PC-Series

GFCI/ELCI & PANEL SEAL

The PC-Series, AC Residual Current Circuit Breaker with Overcurrent Protection (RCBO), combines the ground fault protection of a GFCI with the familiar overcurrent tripping characteristics of a normal circuit breaker. It detects lower level ground faults that do not trip ordinary circuit breakers, but could lead to shock hazards and fires in installations near water. Innovative features include status LED indicators distinguishing if a breaker is closed with line voltage present, or has opened due to leakage current, or has opened due to over current, or is closed with no line voltage present.

Product Highlights:

- Meets latest UL 943 standards
- GFCI self-test auto-monitoring & end-of-life indication
- Integrated push-to-reset button
- Overload, short circuit and ground fault protection in a single package
- Status LED indicators
- Single circuit solution for AC branch ground fault protection
- Optional panel seal

Typical Applications:

- Generators
- Water Heaters
- Battery Chargers
- Marine
- AC main ground fault protection for a boat's entire AC electrical system

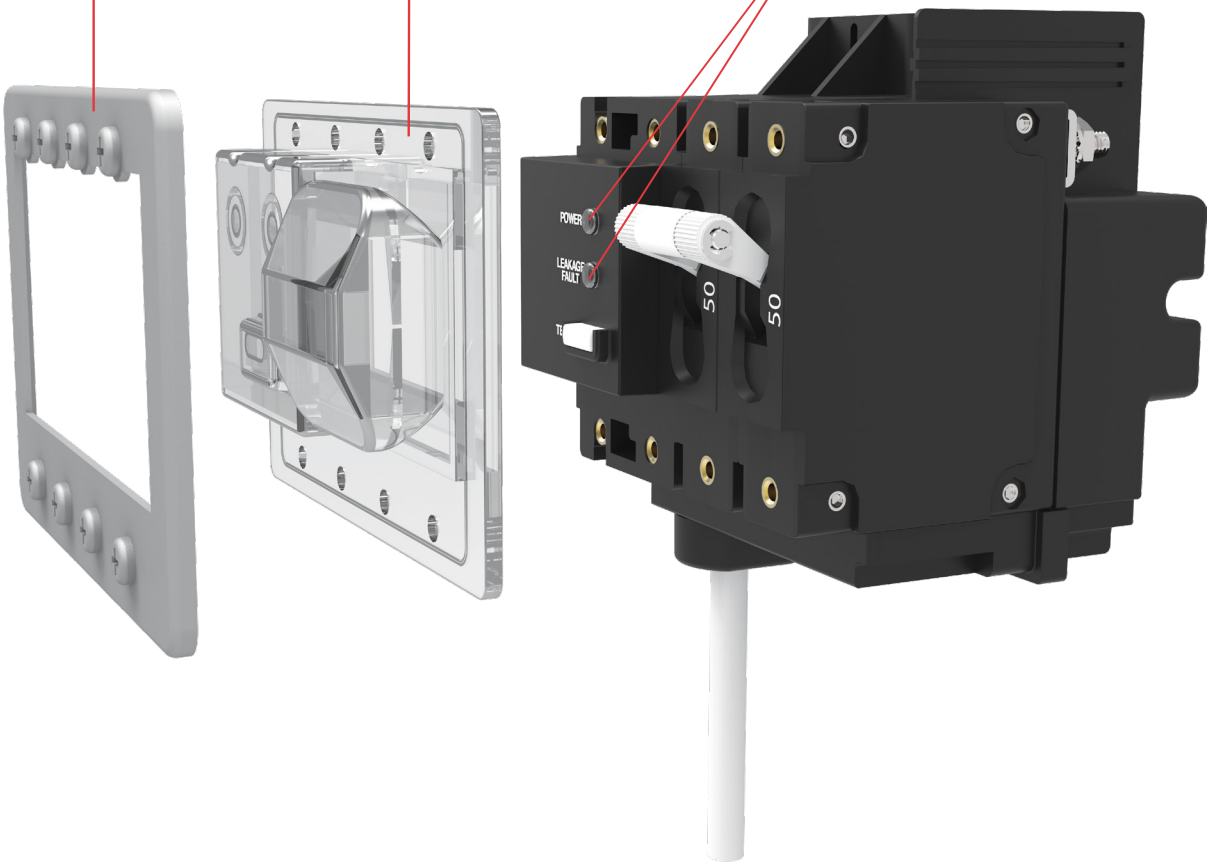
Carling Technologies®
Innovative Designs. Powerful Solutions.

PC-Series Switch
DESIGN FEATURES

MOUNTING PLATE
Available in stainless steal or zinc chromate plated carbon steel

OPTIONAL SEAL
IP66/67 panel seals provide ideal protection against salt spray, ozone, dust, water and most acids

LEDs
Two separate lights that indicate power, ground fault leakage and end-of-life



*Manufacturer reserves the right to change product specification without prior notice.

