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

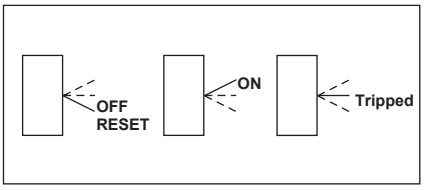
All Series C Circuit Breakers are current limiting because of their high repulsion contact arrangement and incorporation of state-of-the-art arc extinguishing technology.

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

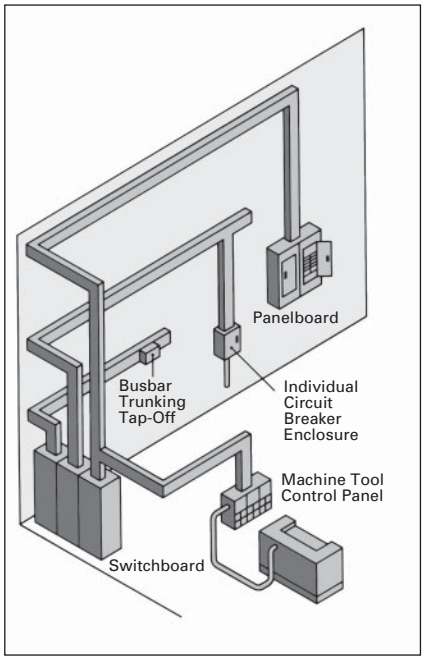
Completely assembled in enclosures to meet specific customer requirements (G-, F-, J-, K-, L-, N- and R-Frames).

Machine Tool Control Panels and Motor Control Centres

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

Additional Applications

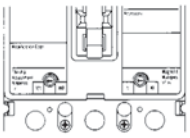
Special versions of each Series C frame are available to provide safe equipment control and protection in mining and other applications. Contact your Cutler-Hammer agent or distributor for additional information.



Typical Series C Applications

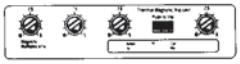
Frame	Continuous Ampere Rating Range	Type of Trip Unit					Moulded Case Switch
		Adjustable Thermal Fixed Magnetic	Fixed Thermal Fixed Magnetic	Adjustable Thermal Adjustable Magnetic	Adjustable Thermal Fixed Magnetic Earth Leakage	Digitrip RMS Electronic Trip Units	
G	16-100		■				
F	16-225	■	■	■	■		■
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	

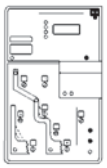
① 2 poles in series.
② At 277 VAC.
③ FWF 16-40A, 415 VAC maximum.
④ FWC 200A and FWCF 175-225A rated 14/7 kA at 690 V.

Electrical Characteristics

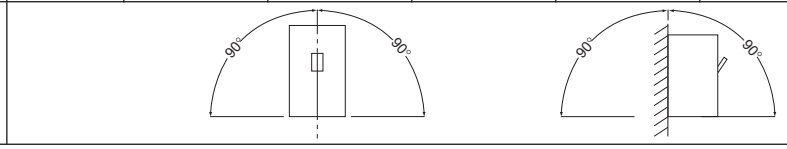
			K			L			
									
Maximum Rated Current (Amperes)			**400**			**630**			**800**
Breaker Type			**KW**	**HKW**	**KWC**	**LW**	**HLW**	**LWC**	**LW**
Breaker Capacity (kA rms) AC 50-60 Hz									
IEC 947-2	220-240 VAC	I_{cu}	85	100	200	85	100	200	65
		I_{cs}	85	100	150	85	100	150	33
	380-415 VAC	I_{cu}	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.

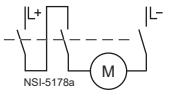
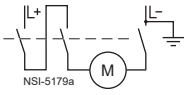
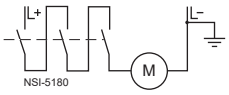
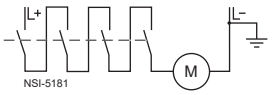
The N- and R-Frame circuit breakers, FWMP, KWMP, and LWMP circuit breakers for motor protection are not suitable for dc currents due to the solid state overcurrent release system.

