	2.5-3.8 VA	2.5-3.8 VA	2.3-4.1 VA	3.4-6.0 VA
– AC 50/60 Hz 110-127V	1.8 VA	1.3 -1.7 VA	1.8 -2.4 VA	1.8 -2.4 VA	1.8-2.4 VA	3.4-4.2 VA	3.3-3.8 VA
– AC 50/60 Hz 208-240V	1.4 VA	2.2 -2.9 VA	2.7-3.8 VA	2.7-3.8 VA	2.7-3.8 VA	4.8-6.5 VA	4.2-7.2 VA
– AC 50/60 Hz 380-500V	4.8 VA	2.9 -5 VA	3.4-5.8 VA	3.4-5.8 VA	3.4-5.8 VA	6.8-12.0 VA	3.8 10.0 VA
– DC 12V	–	2.8 W	1.6 W	1.6 W	1.6 W	2.6 W	3.4 W
– DC 24V	–	1.6 W	3.1 W	3.1 W	3.1 W	3.6 W	4.3 W
– DC 48-60V	–	1.3-2.0 W	2.0-3.1 W	2.0-3.1 W	2.0-3.1 W	3.5 -5.5 W	4.8-7.2 W
– DC 110-125V	–	1.5-1.9 W	1.6-2.2 W	1.6-2.2 W	1.6-2.2 W	2.9-3.6 W	3.3-3.8 W
– DC 220-250V	–	2.6-3.4 W	3.1-4 W	3.1-4 W	3.1-4 W	4.8-6.3 W	6.6-7.5 W
Maximum Opening Time	50 ms	50 ms	50 ms	50 ms	50 ms	80 ms	80 ms
Shunt Trips							
Shunt Trips (“f” Releases)							
Response Voltage:							
– Pickup (Breaker Tripped) U_s	70-110%	70-110%	70-110%	70-110%	70-110%	70-110%	70-110%
Power Consumption in (Short Time) at:							
– AC 50/60 Hz 12-24V	–	40-300 VA	87-405 VA	87-405 VA	81-701 VA	86-631 VA	177-1207 VA
– AC 50/60 Hz 48-60V	–	–	710-1105 VA	710-1105 VA	58-90 VA	48-71 VA	443-731 VA
– AC 50/60 Hz 48-127V	–	92-640 VA	–	–	–	–	–
– AC 50/60 Hz 110-240V	135-500 VA	51-240 VA	66-432 VA	66-432 VA	118-665 VA	81-505 VA	323-1466 VA
– AC 50/60 Hz 380-440V	–	–	127-188 VA	127-188 VA	125-181 VA	43-68 VA	1193-1641 VA
– AC 50/60 Hz 380-600V	–	278-700 VA	–	–	–	–	–
– AC 50/60 Hz 480-600V	–	–	34-60 VA	34-60 VA	43-79 VA	41-69 VA	197-312 VA
– DC 12-24V	–	54-400 W	164-631 W	164-631 W	79-1000 W	46-405 W	289-865 W
– DC 48-60V	–	100-160 W	830-1580 W	830-1580 W	18-31 W	58-94 W	468-696 W
– DC 110-125V	–	55-71 W	112-150 W	112-150 W	112-150 W	74-98 W	363-473 W
– DC 220-250V	–	110-140 W	40-58 W	40-58 W	38-52 W	38-49 W	513-665 W
Maximum Load Duration	Interrupts Automatically						
Maximum Opening Time	50 ms	50 ms	50 ms	50 ms	50 ms	62 ms	62 ms

Electrical Characteristics

DC Switching Duty

The F- to L-Frame circuit breakers are also suitable for switching dc currents.

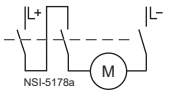
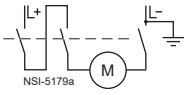
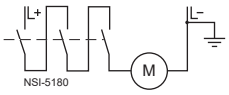
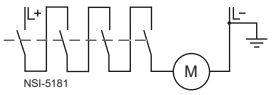
The N- and R-Frame circuit breakers, FWMP, KWMP, and LWMP circuit breakers for motor protection are not suitable for dc currents due to the solid state overcurrent release system.

For switching dc currents, however, the maximum permissible dc voltage per conducting path has to be considered.

For voltages higher than 250 volts, the series connection of two or three conducting paths is required.

As the current has to flow through all conducting paths so as to maintain the thermal tripping characteristics, the following circuit arrangements are recommended. With dc, the trip values of the instantaneous short circuit release (“n” release) are increased by 30 to 40%.

For 3- and 4-Pole Circuit Breakers

Proposed Circuit	Maximum Permissible VDC U_e	Remarks
	250 VDC	Double-pole switching. If there is no risk of an earth fault, or if any earth fault which occurs is immediately eliminated (earth fault monitoring), the maximum permissible dc voltage can be 600 volts.
	440 VDC	Double-pole switching (earth system). The earthed pole must always be assigned to the individual conducting path, so that two paths are always in series in the event of an earth fault.
	600 VDC	Single-pole switching (earthed system). Three conducting paths in series. The earthed pole must be assigned to the nonswitched conducting path.
	750 VDC	Single-pole switching (earthed system). Four conducting paths in series. The earthed pole must be assigned to the nonswitched conducting path.

Selection Guide and Ordering Information

Maximum Continuous Ampere Rating at 40°C①	Standard Interrupting Capacity Catalogue Number				High Interrupting Capacity Catalogue Number				Ultra-High Interrupting Capacity Catalogue Number			Standard Terminals Only Catalogue Number	Metric Mounting Hardware Catalogue Number
	U_e Max. 240 VAC	U_e Maximum 690 VAC			U_e Maximum 240 VAC	U_e Maximum 690 VAC			U_e Maximum 690 VAC				
	40 kA I_{cu} at 240 VAC	40 kA I_{cu} at 415 VAC			70 kA I_{cu} at 240 VAC	70 kA I_{cu} at 415 VAC			100 kA I_{cu} at 415 VAC				
	1-Pole	2-Pole	3-Pole	4-Pole②	1-Pole	2-Pole	3-Pole	4-Pole②	2-Pole	3-Pole	4-Pole②		

Fixed Thermal / Fixed Magnetic Circuit Breakers – Sealed Breakers with Noninterchangeable Trip Units
Line and Load Terminals Included)

	Type FWF (16-40A, 415 VAC Max.)				Type HFWF (16-40A, 415 VAC Max.)				Type FWCF (16-40A, 415 VAC Max.)				
16	FWF1016L	FWF2016L	FWF3016L	FWF40160L	HFWF1016L	HFWF2016L	HFWF3016L	HFWF40160L	FWCF2016L	FWCF3016L	FWCF40160L	T100FB	BMH1M
20	FWF1020L	FWF2020L	FWF3020L	FWF40200L	HFWF1020L	HFWF2020L	HFWF3020L	HFWF40200L	FWCF2020L	FWCF3020L	FWCF40200L	T100FB	BMH1M
25	FWF1025L	FWF2025L	FWF3025L	FWF40250L	HFWF1025L	HFWF2025L	HFWF3025L	HFWF40250L	FWCF2025L	FWCF3025L	FWCF40250L	T100FB	BMH1M
32	FWF1032L	FWF2032L	FWF3032L	FWF40320L	HFWF1032L	HFWF2032L	HFWF3032L	HFWF40320L	FWCF2032L	FWCF3032L	FWCF40320L	T100FB	BMH1M
40	FWF1040L	FWF2040L	FWF3040L	FWF40400L	HFWF1040L	HFWF2040L	HFWF3040L	HFWF40400L	FWCF2040L	FWCF3040L	FWCF40400L	T100FB	BMH1M
50	FWF1050L	FWF2050L	FWF3050L	FWF40500L	HFWF1050L	HFWF2050L	HFWF3050L	HFWF40500L	FWCF2050L	FWCF3050L	FWCF40500L	T100FB	BMH1M
63	FWF1063L	FWF2063L	FWF3063L	FWF40630L	HFWF1063L	HFWF2063L	HFWF3063L	HFWF40630L	FWCF2063L	FWCF3063L	FWCF40630L	T100FB	BMH1M
80	FWF1080L	FWF2080L	FWF3080L	FWF40800L	HFWF1080L	HFWF2080L	HFWF3080L	HFWF40800L	FWCF2080L	FWCF3080L	FWCF40800L	T100FB	BMH1M
100	FWF1100L	FWF2100L	FWF3100L	FWF41000L	HFWF1100L	HFWF2100L	HFWF3100L	HFWF41000L	FWCF2100L	FWCF3100L	FWCF41000L	T100FB	BMH1M
125	FWF1125L	FWF2125L	FWF3125L	FWF41250L	HFWF1125L	HFWF2125L	HFWF3125L	HFWF41250L	FWCF2125L	FWCF3125L	FWCF41250L	T100FB	BMH1M
160	FWF1160L	FWF2160L	FWF3160L	FWF41600L	HFWF1160L	HFWF2160L	HFWF3160L	HFWF41600L	FWCF2160L	FWCF3160L	FWCF41600L	T100FB	BMH1M
175	–	FWF2175L	FWF3175L	FWF41750L	–	HFWF2175L	HFWF3175L	HFWF41750L	FWCF2175L	FWCF3175L	FWCF41750L	TA225FDM	BMH1M
200	–	FWF2200L	FWF3200L	FWF42000L	–	HFWF2200L	HFWF3200L	HFWF42000L	FWCF2200L	FWCF3200L	FWCF42000L	TA225FDM	BMH1M
225	–	FWF2225L	FWF3225L	FWF42250L	–	HFWF2225L	HFWF3225L	HFWF42250L	FWCF2225L	FWCF3225L	FWCF42250L	TA225FDM	BMH1M