Electrical Tables

Table A: UL Listed & CSA Certified configurations as a Ground Fault Circuit Interruptor

PC-SERIES TABLE A: UL Listed / CSA 22.2 No. 144.1 Configurations as a Ground Fault Circuit Interruptor							
Circuit Configuration	Voltage			Current Rating (Amps)	Short Circuit Capacity (Amps)	Ground Fault Trip Level (Milliamps)	Notes
	Max Rating	Frequency (Hertz)	Phase				
Series	120	60	1	1 - 50	5000	6	1 or 2 Poles. One pole of a two pole unit must be Neutral
	120 / 240	60	1	1 - 50	5000	6	2 or 3 Poles. One pole of a three pole unit must be Neutral

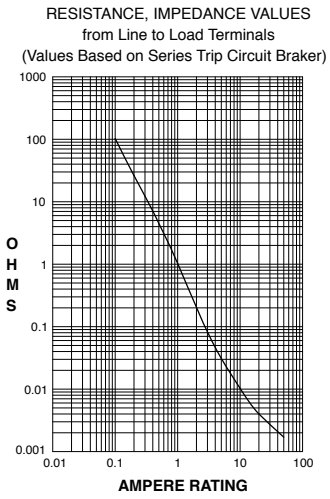
Table B: UL Recognized as an Earth Leakage Circuit Interruptor - 120 and 120/240V

PC-SERIES TABLE B: UL Recognized Configurations as an Earth Leakage Circuit Interruptor							
Circuit Configuration	Voltage			Current Rating (Amps)	Short Circuit Capacity (Amps)	Ground Fault Trip Level (Milliamps)	Notes
	Max Rating	Frequency (Hertz)	Phase				
Series	120	50 / 60	1	1 - 50	5000	30	1 or 2 Poles. One pole of a two pole unit must be Neutral
	120 / 240	50 / 60	1	1 - 50	5000	30	2 or 3 Poles. One pole of a three pole unit must be Neutral
Series Ignition Protection	120	50 / 60	1	1 - 50	3000	30	1 or 2 Poles. One pole of a two pole unit must be Neutral
	120 / 240	50 / 60	1	1 - 50	5000	30	2 or 3 Poles. One pole of a three pole unit must be Neutral

Table C: UL Recognized as an Earth Leakage Circuit Interruptor - 240V

PC-SERIES TABLE C: UL Recognized Configurations as an Earth Leakage Circuit Interruptor - 240V							
Circuit Configuration	Voltage			Current Rating (Amps)	Short Circuit Capacity (Amps)	Ground Fault Trip Level (Milliamps)	Notes
	Max Rating	Frequency (Hertz)	Phase				
Series	240	50 / 60	1	1 - 30	5000	30	2 or 3 Poles. One pole of a three pole unit must be Neutral. Suffix 11
Series Ignition Protection	240	50 / 60	1	1 - 50	5000	30	2 or 3 Poles. One pole of a three pole unit must be Neutral. Suffix 12

Impedance (Across Circuit breaker only)



CURRENT (AMPS)	TOLERANCE (%)
0.10 - 5.0	± 15
5.10 - 20.0	± 25
20.10 - 50.0	± 35

Agency Certifications

UL Standard 489	Circuit Breakers, Molded Case, (Guide DIVQ, File E129899)
UL Standard 1077	Supplementary Protectors
UL Standard 943 & CSA 22.2 No. 144.1	Class A Ground Fault Circuit Interrupters
UL Standard 1053	Ground Fault Sensing and Relaying Equipment
UL Standard 1500	Ignition Protection

Electrical

Current Ratings	50 Amps maximum
Voltage Rating	120 VAC, 120/240 VAC
Dielectric Strength	1480 VAC, 60Hz for 1 minute between all electrically isolated terminals
Insulation Resistance	Minimum of 100 Megohms at 500VDC
Leakage Current Trip Level	5±1 mA
Leakage Current Trip Time	≤ 25 ms complies with UL 943
EMI	UL 943 / IEC 61000-4-6, 0.5V 150KHz ~ 230 MHz
Operating Frequency	50/60 Hz
Reverse Polarity	A reversed Line / Load connection to the circuit breaker shall not cause damage to the device
Grounded Neutral	When neutral is grounded on load side of circuit
Overload	50 operations @ 600% of rated current on Breakers
Switched Neutral	2nd Pole on 120V and 3rd Pole on 120/240V, Optional
Manual Test	To be performed at least every month by pressing the test button on the GFCI to verify the device's ability to respond and trip when subjected to simulated leakage. Current imbalance is sufficient to cause tripping at 85% of rated voltage. Line Power at L1 is required.
GFCI Auto-Monitoring	Performed automatically without opening circuit breaker contacts or compromising ability to respond to ground or neutral faults. Automatic Self-Test performed automatically every time power is supplied within 5 seconds. Automatic Self-Test Frequency: 3 seconds. Line Power at L1 is required. Feedback when auto-monitoring Self-Test fails: Circuit breaker trips and cannot be reset and a visual indication is displayed (See Next Page).
GFCI Heartbeat Indicator	Successful Self Tests are followed by a flash of light per Next Page
GFCI End of Life	Circuit breaker trips and cannot be reset. A visual indication is displayed via the LED's located on the front of the device (See Next Page). Line Power at L1 is required.

