PC-Series

Ground Fault Circuit Protection

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.

The PC-series utilizes the hydraulic magnetic principle which provides precise operation and performance even when exposed to extremely hot and/or cold application environments.

Features:

- Overload, short circuit and ground fault protection in a single package
- Handle style actuators and rocker style "acuguard"
- Wiping Contacts - Mechanical linkage with two-step actuation – cleans contacts, provides high, positive contact pressure & longer contact life
- A trip-free mechanism, a safety feature, makes it impossible to manually hold the contacts closed during overload or fault conditions.
- A common trip linkage between all poles, another safety feature, ensures that an overload in one pole will trip all adjacent poles.
- Front panel mounting
- Integral push-to-test button
- Two integrated LED indicators distinguish 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.
- Optional Hot/Neutral reversal detection and protection

Benefits:

- Increases safety around boats and marinas
- Protects against electrical shock hazards in areas near water
- Protects against defects in the wires & conductors
- Reduces fire and shock hazards from defects in
- Detects low level ground faults, which do not trip ordinary circuit breakers, that can lead to fires and shock hazards for boating occupants

Carling Technologies™

Innovative Designs. Powerful Solutions.

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Email: sales@carlingtech.com • www.carlingtech.com

Electrical Tables

Table A: Lists UL Listed configurations as a Ground Fault Circuit Interruptor

PC SERIES TABLE A : LISTS UL LISTED CONFIGURATIONS AS A GROUND FAULT CIRCUIT INTERRUPTOR							
	VOLTAGE			CURRENT RATING	SHORT CIRCUIT CAPACITY	GROUND FAULT TRIP LEVEL	
CIRCUIT CONFIGURATION	MAX. RATING	FREQUENCY	PHASE	AMPS	AMPS	MILLIAMPS	NOTES
SERIES	120	50 / 60	1	1 - 50	5000	6	1 or 2 Poles. One pole of a two pole unit must be Neutral
	120/240	50 / 60	1	1 - 50	5000	6	2 or 3 Poles. One pole of a three pole unit must be Neutral

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

PC SERIES TABLE B : LISTS UL LISTED AND RECOGNIZED CONFIGURATIONS AS AN EARTH LEAKAGE CIRCUIT INTERRUPTOR - 120 and 120/240V							
	VOLTAGE			CURRENT RATING	SHORT CIRCUIT CAPACITY	GROUND FAULT TRIP LEVEL	
CIRCUIT CONFIGURATION	MAX. RATING	FREQUENCY	PHASE	AMPS	AMPS	MILLIAMPS	NOTES
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	120	50 / 60	1	1 - 50	3000	30	1 or 2 Poles. One pole of a two pole unit must be Neutral
IGNITION PROTECTED	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: Lists UL Listed and Recognized as an Earth Leakage Circuit Interruptor - 240V

PC SERIES TABLE C : LISTS UL LISTED AND RECOGNIZED CONFIGURATIONS AS AN EARTH LEAKAGE CIRCUIT INTERRUPTOR - 240V							
	VOLTAGE			CURRENT RATING	SHORT CIRCUIT CAPACITY	GROUND FAULT TRIP LEVEL	
CIRCUIT CONFIGURATION	MAX. RATING	FREQUENCY	PHASE	AMPS	AMPS	MILLIAMPS	NOTES
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 PROTECTED	240	50 / 60	1	1 - 50	3000	30	2 or 3 Poles. One pole of a three pole unit must be Neutral. Suffix 12

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

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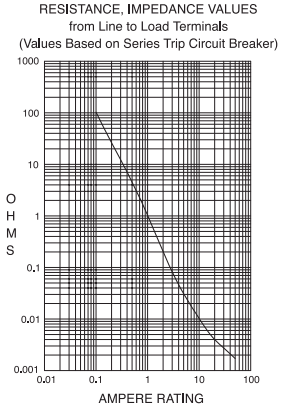
Electrical

Current Ratings	1 - 50 Amps maximum
Voltage Rating	120VAC, 120/240VAC, 240VAC
Current Trip Level	30mA & 6mA
Current Trip Time	For 30mA leakage trip: ≤ 22.2mA, shall not trip 30mA, shall trip within .10 seconds The above complies with UL-1053 & ABYC E11. For 6mA leakage trip: ≤25ms The above complies with UL-943.
Operating Frequency	50/60 Hz for 30mA leakage trip 60 Hz for 6mA leakage trip
Interrupt Capacity	5,000 Amps