Maximum Continuous Ampere Rating at 40°C①	Thermal Range	Magnetic Range	Standard Interrupting Capacity Catalogue Number		High Interrupting Capacity Catalogue Number		Ultra-High Interrupting Capacity Catalogue Number		Standard Terminals Only Catalogue Number	Metric Mounting Hardware Catalogue Number
			U_e Maximum 690 VAC		U_e Maximum 690 VAC		U_e Maximum 690 VAC			
			40 kA I_{cu} at 415 VAC		70 kA I_{cu} at 415 VAC		100 kA I_{cu} at 415 VAC			
			3-Pole	4-Pole③	3-Pole	4-Pole③	3-Pole	4-Pole③		

Adjustable Thermal/Fixed Magnetic Circuit Breakers – Sealed Breakers with Noninterchangeable Trip Units
Line and Load Terminals Included

			Type FW		Type HFW		Type FWC			
16	12- 16	Fixed	FW3016L	FW40160L	HFW3016L	HFW40160L	FWC3016L	FWC40160L	T100FB	BMH1M
20	16- 20	Fixed	FW3020L	FW40200L	HFW3020L	HFW40200L	FWC3020L	FWC40200L	T100FB	BMH1M
25	20- 25	Fixed	FW3025L	FW40250L	HFW3025L	HFW40250L	FWC3025L	FWC40250L	T100FB	BMH1M
32	25- 32	Fixed	FW3032L	FW40320L	HFW3032L	HFW40320L	FWC3032L	FWC40320L	T100FB	BMH1M
40	32- 40	Fixed	FW3040L	FW40400L	HFW3040L	HFW40400L	FWC3040L	FWC40400L	T100FB	BMH1M
50	40- 50	Fixed	FW3050L	FW40500L	HFW3050L	HFW40500L	FWC3050L	FWC40500L	T100FB	BMH1M
63	50- 63	Fixed	FW3063L	FW40630L	HFW3063L	HFW40630L	FWC3063L	FWC40630L	T100FB	BMH1M
80	63- 80	Fixed	FW3080L	FW40800L	HFW3080L	HFW40800L	FWC3080L	FWC40800L	T100FB	BMH1M
100	80-100	Fixed	FW3100L	FW41000L	HFW3100L	HFW41000L	FWC3100L	FWC41000L	T100FB	BMH1M
125	100-125	Fixed	FW3125L	FW41250L	HFW3125L	HFW41250L	FWC3125L	FWC41250L	T100FB	BMH1M
160	125-160	Fixed	FW3160L	FW41600L	HFW3160L	HFW41600L	FWC3160L	FWC41600L	T100FB	BMH1M
200	160-200	Fixed	FW3200L	FW42000L	HFW3200L	HFW42000L	FWC3200L	FWC42000L	TA225FDM	BMH1M
225	200-225	Fixed	FW3225L	FW42250L	HFW3225L	HFW42250L	FWC3225L	FWC42250L	TA225FDM	BMH1M

Adjustable Thermal/Adjustable Magnetic Circuit Breakers – Sealed Breakers with Noninterchangeable Trip Units

			Type FW-J		Type HFW-J		Type FWC-J			
20	16- 20	100- 200	FW3020JL	FW4020J0L	HFW3020JL	HFW4020J0L	FWC3020JL	FWC40200L0J	T100FB	BMH1M
25	20- 25	125- 250	FW3025JL	FW4025J0L	HFW3025JL	HFW4025J0L	FWC3025JL	FWC40250L0J	T100FB	BMH1M
32	25- 32	160- 320	FW3032JL	FW4032J0L	HFW3032JL	HFW4032J0L	FWC3032JL	FWC40320L0J	T100FB	BMH1M
40	32- 40	200- 400	FW3040JL	FW4040J0L	HFW3040JL	HFW4040J0L	FWC3040JL	FWC40400L0J	T100FB	BMH1M
50	40- 50	300- 500	FW3050JL	FW4050J0L	HFW3050JL	HFW4050J0L	FWC3050JL	FWC40500L0J	T100FB	BMH1M
63	50- 63	315- 630	FW3063JL	FW4063J0L	HFW3063JL	HFW4063J0L	FWC3063JL	FWC40630L0J	T100FB	BMH1M
80	63- 80	400- 800	FW3080JL	FW4080J0L	HFW3080JL	HFW4080J0L	FWC3080JL	FWC40800L0J	T100FB	BMH1M
100	80-100	500-1000	FW3100JL	FW4100J0L	HFW3100JL	HFW4100J0L	FWC3100JL	FWC41000L0J	T100FB	BMH1M
125	100-125	625-1250	FW3125JL	FW4125J0L	HFW3125JL	HFW4125J0L	FWC3125JL	FWC41250L0J	T100FB	BMH1M
160	125-160	800-1600	FW3160JL	FW4160J0L	HFW3160JL	HFW4160J0L	FWC3160JL	FWC41600L0J	T100FB	BMH1M
200	160-200	1000-2000	FW3200JL	FW4200J0L	HFW3200JL	HFW4200J0L	FWC3200JL	FWC42000L0J	TA225FDM	BMH1M
225	200-225	1125-2250	FW3225JL	FW4225J0L	HFW3225JL	HFW4225J0L	FWC3225JL	FWC42250L0J	TA225FDM	BMH1M

Adjustable Thermal/Fixed Magnetic Earth Leakage Circuit Breakers – Sealed Breakers with Noninterchangeable Trip Units
Line and Load Terminals Included

			Type ELFW (U_e Max. 415 VAC)		Type ELHFW (U_e Max. 415 VAC)		Type ELFWC (U_e Max. 415 VAC)			
50	40- 50	Fixed	ELFW3050L	ELFW4050L	ELHFW3050L	ELHFW4050L	ELFWC3050L	ELFWC4050L	T100FB	BMH1M
63	50- 63	Fixed	ELFW3063L	ELFW4063L	ELHFW3063L	ELHFW4063L	ELFWC3063L	ELFWC4063L	T100FB	BMH1M
80	63- 80	Fixed	ELFW3080L	ELFW4080L	ELHFW3080L	ELHFW4080L	ELFWC3080L	ELFWC4080L	T100FB	BMH1M
100	80-100	Fixed	ELFW3100L	ELFW4100L	ELHFW3100L	ELHFW4100L	ELFWC3100L	ELFWC4100L	T100FB	BMH1M
125	100-125	Fixed	ELFW3125L	ELFW4125L	ELHFW3125L	ELHFW4125L	ELFWC3125L	ELFWC4125L	T100FB	BMH1M
160	125-160	Fixed	ELFW3160L	ELFW4160L	ELHFW3160L	ELHFW4160L	ELFWC3160L	ELFWC4160L	T100FB	BMH1M
200	160-200	Fixed	ELFW3200L	ELFW4200L	ELHFW3200L	ELHFW4200L	ELFWC3200L	ELFWC3200L	T150FB	BMH1M

Moulded Case Switches

			Type FWF (U_e Max. 690 VAC)		Type HFWF (U_e Max. 690 VAC)					
			3-Pole	4-Pole	3-Pole	4-Pole				
100	–	–	FWF3100KL	FWF4100KL	HFWF3100KL	HFWF4100KL	–	–	T100FB	BMH1M
160			FWF3160KL	FWF4160KL	HFWF3160KL	HFWF4160KL			T100FB	BMH1M
225			FWF3225KL	FWF4225KL	HFWF3225KL	HFWF4225KL			TA225FDM	BMH1M

① Special 50°C rating available. Order by description.
② Add suffix 1 for 100% protected neutral. Neutral left pole.
③ Neutral left pole. 16-63A unprotected neutral only.
Add suffix 1 for 100% protected neutral 80-100A.
Add suffix 6 for 60% protected neutral 125-225A.