Mechanical

Endurance	10,000 "On-Off" Operations at 6 per minute; 6000 with Rated Current & Voltage (3000 test button and 3000 manual operations) and 4000 on/off operations with no load.
Trip Free	Trips on short circuit, overload or leakage to ground, even when actuator is forcibly held in the "On" position

Physical

Number of Poles	1-pole (1 Circuit Breaker + 1 GFCI Sensor Module), 120V. 2-pole (2 Circuit Breakers + 1 GFCI Sensor Module), 120/240V or 120V with Switched Neutral. 3-pole (3 Circuit Breakers + 1 GFCI Sensor Module), 120/240V with Switched Neutral.
Termination	Circuit Breaker Line Side: #10-32 GFCI Sensor Module Load Side: #10-32. Neutral pigtail provided with non-switched neutral units.
Mounting	Front Panel, #6-32 or M3 threaded inserts.
Actuator	Handle, Flat Rocker, Curved Rocker (with or without rocker guard), Push-to-Reset Rocker
Internal Configuration	Circuit Breaker, Series Trip Switch only (without over-current protection)
Weight	1-pole: approximately 300 grams (10.6 ounces) 2-pole: approximately 375 grams (13.2 ounces) 3-pole: approximately 500 grams (17.6 ounces)
Standard Colors	Housing – Black, Test Button – White, Text – White

Environmental

Designed and tested in accordance with requirements of specification MIL-PRF- 55629 and MIL-STD-202G as follows:

Shock	Withstands 100 G, 6ms, sawtooth at rated current per Method 213, Test Condition "I".
Thermal Shock	Method 107D, Condition A (5-cycle at -55°C to +25°C to +85°C to +25°C)
Vibration	Withstands 0.06" excursion from 10-55 Hz, and 10 G 55-500 Hz, at rated current per Method 204C, Test Condition A. Instantaneous & ultrashort curves tested at 90% of rated current.
Moisture Resistance	93% RH at 30°C for 168 Hours.
Operating Temperature	-35°C to +66°C
Corrosion	UL-943-6.21, 3 weeks Humidity: 30±2°C, 70±2% relative humidity Mixed Flowing Gases: 100 ppb H_2S, 20 ppb Cl_2, 200±50 ppb NO_2

GFCI LED Indication

Condition	Breaker	LED Output
Power with Open Circuit	Open	None
Circuit Manually Opened	Open	None
Power with Closed Circuit	Closed	Green (solid)
Ground Fault Leakage	Trips Open	Red (solid)
Grounded Neutral	Trips Open	Red (solid)
Passed Automatic, Self-Test	Closed	Red (flash lasting 2 ms, every 3 seconds)
Failed Automatic, Self-Test	Trips Open	Red (continuous flashing, every 0.10 seconds)
Manual GFCI Monthly Test	Trips Open	Red (solid)
Over Current	Trips Open	None
End of Life	Trips Open	Red (continuous flashing, every 0.10 seconds)

Loss of line power results in no LED output and no continuous trip

GFCI Test Instructions

1. Turn “OFF” the GFCI Breaker actuator. Turn on the power to the panel. The green and red LED’s should be off.
2. Turn “ON” the GFCI Breaker actuator. The green “POWER” LED should show steady illumination and the red “LEAKAGE FAULT” LED should flash every 3 seconds to indicate a successful self-test.
3. Depress the “TEST” button. This will cause the actuator to move to the “OFF” position and the red LED to turn on and show steady illumination, indicating that the GFCI is functioning properly. The green LED will also go from steady to off. If the actuator fails to move to the “OFF” position or the red LED fails to illuminate, the unit MUST be replaced.
4. Turn the GFCI Breaker actuator to the “ON” position. The red LED should flash every 3 seconds and the green LED should show steady illumination.
5. This test is to be performed on a monthly basis and recorded on the “Monthly Test Reminder” label.

ELCI LED Indication

Indicator - Two integrated LEDs, Red & Green

- Green LED On, Red LED Off - Line Voltage is present, the breaker is closed, and the device is protecting the circuits against over current and leakage current.
- Green LED Off, Red LED On - The device has detected leakage current and has opened the circuit breaker.
- Green LED Flashing, Red LED Off - The circuit breaker has opened due to over current or has been turned off manually
- Green LED Off, Red LED Off - Line Voltage is not present
- Green LED Flashing, Red LED Off, Amber LED ON - Indicates Hot & Neutral are reversed and the circuit breaker is open

Neutral Protection - When neutral is grounded on load side of circuit

Test Button - Located on Ground Fault Module

PC	B	-	B	A	-	24	-	620	-	1	B	A	-	A	10
1 Series	*2 System Voltage/Poles*		*3 Circuit*	*4 Actuator*		*5 Frequency & Delay*		*6 Current Rating*		*7 Terminal*	*8 Actuator Color*	*9 Mounting/ Barriers*		*10 Trip Level*	*11 Agency Approval*

1 SERIES
PC

2 SYSTEM VOLTAGE / POLES [4]
A 120 VAC single phase, 1 pole
B 120/240 VAC single phase, 2 pole
C 120/240 VAC single phase with switched neutral, 3 pole
D 120 VAC single phase with switched neutral, 2 pole
G 240 VAC single phase, 2 pole

3 CIRCUIT
B Series Trip (Current)

4 ACTUATOR
Handle
A 1 per breaker pole
B 1 per unit

Two Color Curved Visi-Rocker
C Indicate ON, vertical legend
D Indicate ON, horizontal legend
F Indicate OFF, vertical legend
G Indicate OFF, horizontal legend