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		
	U_e Maximum 240 VAC	U_e Maximum 440 VAC	
	20 kA I_{cu} at 240 VAC	25 kA I_{cu} at 415 VAC	
	Type GWF②		
	1-Pole	2-Pole	3-Pole
Fixed Thermal/Fixed Magnetic Circuit Breakers Sealed Breakers with Noninterchangeable Trip Units and Line and Load Terminals			
16	GWF1016	GWF2016	GWF3016
20	GWF1020	GWF2020	GWF3020
25	GWF1025	GWF2025	GWF3025
32	GWF1032	GWF2032	GWF3032
40	GWF1040	GWF2040	GWF3040
50	GWF1050	GWF2050	GWF3050
63	GWF1063	GWF2063	GWF3063
80	GWF1080	GWF2080	GWF3080
100	GWF1100	GWF2100	GWF3100

Terminals (Factory Fitted Only)

Frame	Amperes	Terminal Type	Wire Type	Wire Range
G	16-100	Pressure Type	Copper	2.5-50

① Special 50°C rating available. Order by description.
② GWF is direct supersedure for GW fixed thermal magnetic breaker.

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

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

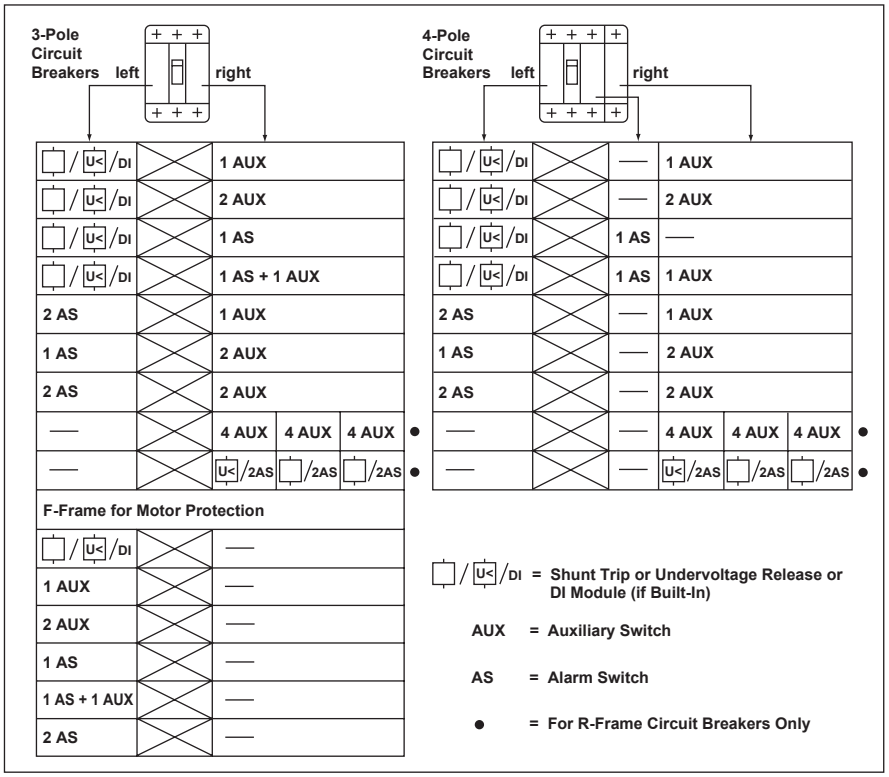
The shunt trip is used for remote tripping.

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

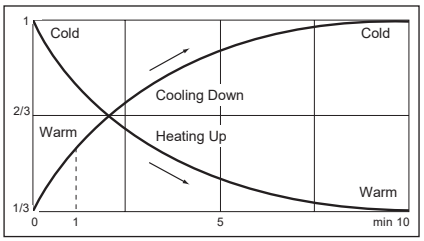
Tripping Characteristics

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.

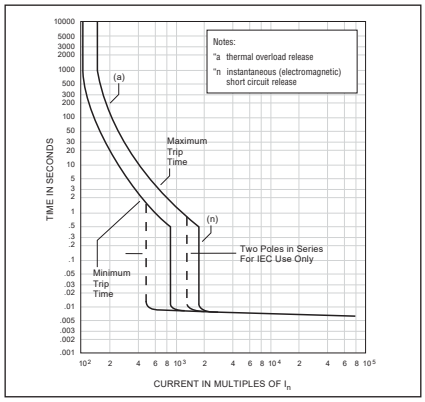
Individual time-current curves K- and L-Frame Digitrip 310 Electronic Trip Curves are available upon request.

