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.

**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 Interrupters
- UL Standard 1053 Ground Fault Sensing and Relaying Equipment
- UL Standard 1500 Ignition Protection (pending)

**Product Bulletin #135**

**May 2010**

**For Additional Information:**
- Phone: (860) 793-9281
- Fax: (860) 793-9231
- email: sales@carlingtech.com
- web: www.carlingtech.com
- mail: Carling Technologies Inc.
  60 Johnson Ave
  Plainville, CT 06062

**Overload, short circuit, & ground fault protection in a user friendly package!**

The PC-Series is suitable for:
- AC branch ground fault protection - a single circuit solution
- AC main ground fault protection for a boat’s entire AC electrical system
- Portable generator ground fault protection

**Key Benefits of the PC-Series:**
- 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 permanently installed appliances such as water heaters, battery chargers, lighting fixtures, etc.
- Detects low level ground faults, which do not trip ordinary circuit breakers, that can lead to fires and shock hazards for boating occupants

**Innovative Features:**
- These precision mechanisms are temperature stable and are not adversely affected by temperature changes in their operating environment. As such, derating considerations due to temperature variations are not normally required, and heat-induced nuisance tripping is avoided.
  - 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
PC-Series General Specifications

Electrical
Current Rating 1 - 50 Amps maximum
Voltage Rating 120VAC, 120/240VAC
Leakage Current Trip Level 30mA & 6mA
Leakage 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

<table>
<thead>
<tr>
<th>CURRENT (AMPS)</th>
<th>TOLERANCE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10 - 5.0</td>
<td>15%</td>
</tr>
<tr>
<td>5.1 - 20.0</td>
<td>25%</td>
</tr>
<tr>
<td>20.1 - 50.0</td>
<td>35%</td>
</tr>
</tbody>
</table>

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 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
Grounded Neutral Protection
When neutral is grounded on load side of circuit
Test Button
Located on Ground Fault Module

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 Neutral Break.
3-pole 120/240V with Neutral Break (Sensor module has 2 pole width)
Termination Circuit Breaker Line Side: #10-32, threaded stud.
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/ Humidity
93% RH at 30°C for 168 Hours.
Corrosion
UL-943-6.21, 3 weeks
Humidity: 30±2°C, 70±2% relative humidity
Mixed Flowing Gases:
100 ppb H2S
20 ppb Cl2
200±50 ppb NO2
Operating Temperature -35°C to +66°C

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.
PC-Series – Ordering Scheme

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

3 CIRCUIT

B Series Trip (Current)

4 ACTUATOR

Handle
A one per pole
B one per multiple pole 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

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)

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 2.750 510 10.000 625 25.000
265 0.650 430 3.000 515 10.500 630 30.000
270 0.700 435 3.500 511 11.000 635 35.000
275 0.750 440 4.000 511 11.500 640 40.000
280 0.800 445 4.500 512 12.000 650 50.000

7 TERMINAL

1 Stud, 10-32 threaded

8 ACTUATOR COLOR & LEGEND

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

Handle or Standard Rocker Bezel
Threaded Insert, 2 per pole
ISO M3 x 5mm yes

Threaded Insert, 2 per pole
ISO M3 x 5mm yes

Threaded Insert, 2 per pole
ISO M3 x 5mm yes

Push-to-Reset Bezel
Threaded Insert, 2 per pole
ISO M3 x 5mm yes

10 LEAKAGE CURRENT TRIP LEVEL - MAX. TRIP CURRENT

A 6 mA (Class A GFCI)
B 30 mA (ELCB)

11 AGENCY APPROVAL

AA W/O Approvals
UL 943 1,2
UL 1053 1,2
UL 1053 & UL 1500 1,2

www.carlingtech.com

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.
PC-Series Wiring Diagrams & Panel Cut Out

INDICATE OFF / SINGLE COLOR ROCKERS

PC-E
120 VAC VERSION
W/ REVERSE POLARITY PROTECTION & INDICATOR

PC-F
120/240 VAC VERSION
W/ REVERSE POLARITY PROTECTION & INDICATOR

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

HANDLE / INDICATE ON ROCKERS

TERMINAL LOCATIONS

HANDLE ACTUATOR

ROCKER ACTUATOR

PANEL CUTOUT DETAIL
TOLERANCES ±.005 [.12]
PC-Series Dimensions

NOTE:
For additional circuit breaker dimensions, reference the C-Series Breakers in the Carling Circuit Protection catalog.
**Time Delay Curves**

**Instantaneous**

![Instantaneous Time Delay Curve](image)

**Medium**

![Medium Time Delay Curve](image)

**Ultra Short**

![Ultra Short Time Delay Curve](image)

**Long**

![Long Time Delay Curve](image)

**Short**

![Short Time Delay Curve](image)

### Time Delay Values

<table>
<thead>
<tr>
<th>DELAY</th>
<th>100%</th>
<th>125%</th>
<th>150%</th>
<th>200%</th>
<th>250%</th>
<th>300%</th>
<th>400%</th>
<th>500%</th>
<th>600%</th>
<th>800%</th>
<th>1000%</th>
<th>1200%</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
</tr>
<tr>
<td>21</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
</tr>
<tr>
<td>22</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
</tr>
<tr>
<td>26</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
<td>Trip</td>
</tr>
</tbody>
</table>

**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.