Single Color Curved Rocker
J Vertical legend
K Horizontal legend

Two Color Curved Visi-Rocker Push-to-Reset
N Indicate OFF, Vertical legend
O Indicate OFF, Horizontal legend

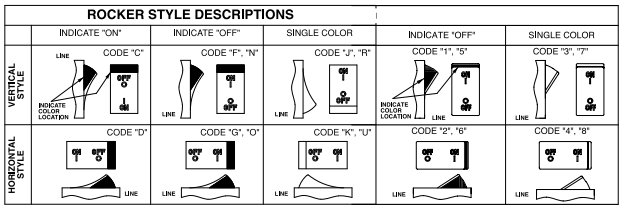
Single Color Curved Rocker Push-to-Reset
R Vertical legend
U Horizontal legend

Two Color Flat Visi-Rocker
1 Indicate OFF, vertical legend
2 Indicate OFF, horizontal legend

Single Color Flat Rocker
3 Vertical legend
4 Horizontal legend

Two Color Flat Visi-Rocker Push-to-Reset
5 Indicate OFF, vertical legend
6 Indicate OFF, horizontal legend

Single Color Flat Rocker Push-to-Reset
7 Vertical legend
8 Horizontal legend



5 FREQUENCY & DELAY
20 50 / 60Hz Instantaneous
21 50 / 60Hz Ultra Short
22 50 / 60Hz Short
24 50 / 60Hz Medium
26 50 / 60Hz Long

6 CURRENT RATING (AMPERES)

CODE	AMPERES	CODE	AMPERES	CODE	AMPERES	CODE	AMPERES
410	1.000	**445**	4.500	**610**	10.000	**618**	18.000
512	1.250	**450**	5.000	**710**	10.500	**620**	20.000
415	1.500	**455**	5.500	**611**	11.000	**622**	22.000
517	1.750	**460**	6.000	**711**	11.500	**624**	24.000
420	2.000	**465**	6.500	**612**	12.000	**625**	25.000
522	2.250	**470**	7.000	**712**	12.500	**630**	30.000
425	2.500	**475**	7.500	**613**	13.000	**635**	35.000
527	2.750	**480**	8.000	**614**	14.000	**640**	40.000
430	3.000	**485**	8.500	**615**	15.000	**650**	50.000
435	3.500	**490**	9.000	**616**	16.000		
440	4.000	**495**	9.500	**617**	17.000		

7 TERMINAL
1 Stud, 10-32 threaded

8 ACTUATOR COLOR & LEGEND

Handle Actuator Color	I-O	ON-OFF	Dual	Rocker Actuator Color Single	Visi-Rocker
White	A	B	1	Black	White
Black	C	D	2	White	N/A
Red	F	G	3	White	Red
Green	H	J	4	White	Green
Blue	K	L	5	White	Blue
Yellow	M	N	6	Black	Yellow
Gray	P	Q	7	Black	Gray
Orange	R	S	8	Black	Orange

9 MOUNTING / BARRIERS

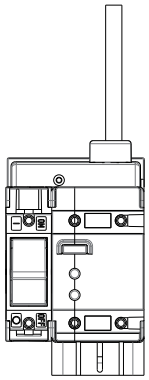
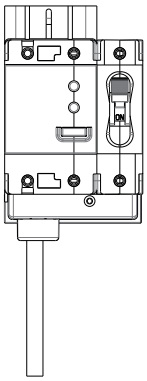
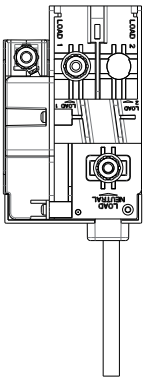
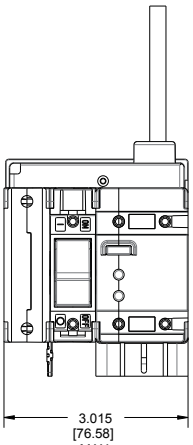
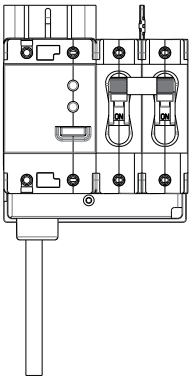
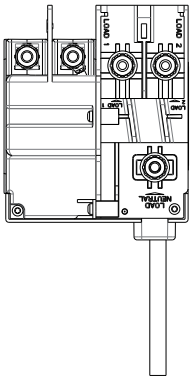
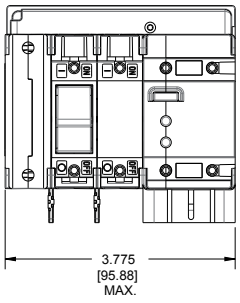
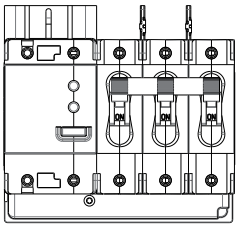
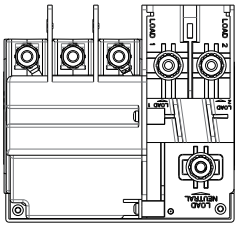
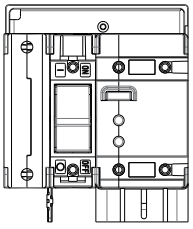
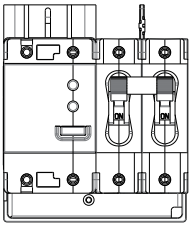
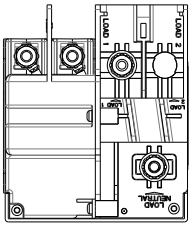
	MOUNTING STYLE	BARRIERS
	Threaded Insert, 2 per pole	
A	6-32 X 0.195 inches	yes
B	ISO M3 x 5mm	yes
	Rockerguard Bezel	
	Threaded Insert, 2 per pole	
C	6-32 X 0.195 inches	yes
D	ISO M3 x 5mm	yes
	Standard Bezel with Recessed Off-Side Flat Rocker	
	Threaded Insert, 2 per pole	
E	6-32 X 0.195 inches	yes
F	ISO M3 x 5mm	yes
	Push-to-Reset Bezel	
	Threaded Insert, 2 per pole	
G	6-32 X 0.195 inches	yes
H	ISO M3 x 5mm	yes