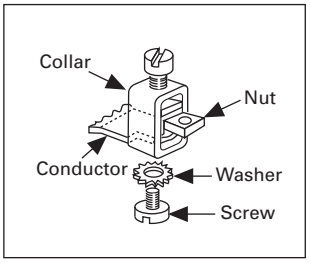
Selection Guide and Ordering Information

Line and Load Terminals

F-Frame circuit breakers and moulded case switches have line and load terminals as standard equipment.

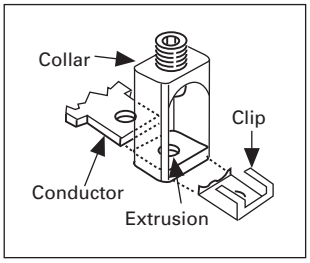
Package of Breaker Amperes	Body Material	Type	Wire Range mm^2	Range/Number Conductors	3 Terminals Catalogue Number
Standard Pressure Type Terminals					
160	Steel	Cu/Al	2.5-50	#14-1/0	3T100FB
225	Aluminium	Cu/Al	25-95	#4-4/0	3TA225FDM
Optional Pressure Type Terminals					
160	Stainless Steel	Copper	25-95	#4-4/0	3T150FB
225	Aluminium	Cu/Al	16-150	6-300 MCM	3TA225FDK

Catalogue Number



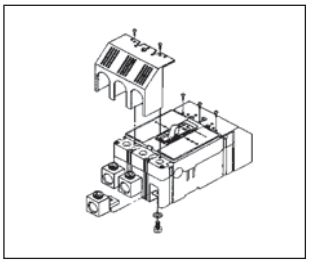
3T100FB, 3T150FB

Insert collar enclosing conductor as shown. Locate nut on top of conductor and tighten securely with screw and washer. Caution: Collar must surround conductor



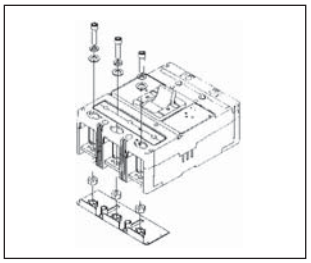
3TA225FDM

Insert collar enclosing conductor and centre on extrusion. Install clip with legs on top of conductor and snap end around bottom of collar.



3TA225FDK

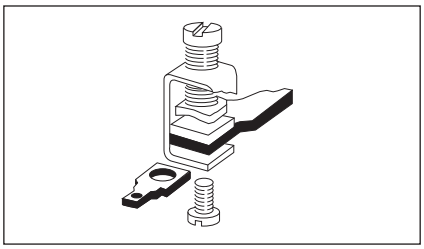
Assemble collar on top of conductor and tighten to 100 lbs. Slide the terminal shield into position; use the high-low screws to secure the shield in place.



KPEKM1 – Metric,
KPEK1 – Imperial

Endcap kits are used on F-frame breaker line load to connect bus bar or similar electrical connections. Includes hardware.

Control Wire Terminal Kit



For use with steel or stainless steel① terminals only.

Package of 12 – Priced Individually
Catalogue Number – FCWTK

Interphase Barriers

The interphase barrier is available for extended insulation between circuit breaker poles. Specify quantity when ordering.

Package of 2
Catalogue Number – IPB1

Base Mounting Hardware

Base mounting hardware is included with a circuit breaker or moulded case switch.

Number of Poles	Description	Type of Mounting	Catalogue Number
Metric Thread			
1	M4-0.7 x 80 mm Pan-Head Steel Screws, Lockwashers, and Clamps	Individual Group (One Set of Hardware for Two Circuit Breakers)	4218B80G09 4218B80G10
2	M4-0.7 x 38 mm Pan-Head Steel Screws, and Lock-washers	Individual	4218B80G11
3, 4	–	Individual	4218B80G12
Imperial Thread			
1	.164-32 x 3.188 Inch Pan-Head Steel Screws, Lockwashers, and Clamps	Individual Group (One Set of Hardware for Two Circuit Breakers)	624B375G01 624B375G02
2	.164-32 x 1.5 Inch Pan-Head Steel Screws and Lockwashers	Individual	4218B80G01
3, 4	–	Individual	4218B80G02

Terminal Shields

The terminal shield is available for line terminal areas in 1-, 2-, 3-, and 4-pole circuit breakers. Special terminal shields are also available for use when an electrical (solenoid) operator is mounted on the circuit breaker. The standard style number by pole for each terminal shield is for a package of 10 and is priced per each package. Special terminal shields are packaged individually.

Number of Poles	Standard Package of 10	Special Packaged Individually
	Catalogue Numbers – Priced Individually	
1	625B229G06	–
2	625B229G07	–
3	625B229G08	4210B95G01
4	625B229G09	4210B95G02

Terminal End Covers

The terminal end cover is available for 3-pole circuit breakers only. Two conductor opening sizes are available. Specify quantity (one per circuit breaker) when ordering.

Conductor Opening Diameter – mm (Inches)	Catalogue Number
6.35 (0.25)	TEC1
10.41 (0.41)	TEC2

① Not for use with 3T20FB terminals

Selection Guide and Ordering Information

Special Calibration

Special non-UL listed calibrations are available for certain ambient temperatures other than 40˚C and for frequencies other than 50/60 Hz or dc. Reduced interrupting ratings will apply for 400 Hz applications.

50˚C Calibration①

Add suffix "V" to catalogue number for complete breaker when ordering listed ampere ratings for breakers to be used in 50˚C ambients.

Contact Cutler-Hammer for availability.

Moisture-Fungus Treatment

All Series C Circuit Breaker cases are moulded from glass-polyester which does not support the growth of fungus. Any parts which are susceptible to the growth of fungus will require special treatment.

Order by description.

Accessory	Frame						
	G	F	J	K	L	N	R
Special Calibration	✓	✓	✓	✓	✓	✓	✓
Moisture-Fungus Treatment	✓	✓	✓	✓	✓	✓	✓

Accessory	Fit Type	Frame						
		G	F	J	K	L	N	R
External Accessory Catalogue Numbers								
Non-Padlockable Handle Block	Field Fitted	1294C01H01	LKD1	LKD3	LKD3	LKD4	LKD4	–
Padlockable Handle Block	Field Fitted	–	–	–	–	–	–	–
	Field Fitted	223C77G03	–	PHB3	PHB3	–	–	HLK6
Padlockable Handle Lock Hasp	Field Fitted	–	PHL1	PLK3	PLK3	HLK4	PLK5	–
Cylinder Lock	Factory Fitted	Order by Description						
Key Interlock Kit (Provision Only)	Field Fitted	–	KYK1	KYK3	KYK3	KYK4	KYK4	KYK6
Slide Bar Interlock – Requires 2 Breakers	Field Fitted	–	SBK1	SBK2	SBK3	SBK4	SBK5	–
Walking Beam Interlock – Requires 2 Breakers	Factory Fitted	Order by Description						
Electrical Operator	120 VAC	–	E0P1P07	E0P2T07	E0P3T07	E0P4T07	E0P5T07	E0P6T08
	240 VAC	–	E0P1P11	E0P2T11	E0P3T11	E0P4T11	E0P5T11	E0P6T11
	120 VDC	–	E0P1P07DC	E0P2T07DC	E0P3T07DC	E0P4T26	–	–
	240 VDC	–	E0P1P11DC	E0P2T11DC	E0P3T11DC	–	–	–
	48 VDC	–	-	–	–	–	E0P5T22	E0P6T21
	125 VDC	–	–	–	–	E0P4T21	E0P5T26	–
Plug-In Adapters②	Field Fitted	–	✓	✓	✓	✓	✓	–
Rear Connecting Studs②	Field Fitted	–	✓	✓	✓	✓	✓	–
Handle Mechanism Field Fitted Only②	Flex Shaft	–	✓	✓	✓	✓	✓	✓
	Type SM	–	✓	✓	✓	✓	–	–
	Series C Rotary	✓	✓	✓	✓	✓	✓	–
	Type MC	–	✓	✓	✓	✓	–	–
	Slide Plate	–	✓	✓	✓	✓	✓	✓
Test Kit								
Electronic Portable Test Kit (Digitrip 310 Only)		–	–	–	STK2	STK2	STK2	STK2

① K-, L-, N- and R-Frame breakers equipped with electronic trip units can operate reliably in ambient temperatures of 50˚C.