Impedence



CURRENT (AMPS)	TOLERANCE (%)
0.10 - 5.0	15%
5.1 - 20.0	25%
20.1 - 50.0	35%

Innovative Features

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 cicuit 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

Mechanical

Endurance	10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.
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 (Breakers only)	1-pole (1 Circuit Breaker + 1 GFCISensor Module), 120V 2-pole (2 Circuit Breakers + 1 GFCI Sensor Module), 120/240V or 120V with Neutral Break. 240VAC two pole 3-pole 120/240V with Neutral Break (Sensor module has 2 pole width)
Termination	Circuit Breaker Line Side: #10-32, threaded stud. GFCI Sensor Module Load Side: #10-32 threaded stud. Neutral pigtail.
Mounting	Front Panel, #6-32 and M3 threaded inserts.
Actuator	Handle, Flat Rocker, Curved Rocker (with or without rocker guard), Push-to-Reset Rocker

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”.
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 and 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 H2S, 20 ppb CI2, 200±50 ppb NO2

Agency Certifications

UL Listed

UL Standard 489	Circuit Breakers, Molded Case, (Guide DIVQ, File E129899)
UL Standard 1077	Supplementary Protectors
UL Standard 943	Class A Ground Fault Circuit Interruptors
UL Standard 1053	Ground Fault Sensing and Relaying Equipment
UL Standard 1500	Ignition Protection

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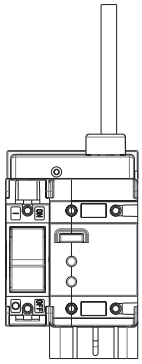
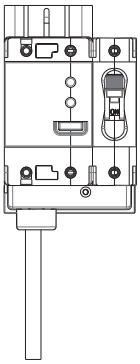
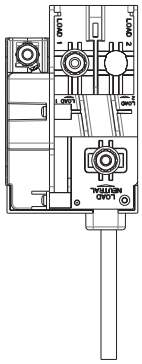
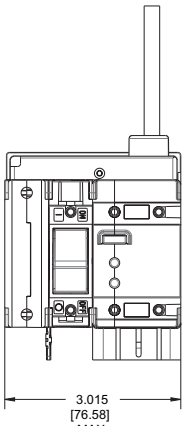
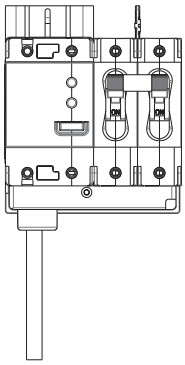
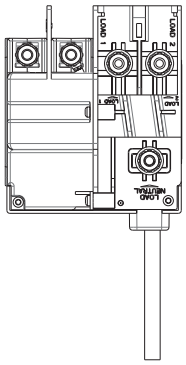
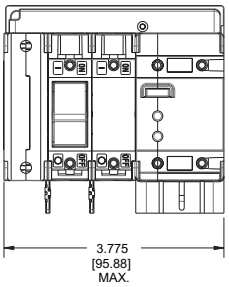
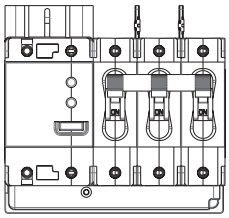
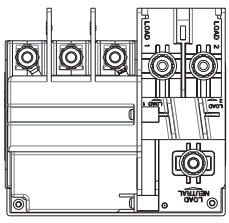
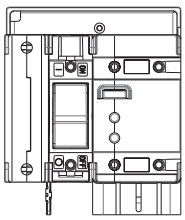
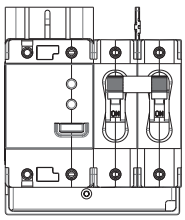
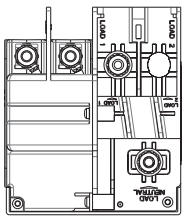
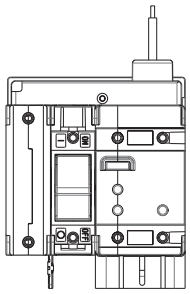
	INDICATE OFF / SINGLE COLOR ROCKER ACTUATOR	HANDLE / INDICATE ON ROCKER ACTUATOR	TERMINAL LOCATIONS
PCA 120 VAC VERSION			
PCB 120/240 VAC VERSION			
PCC 120/240 VAC VERSION W/ NEUTRAL BREAK			
PCD 120 VAC VERSION W/NEUTRAL BREAK			