10 LEAKAGE CURRENT TRIP LEVEL - MAX. TRIP CURRENT
A 6 MA (CLASS A GFCI) [2]
E 30 MA (ELCI) [1,3]

11 AGENCY APPROVAL
AA without Approvals
10 UL 943 and CSA certified [2]
11 UL 1053 [1,3]
12 UL 1053 & UL 1500 [1,3]

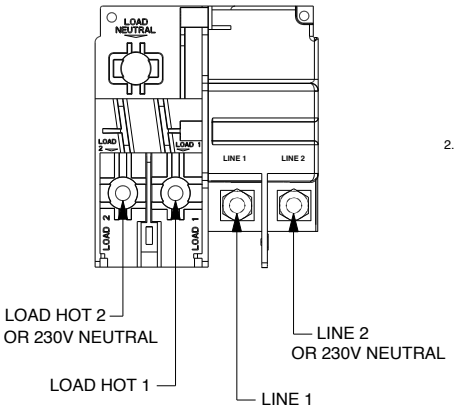
Notes:
1 This device meets the requirements of ABCY E11.
2 6mA per UL943, available with agency code 10.
3 30mA per UL1053, available with agency approval codes 11 & 12.
4 Agency approval code 10 only available with system voltages A, B, C and D.

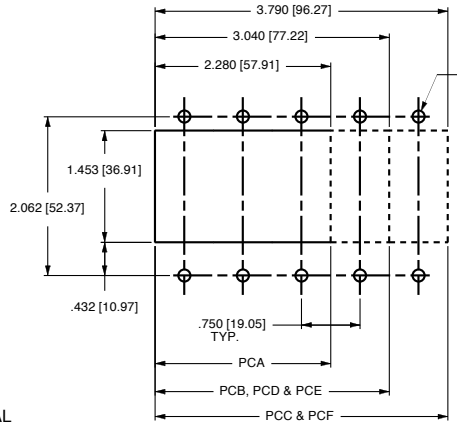
Dimensional Specifications: in. [mm]

	INDICATE OFF / SINGLE COLOR ROCKER ACTUATOR	HANDLE / INDICATE ON ROCKER ACTUATOR	TERMINAL LOCATIONS
PCA 120 VAC VERSION			
PCB 120/240 VAC VERSION			
PCC 120/240 VAC VERSION W/ NEUTRAL BREAK			
PCD 120 VAC VERSION W/NEUTRAL BREAK			

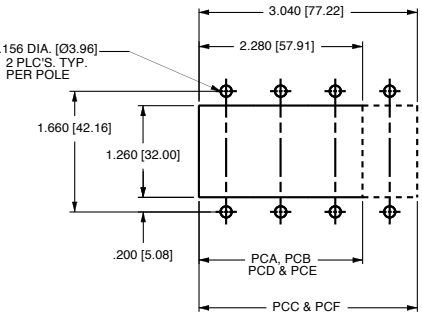
Dimensional Specifications: in. [mm]

NOTE: NEUTRAL - SUPPLIED 12" LONG MIN. (CIRCUIT CODES A,B,E & F)