② Contact Cutler-Hammer for catalogue numbers.

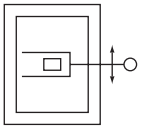
Selection Guide and Ordering Information

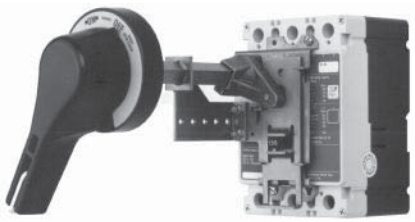
Accessory		Pole Location	Frame						
			G	F	J	K	L	N	R
Field Fit Kit Catalogue Numbers									
Alarm Lockout 	Make/Break	Left	–	A1L1LPK	A1L2LPK	A1L3LPK	A1L4LPK	A1L5LPK	–
		Right	Factory Fit Only	A1L1RPK	A1L2RPK	A1L3RPK	A1L4RPK	A1L5RPK	A1L6RPK
	2 Make/2 Break	Left	–	A2L1LPK	–	A2L3LPK	A2L4LPK	A2L5LPK	–
		Right	–	A2L1RPK	–	A2L3RPK	A2L4RPK	A2L5RPK	A2L6RPK
Auxiliary Switch 	1A, 1B	Left	–	A1X1PK	A1X2PK	A1X3PK	A1X4PK	A1X5LPK	–
		Right	Factory Fit Only	A1X1PK	A1X2PK	A1X3PK	A1X4PK	A1X5RP	–
	2A, 2B	Left	–	A2X1LPK	A2X2PK	A2X3PK	A2X4PK	A2X5LPK	–
		Right	Factory Fit Only	A2X1RPK	A2X2PK	A2X3PK	A2X4PK	A2X5RPK	A2X6RPK
	3A, 3B	Left	–	–	–	A3X3LPK	A3X4PK	A3X5LPK	–
		Right	–	–	–	A3X3RPK	A3X4PK	A3X5RPK	–
Auxiliary Switch / Alarm Lockout		Left	–	AAL1LPK	AAL2LPK	AAL3LPK	AA114LPK	AA115LPK	–
		Right	–	AAL1RPK	AAL2RPK	AAL3RPK	AA114RPK	AA115RPK	–
Shunt Trip – Standard①	120 VAC	Left	Factory Fit Only	SNT1LP08K	SNT2P11K	SNT3P11K	SNT4LP11K	SNT5LP11K	–
		Right	–	SNT1RP08K	SNT2P11K	SNT3P11K	SNT4RP11K	–	SNT6P11K
	240 VAC	Left	Factory Fit Only	SNT1LP12K	SNT2P11K	SNT3P11K	SNT4LP11K	SNT5LP11K	–
		Right	–	SNT1RP12K	SNT2P11K	SNT3P11K	SNT4RP11K	–	SNT6P11K
	24 VDC	Left	Factory Fit Only	SNT1LP03K	SNT2P04K	SNT3P04K	SNT4LP03K	SNT5LP03K	–
		Right	–	SNT1RP03K	SNT2P04K	SNT3P04K	SNT4RP03K	–	SNT6P03K
	48 VDC	Left	–	SNT1LP08K	SNT2P06K	SNT3P06K	SNT4LP23K	SNT5LP23K	–
		Right	–	SNT1RP08K	SNT2P06K	SNT3P06K	SNT4RP23K	–	SNT6P23K
Shunt Trip – Low Energy		Left	–	LST1LPK	LST2LPK	LST3LPK	LST4LPK	LST5LPK	–
		Right	–	LST1RPK	LST2RPK	LST3RPK	LST4RPK	–	LST6RPK
Undervoltage Release Mechanism①	120 VAC	Left	Factory Fit Only	UVH1LP08K	UVH2LP08K	UVH3LP08K	UVH4LP08K	UVH5LP08K	–
		Right	–	UVH1RP08K	UVH2RP08K	UVH3RP08K	UVH4RP08K	–	UVH6RP08K
	240 VAC	Left	Factory Fit Only	UVH1LP11K	UVH2LP11K	UVH3LP11K	UVH4LP11K	UVH5LP11K	–
		Right	–	UVH1RP11K	UVH2RP11K	UVH3RP11K	UVH4RP11R	–	UVH6RP11K
	24 VDC	Left	–	UVH1LP21K	UVH2LP21K	UVH3LP21K	UVH4LP21K	UVH5LP21K	–
		Right	–	UVH1RP21K	UVH2RP21K	UVH3RP21K	UVH4RP21K	–	UVH6RP21K
	48 VDC	Left	–	UVH1LP23K	UVH2LP23K	UVH3LP23K	UVH4LP23K	UVH5LP23K	–
		Right	–	UVH1RP23K	UVH2RP23K	UVH3RP23K	UVH4RP23K	–	UVH6RP23K

① Shunt trip and undervoltage release can only be mounted in left pole of K- and L-Frame breakers equipped with electronic trip units.

Selection Guide and Ordering Information

Series C Rotary Handle Mechanism





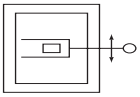
The Cutler-Hammer general purpose rotary handle mechanisms are suitable for use with NEMA 1, 3R, 4 and 12 fabricated enclosures. They are designed for use with Series C Circuit Breakers, Moulded Case Switches, and Motor Circuit Protectors (MCP).

Required for a standard application are the operating handle, shaft, and mechanism.

It may be mounted in either the horizontal or the vertical direction. The handle was ergonomically designed with extra clearance for "gloved hand" to operate. It may be padlocked in the OFF position utilizing three padlocks. The handle is cast metal only.

The standard label on the operating handle indicates ON/Tripped/OFF/Reset.

Flex Shaft™ Handle Mechanism



The Flex Shaft type handle mechanism is an extra heavy-duty handle mechanism designed for mounting in flange-type enclosures. An operating handle, flexible shaft, and mechanism are required for standard application.

The handle can be locked in the RESET position with up to three padlocks. The handle is suitable for NEMA 1, 3R, 4, 4X, and 12 fabricated enclosures. It is supplied for mounting in right-hand flange enclosures. The handle fits the industry standard cutout.

Eight lengths of shafts are available for use with the wide range of depths of various enclosures (3-feet through 10-feet). These choices enable this mechanism to be mounted in various depth, width, and height enclosures. Note: when selecting the length of shaft, ensure minimum bending radius of 4-inches is maintained to operate properly.

The standard method of shipment includes the mechanism preset at the factory; however, minor field adjustments may be required.

Refer to Cutler-Hammer for availability.

Series C Rotary Handle Mechanisms

Breaker Frame	Shaft Length (mm)	Complete Catalog Number③	
		IEC IP65①②	IEC IP66①②
Series C F-Frame	152.4 304.8 406.4 609.6	WHM1R06 WHM1R12 WHM1R16 WHM1R24	WHM1R06X WHM1R12X WHM1R16X WHM1R24X
Series C J-Frame	152.4 304.8 406.4 609.6	WHM2R06 WHM2R12 WHM2R16 WHM2R24	WHM2R06X WHM2R12X WHM2R16X WHM2R24X
Series C K-Frame	152.4 304.8 406.4 609.6	WHM3R06 WHM3R12 WHM3R16 WHM3R24	WHM3R06X WHM3R12X WHM3R16X WHM3R24X
Series C L-Frame	152.4 304.8 406.4 609.6	WHM4R06 WHM4R12 WHM4R16 WHM4R24	WHM4R06X WHM4R12X WHM4R16X WHM4R24X
Series C N-Frame	152.4 304.8 406.4 609.6	WHM5R06 WHM5R12 WHM5R16 WHM5R24	WHM5R06X WHM5R12X WHM5R16X WHM5R24X

① Standard Label on the IEC operating handle indicates (I)/Tripped/(O)/Reset.