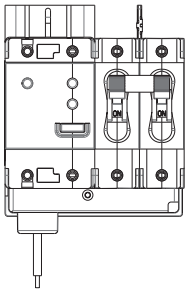
INDICATE OFF / SINGLE COLOR ROCKER ACTUATOR

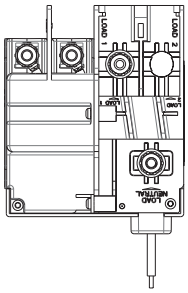
HANDLE / INDICATE ON ROCKER ACTUATOR

TERMINAL LOCATIONS

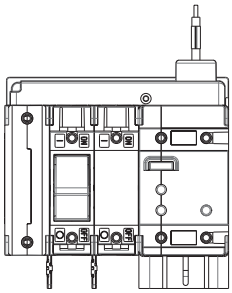
PCE
120 VAC VERSION
W/ REVERSE POLARITY
INDICATOR

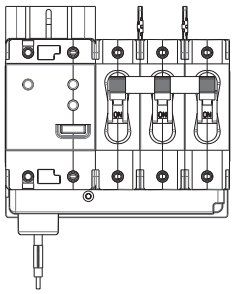


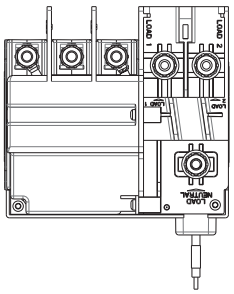




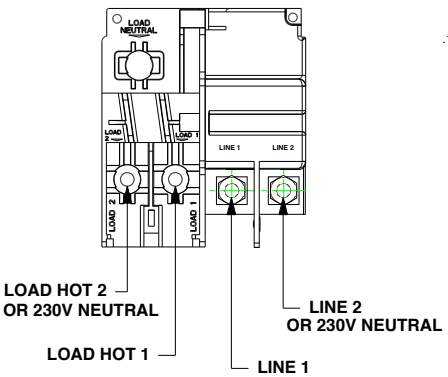
PCF
120/240 VAC VERSION
W/ REVERSE POLARITY