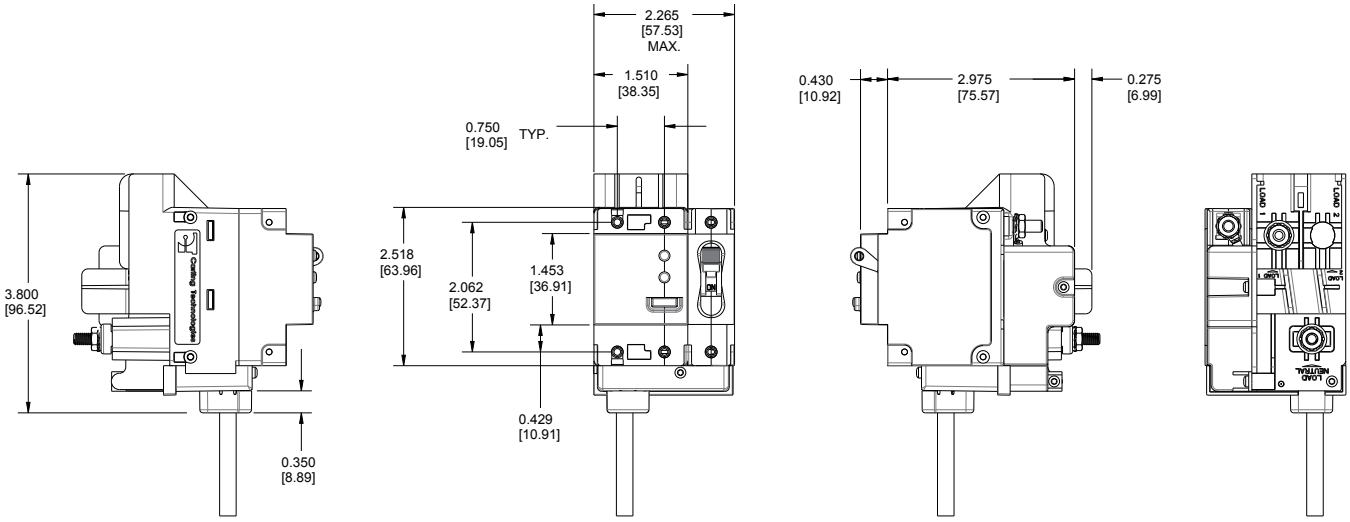
HANDLE ACTUATOR

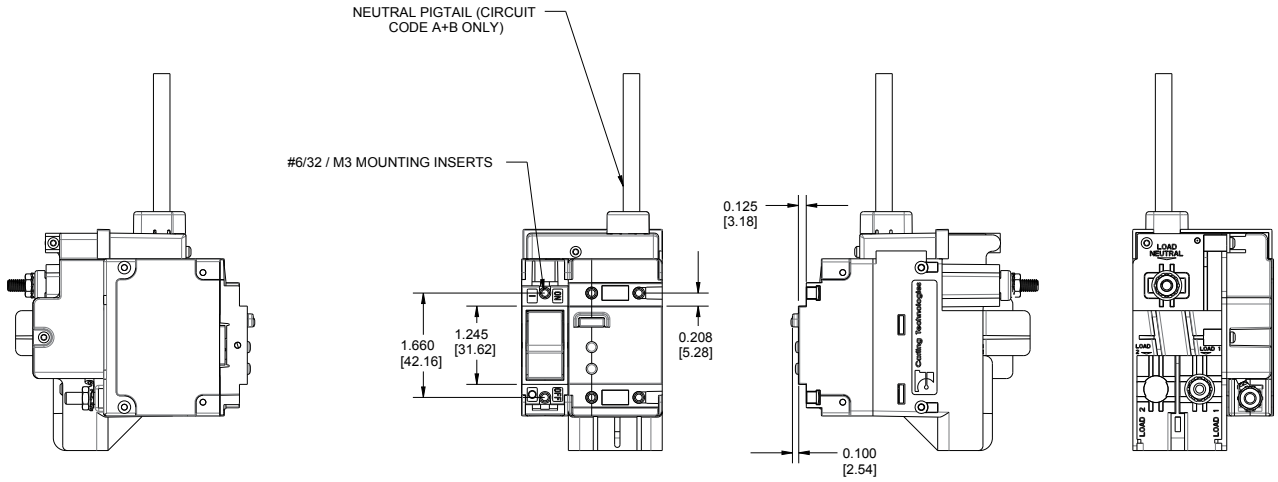


ROCKER ACTUATOR

PANEL CUTOUT DETAIL

TOLERANCES ±.005 [.12]





Notes:
For additional circuit breaker dimensions, reference the C-Series Breakers in the Carling Circuit Protection catalog

8	PC	-	1	4	1
1 Type Number	*2 Series*		*3 Actuator*	*4 Poles*	*5 Mounting*

1 TYPE NUMBER
8 Circuit Breaker Assembly

2 SERIES
PC

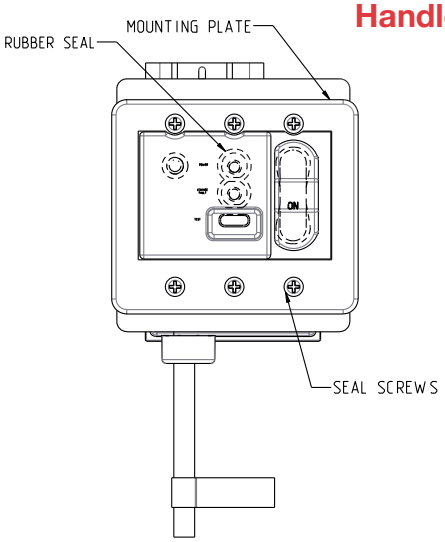
3 ACTUATOR TYPE
1 Handle, one per pole
2 Handle, one per multipole unit
A Rocker

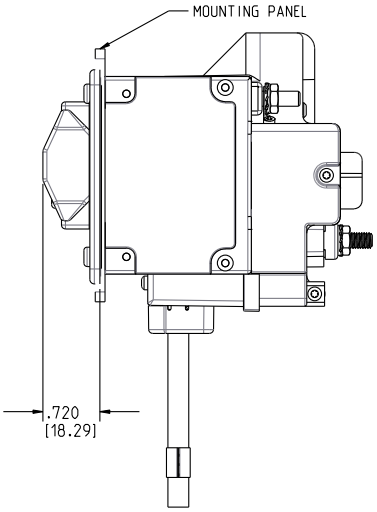
4 POLES PER UNIT - INCLUDING ELECTRONIC MODULE
3 Three
4 Four
5 Five