Tripping time characteristics (Thermal Memory)



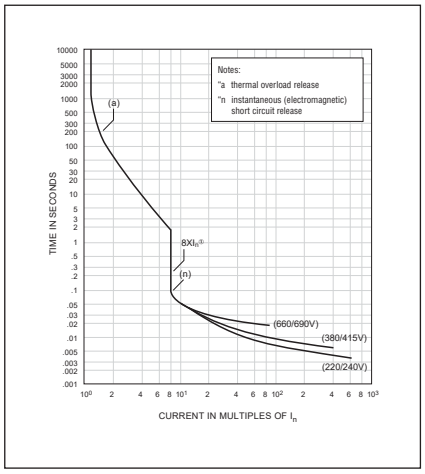
Type GWF

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



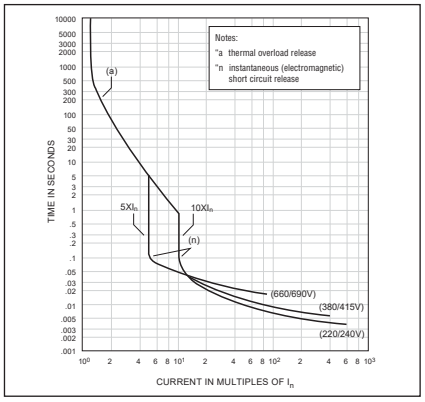
Type FWF

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



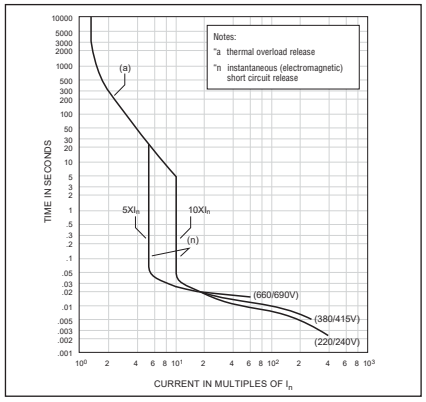
Type FW

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



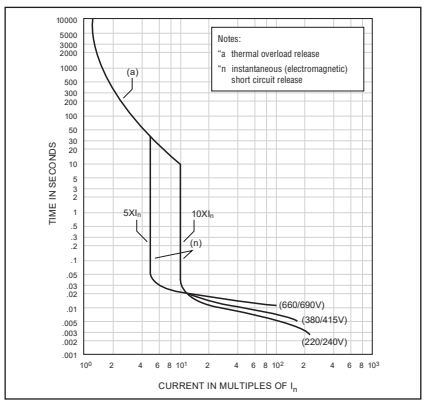
Type JW

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



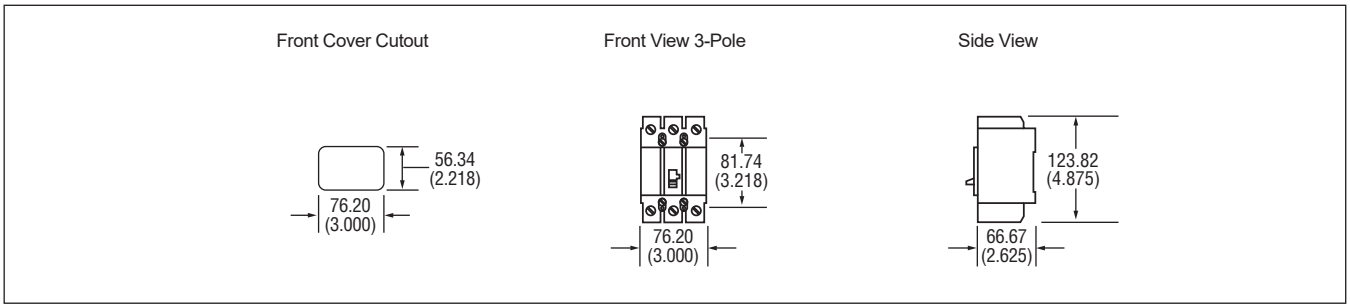
Type KW

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

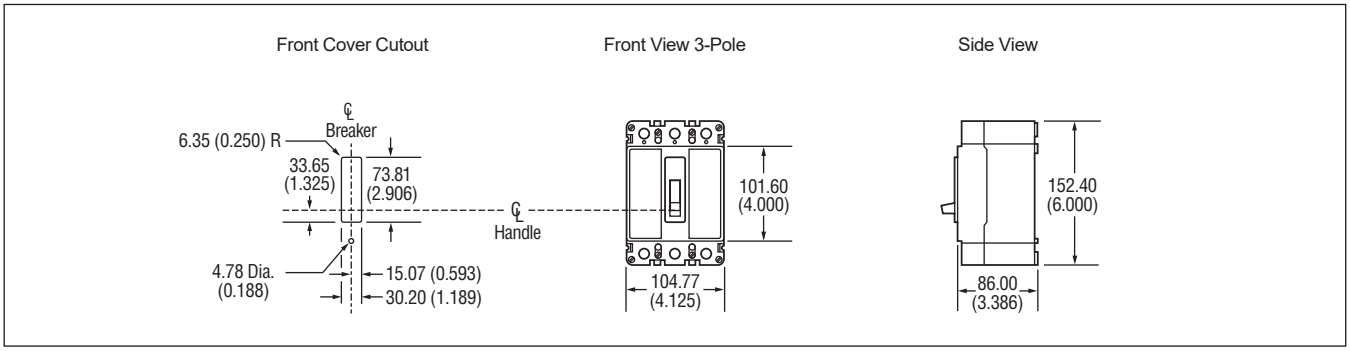


Dimensions, mm (inches)