② IEC Handle Mechanism supplied with Metric thread mounting hardware.

③ Complete Catalog Number includes a handle, mechanism and shaft.

Selection Guide and Ordering Information

Remote Controlled Operating Mechanisms

Series C Circuit Breakers (sizes 160 to 2000 amperes) can be equipped with motorized operating mechanisms for remote in-service closing and opening.

For normal remote opening, solenoid operating mechanisms F- and K-Frames are available for circuit breakers and motorized operating mechanisms for J to R (sizes 250 to 2500 amperes) solenoid operating mechanisms and motor operators are always supplied with a locking device for padlocks. This device can be used for electrical and mechanical blocking of the operating mechanism. All remote operating mechanisms are equipped with a manual actuator for local operation.

Alarm Lockout

The alarm switches operate when the circuit breaker is tripped by a short circuit or overcurrent, but also when it is tripped by a shunt trip or undervoltage release.

Auxiliary Switches

Auxiliary switches are used for signalling and control purposes. The various functions of the auxiliary switches (changeover) are shown in the top table to the right.

Shunt Trips

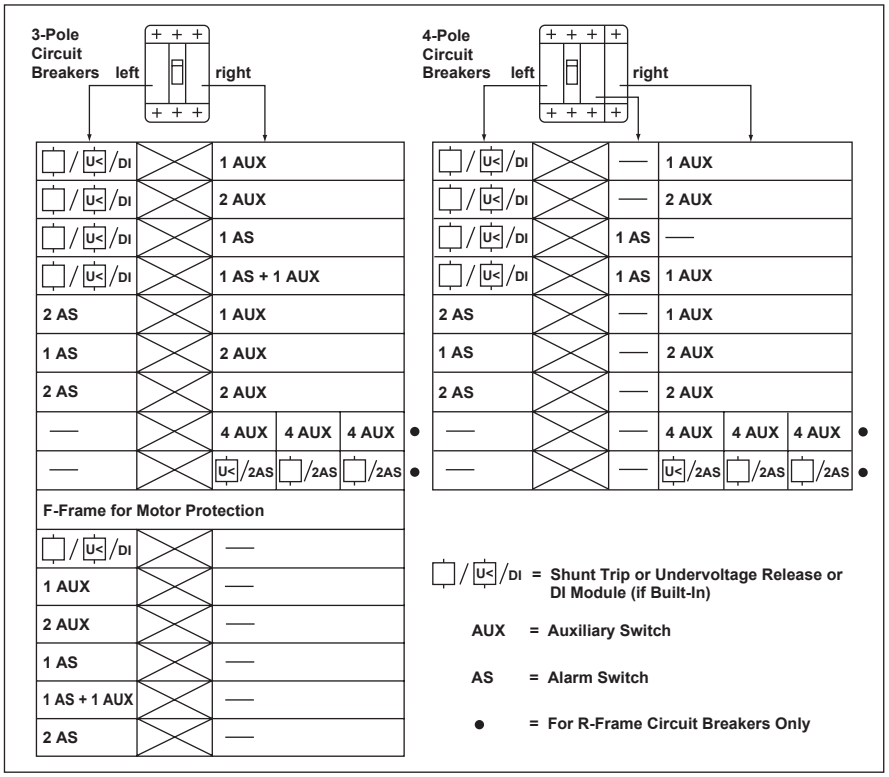
The shunt trip is used for remote tripping.

The coil of the shunt trip is rated only for short-time operation.

It is not permissible with the circuit breaker open to apply a continuous opening command to the shunt trip in order to prevent the breaker from closing.

This means that interlocking circuits with continuous commands may not be set up with shunt trips.

Possible Equipment of F- and L-Frame Circuit Breakers with Auxiliary and Alarm Switches



Undervoltage Releases

The circuit breaker cannot be closed until the undervoltage release is energized. If the release is not energized, the circuit breaker can only perform an idle switching operation.

Frequent idle switching actions should be avoided as they shorten the endurance of the circuit breaker.

Contact making by the auxiliary and alarm switches as a function of the switching position of the circuit breaker

Position of the Toggle Handle Drive (Equivalently Applicable for Rotary Drives)	Position of the Auxiliary Switch	Position of the Alarm Switch
OFF RESET		
ON		
Tripped		

Time-Current Curves

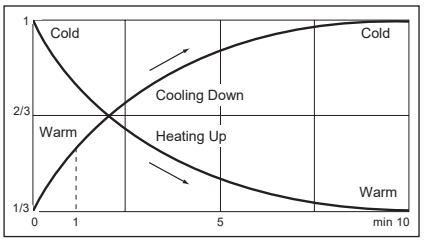
Tripping Characteristics

The operating values specified for the inverse time overcurrent releases (thermal overload releases, "a" releases) are mean values of the scatter bands of all setting ranges from the cold state and with uniform current loading of the conducting paths.

The tripping characteristics of the instantaneous (electromagnetic) short circuit releases ("n" releases) are based on the rated phase current I_n which in the case of circuit breakers with adjustable thermal overload releases is also the upper value of the setting range. With a lower setting current, a correspondingly higher multiple is obtained for the operating current of the "n" release.

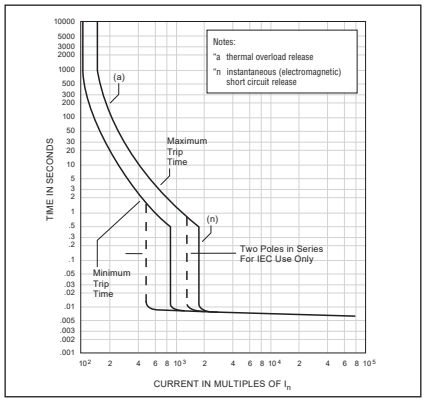
Individual time-current curves K- and L-Frame Digitrip 310 Electronic Trip Curves are available upon request.

Tripping time characteristics (Thermal Memory)



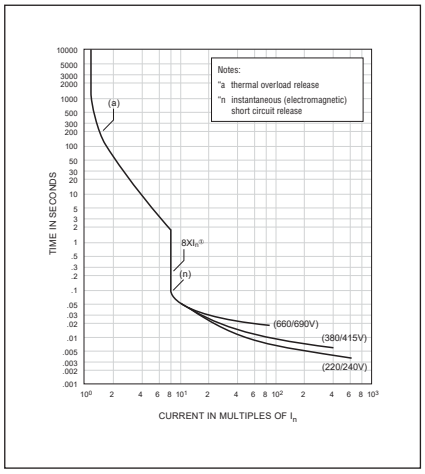
Type GWF

Tripping characteristics of GWF circuit breakers for plant protection, I_{cu} = 25 kA, "n" release fixed setting n = 500-1300 for breaker 16-63A; 1300-1800 for breaker 70-100A



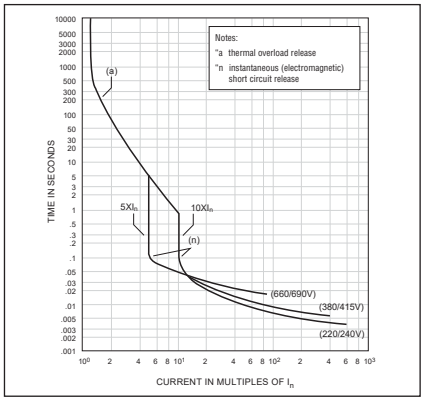
Type FWF

Tripping characteristics of FWF circuit breakers for plant protection, I_{cu} = 40/70 kA, "n" release fixed setting



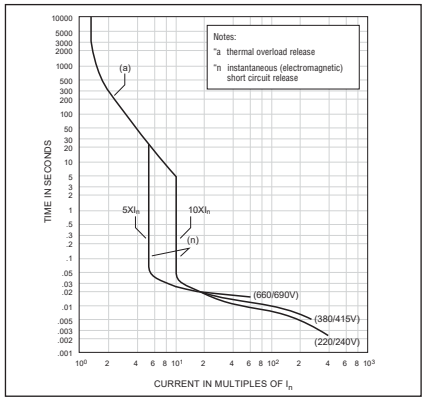
Type FW

Tripping characteristics of FW circuit breakers for plant protection, I_{cu} = 40/70 kA, "n" release adjustable