INDICATOR



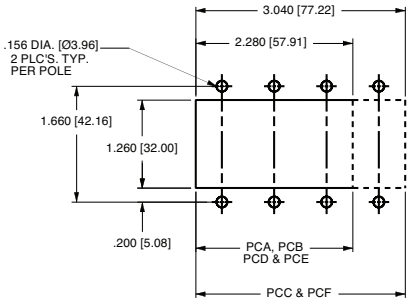




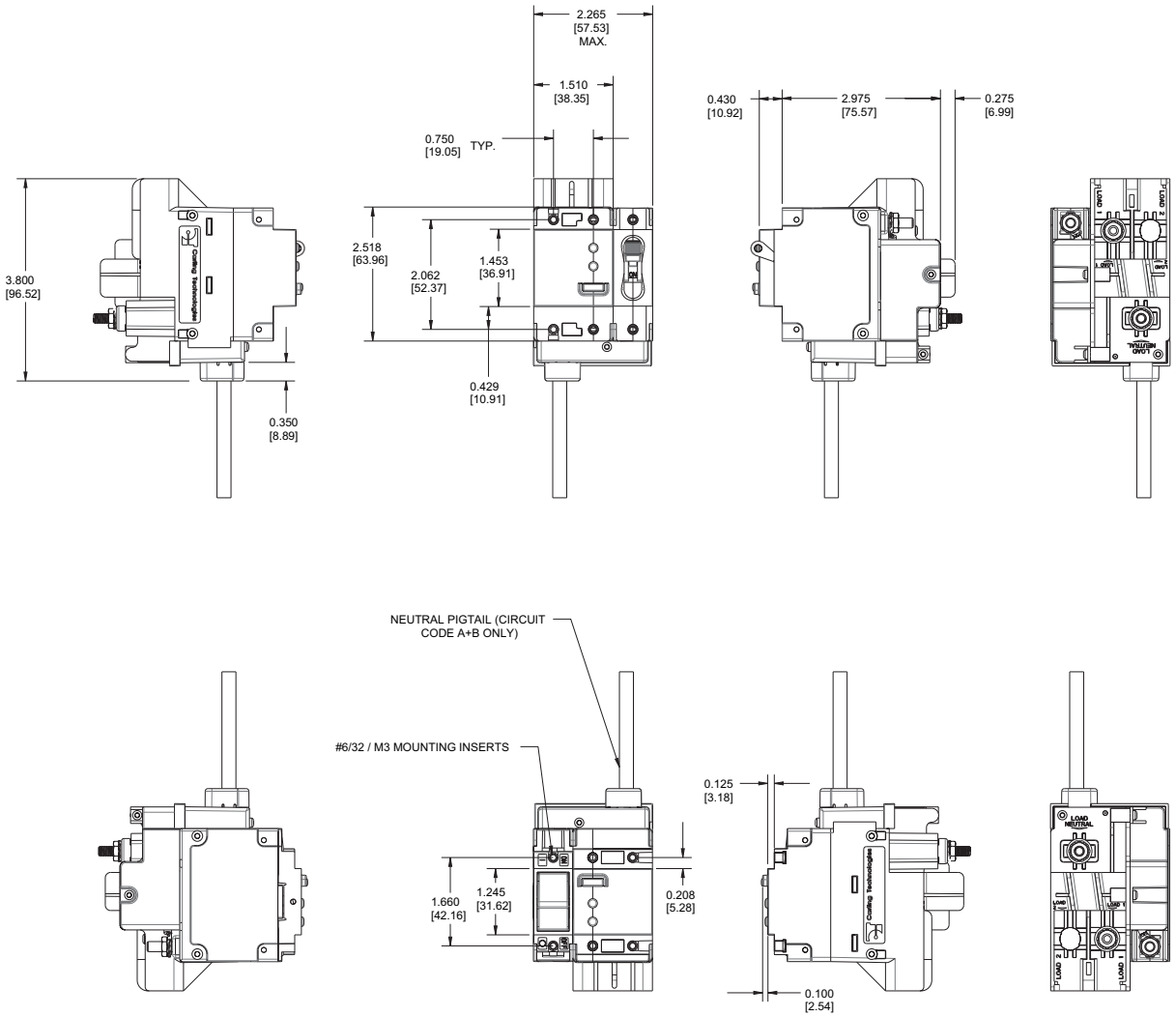
NOTE: NEUTRAL & GROUND PIGTAIL WIRES - SUPPLIED 12" LONG MIN. (CIRUCIT CODES A,B,E & F)



1-Phase 240VAC



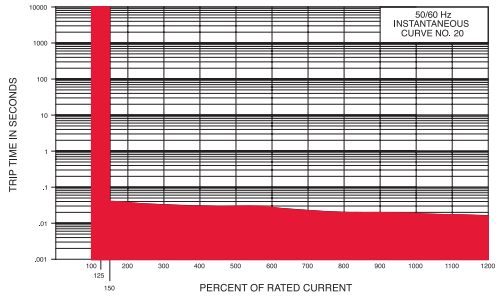
ROCKER ACTUATOR



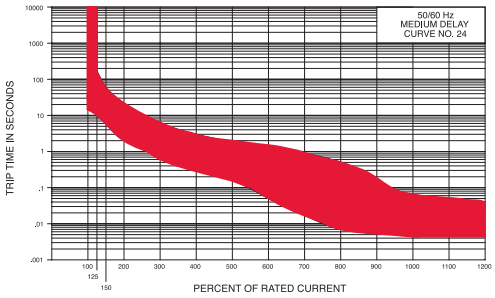
Notes:
For additional circuit breaker dimensions, reference the C-Series Breakers in the Carling Circuit Protection catalog