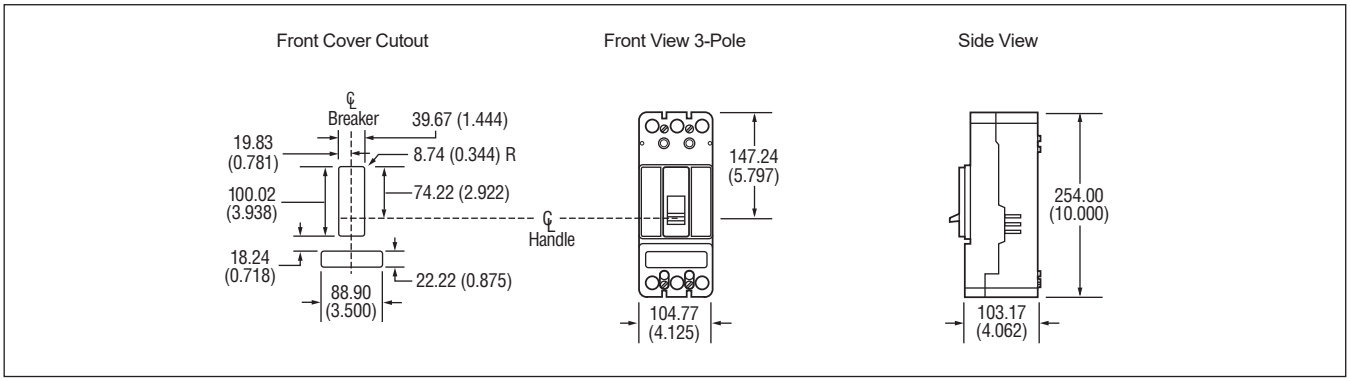
G-Frame



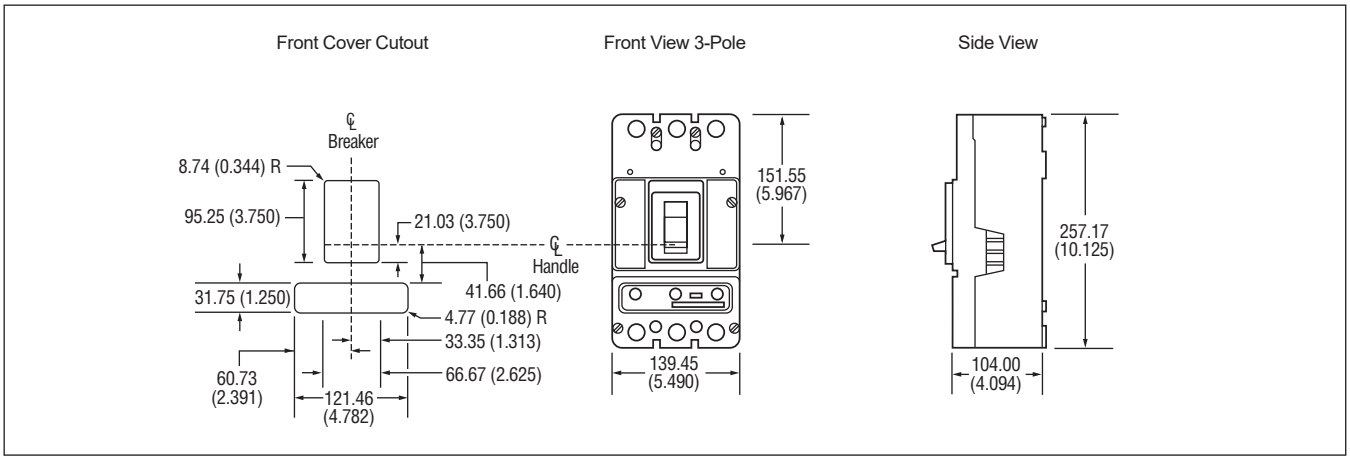
F-Frame



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.