5 MOUNTING SCREWS / PLATE MATERIAL [1]
1 6-32 Thread Phillips Head
2 M-3 Thread Phillips Head
3 6-32 Thread Slotted Head
4 M-3 Thread Slotted Head
5 6-32 Thread Phillips Head with Stainless Steel Plate
6 M-3 Thread Phillips Head with Stainless Steel Plate
7 6-32 Thread Slotted Head with Stainless Steel Plate
8 M-3 Thread Slotted Head with Stainless Steel Plate

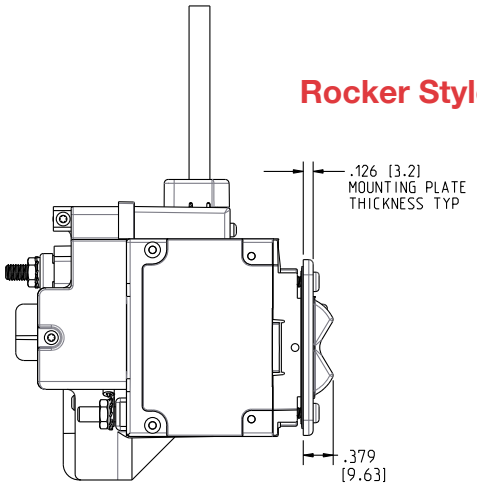
Notes:
1 Screws supplied to accommodate mounting panel thickness of 1/8" ± 1/32". Consult Factory for additional options
2 Available for Flat and Curved Rocker options - No Rockerguard Bracket