Time Delay Curves

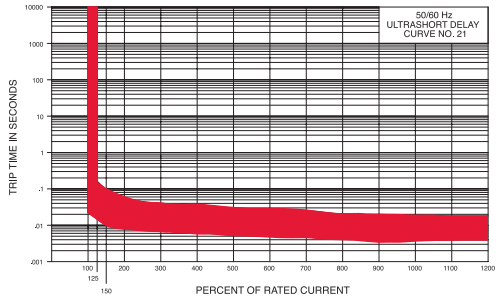
Instantaneous



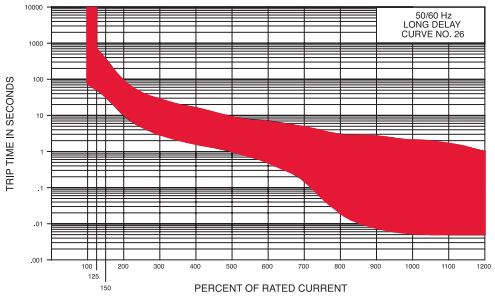
Medium



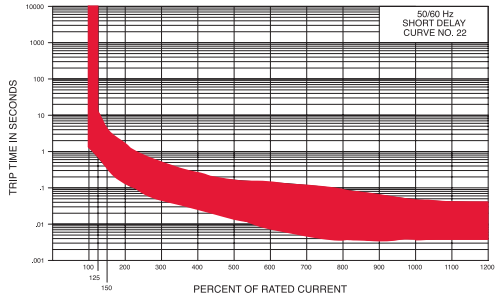
Ultra Short



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.

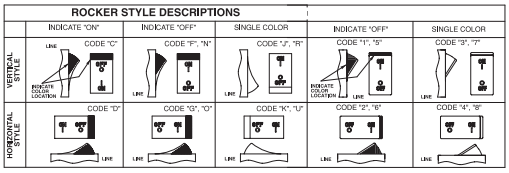
PC	B	–	B	A	–	24	–	620	–	1	B	A	–	A	10
1 Series	2 System Voltage/Poles		3 Circuit	4 Actuator		5 Frequency & Delay		6 Current Rating		7 Terminal	8 Actuator Color	9 Mounting/ Barriers		10 Trip Level	11 Agency Approval

1 SERIES
PC

2 SYSTEM VOLTAGE / POLES
A 120 VAC single phase, one pole
B 120/240 VAC single phase, two pole
C 120/240 VAC single phase with switched neutral, three pole
D 120 VAC single phase with switched neutral, two pole
E 120 VAC single phase with reversed polarity indicator, two pole
F 120/240 VAC single phase with reversed polarity indicator, three pole
G 240 VAC single phaze, two pole

3 CIRCUIT
B Series Trip (Current)

4 ACTUATOR
Handle
A one per pole
B one per multipole 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 Vertical legend
O 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 AUXILIARY/ALARM SWITCH
20 50/60Hz Instantaneous
21 50/60Hz Ultra Short
22 50/60Hz Short
24 50/60Hz Medium
26 50/60Hz Long

Notes:
1 This device meets the requirements of ABCY E11.
2 6mA per UL943, available with agency approval code 10.
3 30mA per UL1053, available with agency approval codes 11 & 12.
4 AIC Rating at 120 VAC 3kA, at 120/240 VAC 5kA

6 CURRENT RATING (AMPERES)

CODE	AMPERES	CODE	AMPERES	CODE	AMPERES	CODE	AMPERES
210	0.100	**285**	0.850	**450**	5.000	**712**	12.500
215	0.150	**290**	0.900	**455**	5.500	**613**	13.000
220	0.200	**295**	0.950	**460**	6.000	**614**	14.000
225	0.250	**410**	1.000	**465**	6.500	**615**	15.000
230	0.300	**512**	1.250	**470**	7.000	**616**	16.000
235	0.350	**415**	1.500	**475**	7.500	**617**	17.000
240	0.400	**517**	1.750	**480**	8.000	**618**	18.000
245	0.450	**420**	2.000	**485**	8.500	**620**	20.000
250	0.500	**522**	2.250	**490**	9.000	**622**	22.000
255	0.550	**425**	2.500	**495**	9.500	**624**	24.000
260	0.600	**527**	2.750	**610**	10.000	**625**	25.000
265	0.650	**430**	3.000	**710**	10.500	**630**	30.000
270	0.700	**435**	3.500	**611**	11.000	**635**	35.000
275	0.750	**440**	4.000	**711**	11.500	**640**	40.000
280	0.800	**445**	4.500	**612**	12.000	**650**	50.000

7 TERMINAL
1 Stud, 10-32 threaded

8 ACTUATOR COLOR & LEGEND

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

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 5 MA (CLASS A GFCI)[2]
E 30 MA (ELCB)[1,3]

11 AGENCY APPROVAL
AA W/O Approvals
10 UL 943[2]
11 UL 1053[1,3]
12 UL 1053 & UL 1500[1,3,4]

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