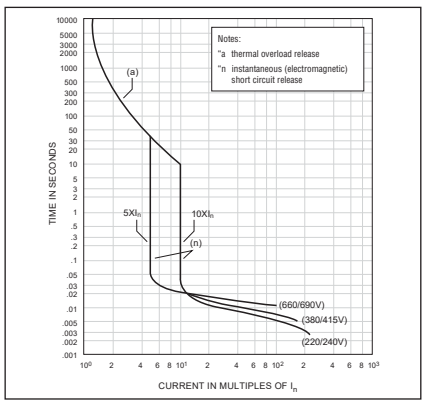
Type JW

Tripping characteristics of JW circuit breakers for plant protection, I_{cu} = 40/70 kA, "n" release adjustable



Type KW

Tripping characteristics of KW circuit breakers for plant protection, I_{cu} = 45/70 kA, "n" release adjustable



Time-Current Curves

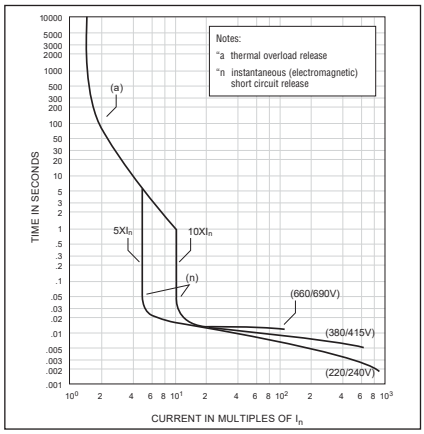
Tripping Characteristics

The operating values specified for the inverse time overcurrent releases (thermal overload releases, "a" releases) are mean values of the scatter bands of all setting ranges from the cold state and with uniform current loading of the conducting paths.

The tripping characteristics of the instantaneous (electromagnetic) short circuit releases ("n" releases) are based on the rated phase current I_n which in the case of circuit breakers with adjustable thermal overload releases is also the upper value of the setting range. With a lower setting current, a correspondingly higher multiple is obtained for the operating current of the "n" release.

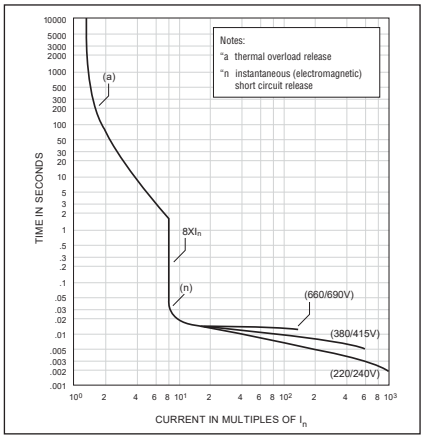
Type FW

Tripping characteristics of FW circuit breakers for plant protection, I_{cu} = 100 kA, "n" release adjustable



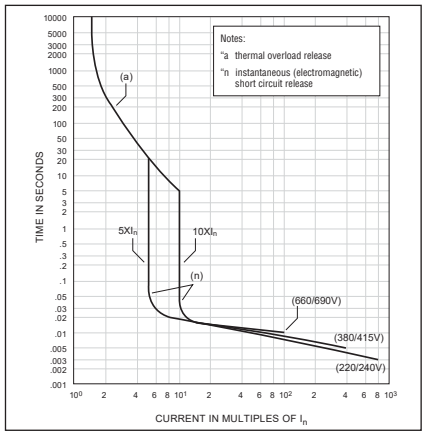
Type FWF

Tripping characteristics of FWF circuit breakers for plant protection, I_{cu} = 100 kA, "n" release fixed setting



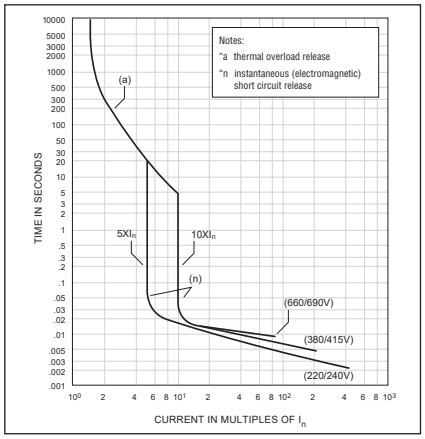
Type JW

Tripping characteristics of JW circuit breakers for plant protection, I_{cu} = 100 kA, "n" release adjustable



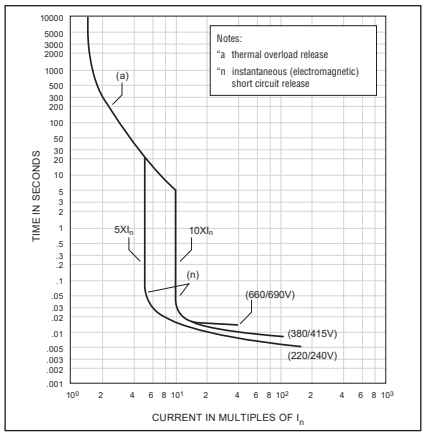
Type KW

Tripping characteristics of KW circuit breakers for plant protection, I_{cu} = 100 kA, "n" release adjustable



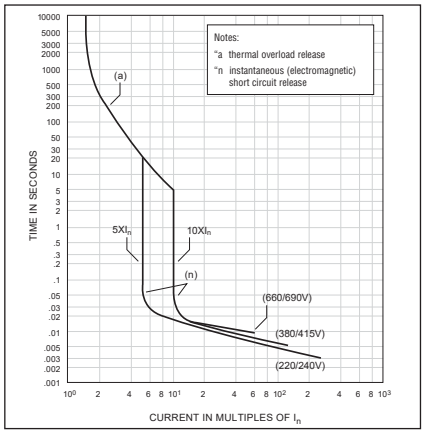
Type LW

Tripping characteristics of LW circuit breakers for plant protection, I_{cu} = 45/70 kA, "n" release adjustable



Type LW

Tripping characteristics of LW circuit breakers for plant protection, I_{cu} = 100 kA, "n" release adjustable



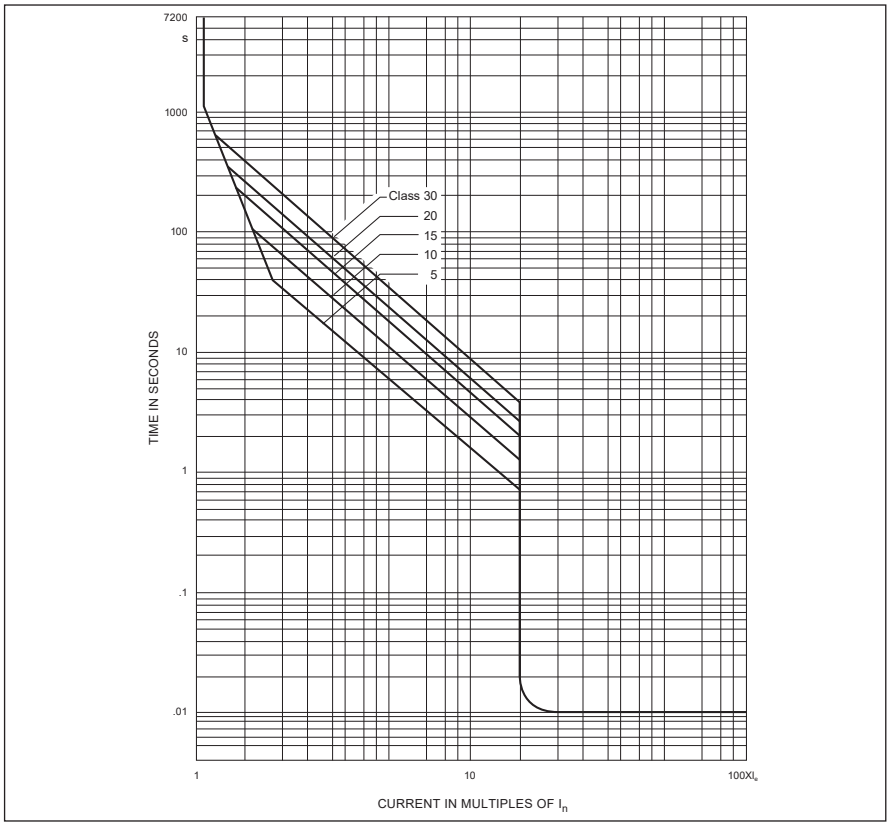
Time-Current Curves

Characteristics of the FWMP, KWMP, and LWMP Circuit Breakers for Motor Protection with Solid State Overcurrent Releases

The tripping times of the inverse-time delayed overcurrent releases are only valid for the not preloaded (cold) state. At operating temperature (after load with rated current), the tripping times are reduced to approximately 33%. After an overcurrent trip, the tripping times are reduced according to the tripping time characteristics (see figure below) so that cooling down for some minutes is required before restarting the motor. During the first minute after tripping, reclosing of the circuit breaker is blocked.