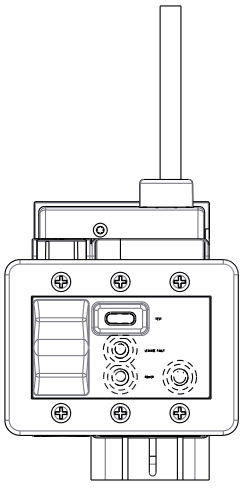
Handle Style Panel Seal





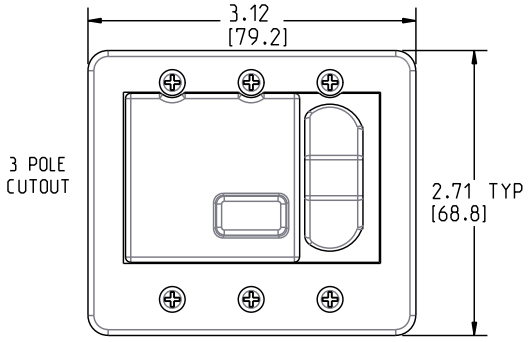
Rocker Style Panel Seal





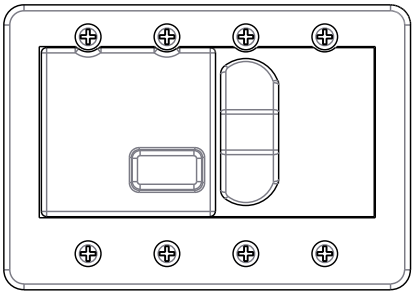
Handle Actuator

HANDLE, 1 PER POLE

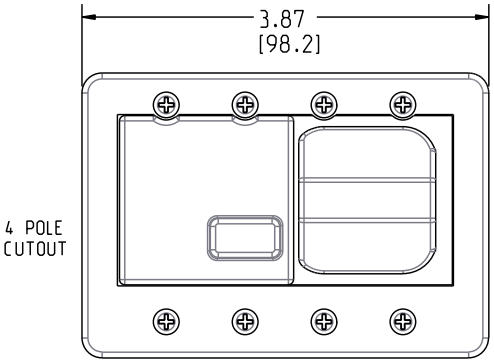


8PC-13

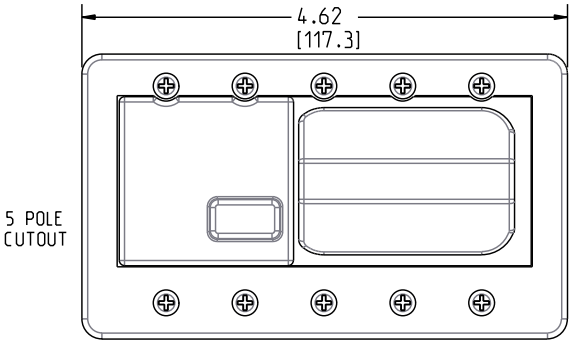
HANDLE, 1 PER MULTIPOLE UNIT



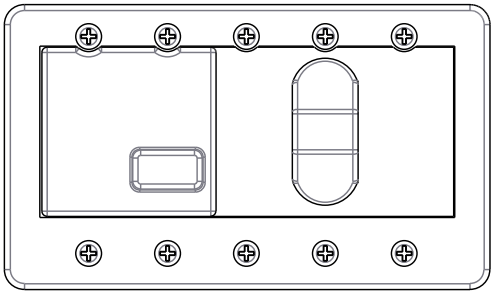
8PC-24



8PC-14

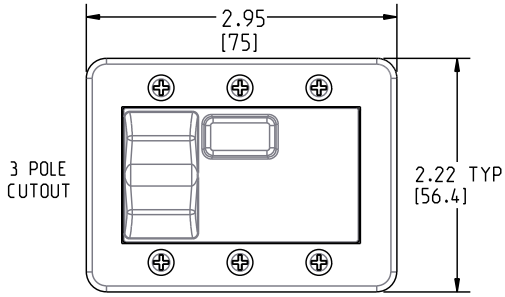


8PC-15

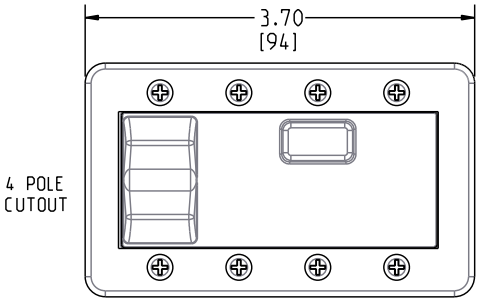


8PC-25

Rocker Actuator



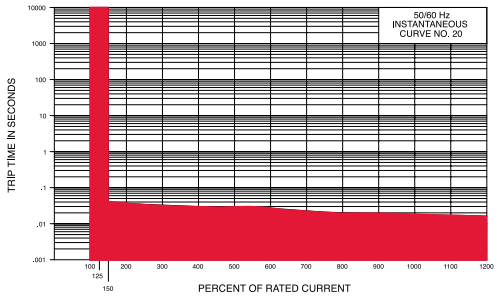
8PC-A3



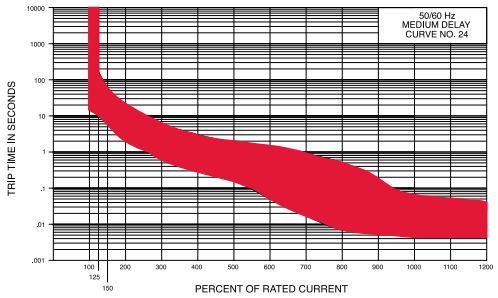
8PC-A4

Time Delay Curves

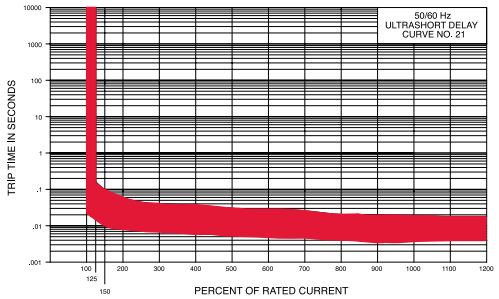
Instantaneous



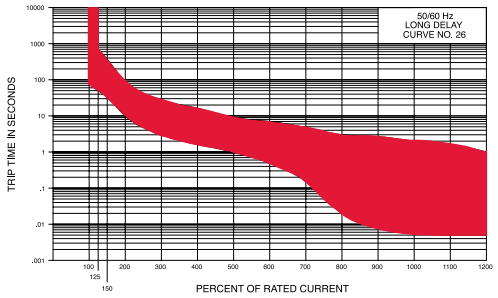
Medium



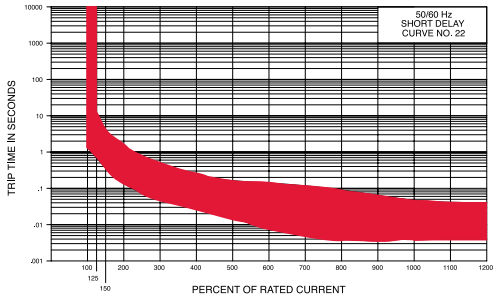
Ultra Short



Long



Short



Time Delay Values									
	Percent of Rated Current								
Delay	100%	125%	150%	200%	400%	600%	800%	1000%	1200%
20	No Trip	May Trip	.040 MAX	.035 MAX	.030 MAX	.025 MAX	.020 MAX	.017 MAX	.015 MAX
21	No Trip	.014 - .150	.011 - .095	.008 - .055	.006 - .035	.005 - .027	.005 - .021	.004 - .018	.004 - .017
22	No Trip	.700 - 12.0	.350 - 4.00	.130 - 1.30	.027 - .220	.008 - .130	.004 - .090	.004 - .045	.004 - .040
24	No Trip	10.0 - 160	6.00 - 60.0	2.20 - 20.0	.300 - 3.00	.050 - 1.30	.007 - .500	.005 - .060	.005 - .040
26	No Trip	50.0 - 700	32.0 - 350	10.0 - 90.0	1.50 - 15.0	.500 - 7.00	.020 - 3.00	.006 - 2.00	.005 - 1.00

Notes:
Other time delay values available, consult factory.
Delay Curves 21,22,24,26: Breakers to hold 100% and must trip at 125% of rated current and greater within the time limit shown in this curve.
Delay Curve 20: Breakers to hold 100% and must trip at 150% of rated current and greater within the time limit shown in this curve.
All Curves: Curve data shown represents breaker response at ambient temperature of 77°F (25°C) with no preloading. Breakers are mounted in standard wall-mount position.
The minimum inrush pulse tolerance handling capability is 12 times the rated current. These values are based on a 60 Hz 1/2 cycle, 8.33 ms pulse.