Type FWMP, KWMP, and LWMP

Tripping characteristics for FWMP, KWMP, and LWMP circuit breakers for motor protection with solid state overcurrent releases

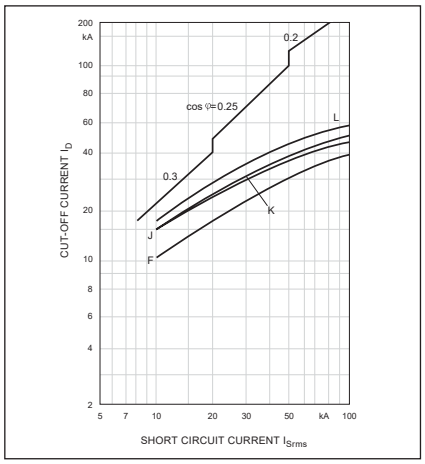


Current Limiting Curves

Current Limiting Characteristics and Maximum I²t Values

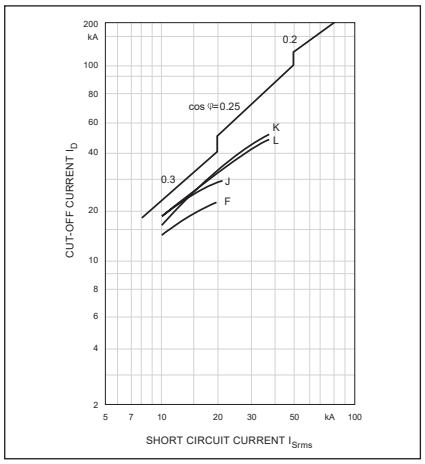
Type FW/LW

Current limiting characteristics for FW to LW, 50/60 Hz 380/415 VAC



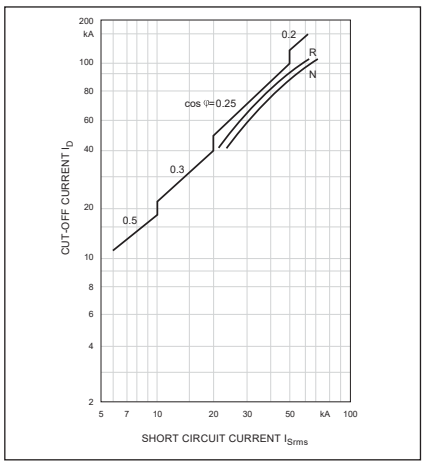
Type FW/LW

Current limiting characteristics for FW to LW, 50/60 Hz 660/690 VAC



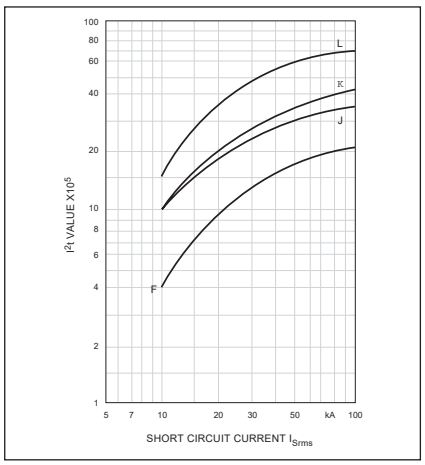
Type NW/RW

Current limiting characteristics for NW to RW, 50/60 Hz 380/415 VAC



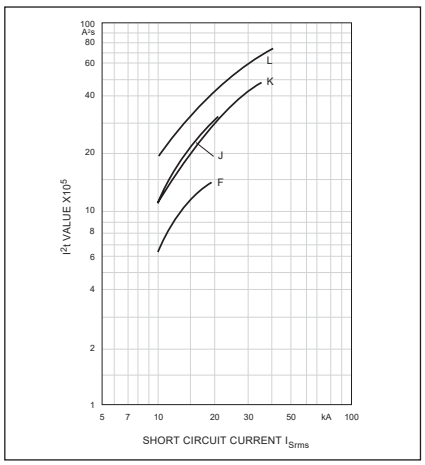
Type FW/LW

Maximum I²t values for FW to LW, 50/60 Hz 380/415 VAC



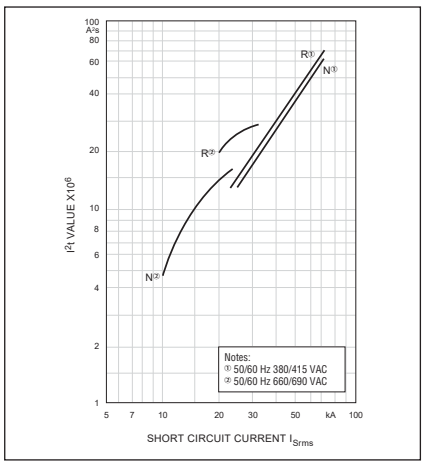
Type FW/LW

Maximum I²t values for FW to LW, 50/60 Hz 660/695 VAC



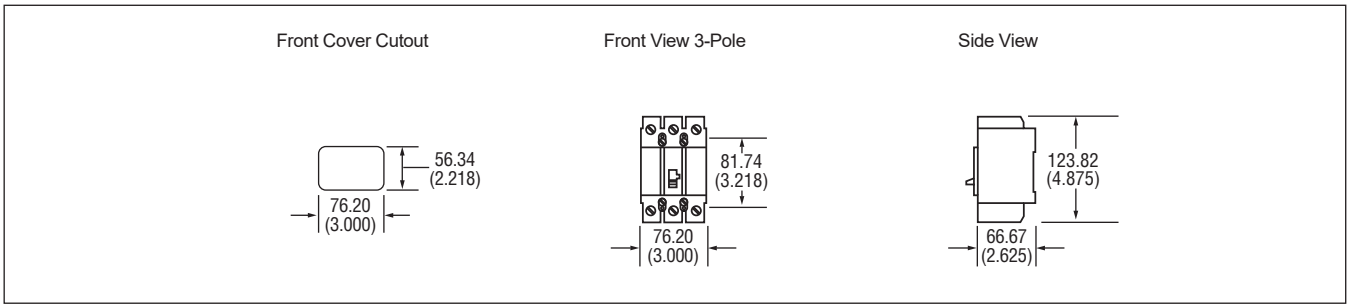
Type NW/RW

Maximum I²t values for NW to RW

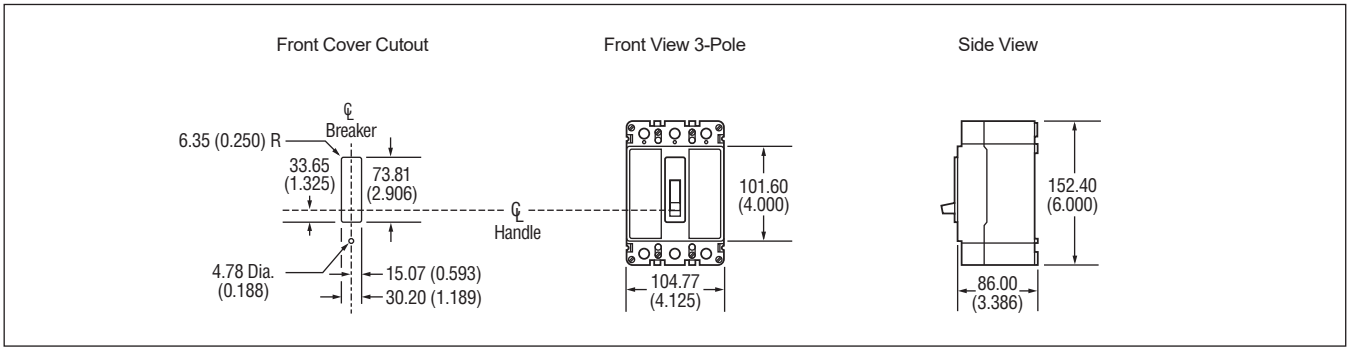


Dimensions, mm (inches)

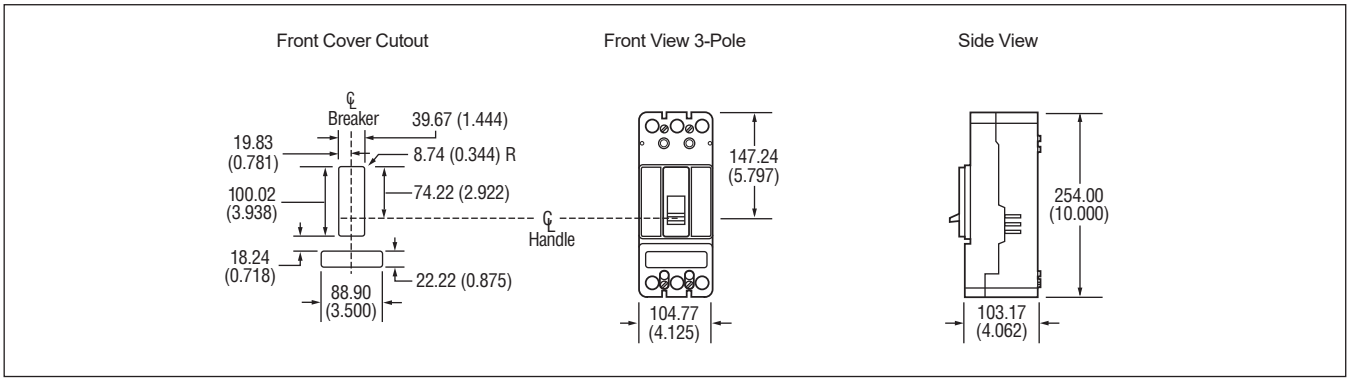
G-Frame



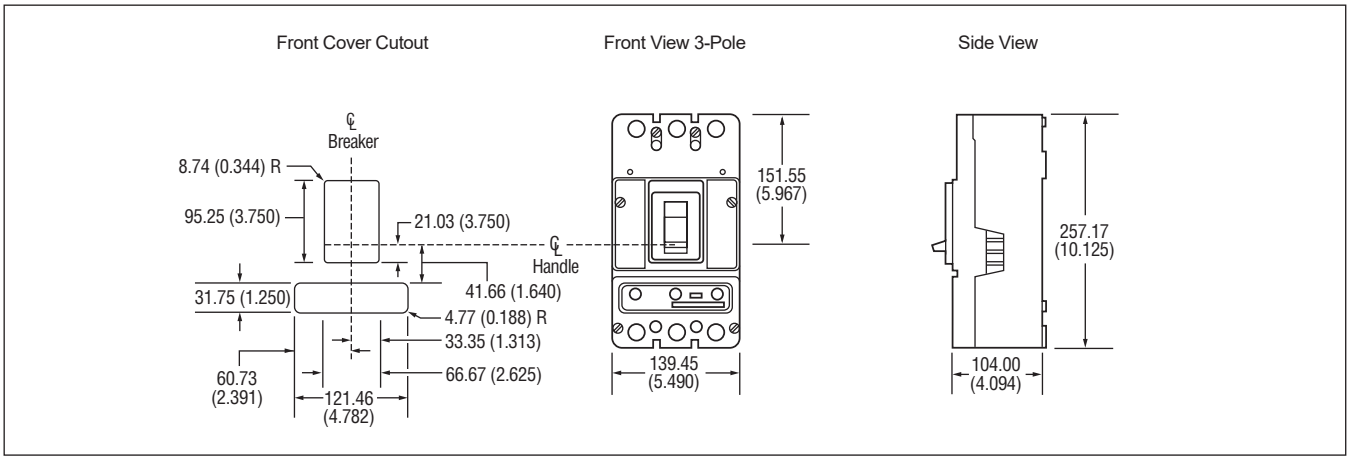
F-Frame



J-Frame



K-Frame



Dimensions in parentheses in inches.

Typical Specifications for Series C® Moulded Case Circuit Breakers

The circuit breakers shall meet or exceed all standards as defined in IEC 947-2. Electrical circuits shall be protected by Series C World Moulded Case Circuit Breakers as manufactured by Cutler-Hammer.

Each pole of the one-, two-, and three-pole circuit breakers shall provide complete circuit overcurrrent protection by having inverse time and instantaneous tripping characteristics and, where applicable, be current limiting.

The circuit breaker shall be available in interrupting families that provide 35-65-100 kA at 380-415 volts AC.

The circuit breakers shall be operated by a toggle-type handle and have a quick-make, quick-break, over-centre switching mechanism that is mechanically trip-free from the handle so that the contacts cannot be closed against short circuit currents. Tripping due to overload or short circuits shall be clearly indicated by the position of the handle. The ON and OFF positions shall be clearly marked on the cover of the circuit breaker along with the international symbols I for ON and O for OFF on the handle, providing positive indication of the circuit breaker contact position. Additionally, a colour-coded indication of the circuit breaker contact position shall be provided: red for ON, green for OFF, and white for TRIPPED. An easily accessible Push-To-Trip button for mechanically exercising the trip unit shall be provided on the cover of each circuit breaker. All poles of a multi-pole circuit breaker shall be so constructed as to ensure simultaneous open, close, and trip operations.

Circuit breakers shall be completely enclosed in a high strength glass-polyester case.

Noninterchangeable trip circuit breakers shall be factory sealed; interchangeable trip circuit breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible from the front of the circuit breaker. Contacts shall be nonwelding silver alloy. Arc extinction shall be accomplished by means of DE-ION® arc extinguishers consisting of metal grids mounted in an insulating support.

The minimum interrupting ratings of the circuit breakers shall be at least equal to the available short circuit current at the line terminals.

The circuit breakers can be applied in series rated applications and subject to test data verification.

Circuit breakers in frame sizes 100 amperes through 250 amperes shall be equipped with thermal-magnetic trip units. Circuit breakers 400 amperes through 2500 ampere frame sizes shall be equipped with electronic trip units that are insensitive to changes in ambient temperature within the normal operating temperature range of the circuit breaker. The 400 ampere and 630 ampere frame sizes shall be designed to accept either thermal-magnetic or electronic interchangeable trip units.

Electronic trip units shall be rms sensing type and have unpowered thermal memory.

Circuit breaker ratings and modifications shall be indicated on the drawings.

Circuit breakers shall be of the inverse time and instantaneous trip type as provided by thermal-magnetic or electronic trip elements with either standard interrupting, high interrupting, or current limiting characteristics as required.

Moulded case circuit interrupters (motor circuit protectors) shall be of the instantaneous (magnetic) only type, providing instantaneous short circuit protection by means of a front adjustable trip unit.

Moulded case switches shall be of the same construction as the related listed circuit breaker and equipped with a factory sealed, nonadjustable, high instantaneous only short circuit protection.

Moulded case switches shall have no overload or low level fault protection provided and shall be marked with a maximum withstand rating denoting the type and level of upstream protection required. Moulded case switches shall be listed per IEC 947-2.

Internally mounted accessories including alarm (signal)/lockout switches, auxiliary switches, shunt trips, and undervoltage released mechanisms shall be of the plug-in type and shall be listed for field fitting in circuit breakers which are not factory sealed.

Electrical operators for circuit breakers of the 400 ampere frame size and below shall be of the solenoid type with maximum five-cycle closing characteristics. Electrical operators for circuit breaker frame sizes 630 amperes through 2500 amperes shall be of the motor driven type. All electrical operators shall be cover mounted. All electrical operators shall be listed for field installation per IEC 947-2.

Electrical characteristics of accessories shall be as indicated on the drawings.

Circuit breakers in the 160 amperes rating shall be supplied in one-, two-, three-, and four-pole models, as specified on the drawings. Circuit breakers in ratings of 225 amperes through 1250 amperes shall be supplied in two-, three-, or four-pole models. The 2500 ampere circuit breaker is available in three- and four-pole models as specified on the drawings.

Accessory wiring shall be brought out through the side or rear of the circuit breaker, or be connected to a terminal block mounted on the side of the circuit breaker, as specified. The ability to route accessory wiring to the opposite side of the circuit breaker through a trough in the base shall be provided.

Circuit breakers shall be provided with uniformly designed nameplates to clearly indicate the type, rating, listing/recognition/certification marks, accessory details, and other information defined in IEC 947-2.