PD-Series

Ground Fault Circuit Protection

SmartGuard is an equipment ground fault protection device that functions as a standard high-quality Carling hydraulic/magnetic circuit breaker, offering customized overload and short circuit protection. In addition, this breaker senses and guards against faults to ground using a state of the art integrated circuit developed by Carling. This new technology detects faults and when a fault occurs, the breaker trips and an LED illuminates. The LED gives a clear indication that the trip occurred as a result of leakage. This protection helps prevent serious equipment damage and fire.

Features:

- Overload, short circuit and ground fault protection in a single package
- Handle style actuators with optional "handleguard"
- 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 which 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 or DIN rail mounting options
- "State of the art" integrated circuit developed by Carling
- Equipment leakage sensitivity from 10 to 100 milliamps
- Integral push-to-test button and LED "tripped" indicator
- Immediate reset after fault has been cleared

Agency Certifications:

UL Standard 1077	Component Recognition Program as Equipment Leakage Circuit Interrupter and, Protectors, Supplementary (FTTJ2, File E177510).
UL Standard 943	Tested as Ground Fault Circuit Interrupters for Equipment Protection.
CSA Certified	Component Equipment Leakage Current Interrupter with Supplementary Protector, under Class C22.2,No. 144-M91, File LR47848-50
TUV Certified	IEC 947-2 and appendix B: Circuit Breakers incorporating Residual Current Protection. Complies with waveform requirements of IEC 1008-1, Type A.

Electrical Tables

Table A: Lists UL Recognized & CSA Certified configurations and performance capabilities as a Component Supplementary Protector.

PD-SERIES TABLE A: COMPONENT SUPPLEMENTARY PROTECTOR & EARTH LEAKAGE CURRENT INTERRUPTER

CIRCUIT CONFIGURATION	VOLTAGE			CURRENT RATING		INTERRUPTING CAPACITY (AMPS)	LEAKAGE CURRENT
	MAX RATING VOLTS	FREQUENCY HERTZ	PHASE	FULL LOAD AMPS	GENERAL PURPOSE AMPS	UL / CSA WITHOUT BACKUP FUSE	MUST - TRIP RATING (MILLIAMPS)
SERIES	120/208	50/60	1	1-50	---	5000	7-100
	120/208	50/60	3	1-50	---	5000	7-100
	208-240	50/60	3	1-50	---	2000	7-100
	480Y	50/60	3	1-30	30.1-50	2000	7-100

Table B: Lists TUV Certified configurations and performance capabilities as a Circuit breaker incorporating residual current protection.

PD-SERIES TABLE B: CIRCUIT BREAKER WITH RESIDUAL CURRENT PROTECTION

CIRCUIT CONFIGURATION	VOLTAGE			CURRENT RATING	LEAKAGE CURRENT	INTERRUPTING CAPACITY (AMPS)		
	MAX RATING VOLTS	FREQUENCY HERTZ	PHASE	FULL LOAD AMPS	MUST - TRIP RATING (MILLIAMPS)	ULTIMATE S/C BREAKING CAPACITY (Icu)	SERVICE S/C BREAKING CAPACITY (Ics)	RESIDUAL S/C MAKE/BREAK CURRENT (Idm)
SERIES	120-240	50/60	1	1-50	7-100mA	5000	3750	1250
	200-240	50/60	3	1-50	7-100mA	2667	2000	1000
	380-415	50/60	3 -Y	1-50	7-100mA	2000	2000	1000
	380-415	50/60	1	1-50	7-100mA	2000	2000	1000

Electrical

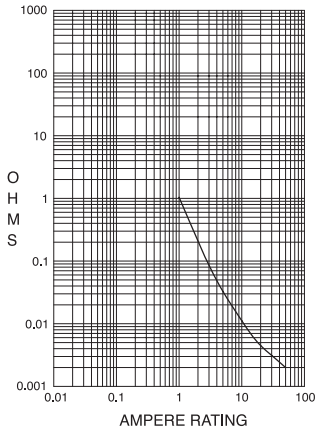
Maximum Voltage AC, 480 WYE/277 VAC, 50/60 Hz

Standard Current Ratings 1.00, 2.50, 5.00, 7.50, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0, 40.0 & 50.0 amps. For other ratings, consult factory.

Insulation Resistance Minimum of 100 Megohms @ 500 VDC.

Dielectric Strength 1960 VAC, 60 Hz for one minute between all electrically isolated terminals.

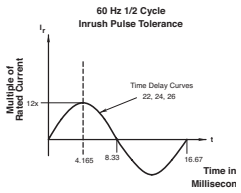
Resistance, Impedance From Line to Load Terminal (Values Based on Series Trip Circuit Breaker)



Ampere Rating

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

Pulse Tolerance Curve



Leakage To Ground

Standard Must Trip Leakage Current Ratings 7, 10, 15, 30, 50 & 100 milliamps. For other ratings, consult factory.

Trip Time 300 ms Max. @ 100%, 40ms Max. @ 500% of must trip leakage current.

Test Button On breaker face above actuator.

Leakage Trip Indicator Red LED on breaker face above actuator.

Mechanical

Endurance 10,000 ON-OFF operations @ 6 per minute; with rated current and voltage.

Trip Free All SmartGuard equipment leakage circuit breakers will trip on overload or leakage to ground, even when actuator is forcibly held in the ON position.

Trip Indication The actuator moves to the OFF position when an overload or earth leakage ground fault causes the breaker to trip. The LED is illuminated when leakage to ground causes the circuit breaker to trip.

Physical

Number of Poles 2, 3 & 4

Length (included switched or unswitched neutral) 4.2 inches (106.7 mm)

Width 2-pole: 3.0 inches (76.2 mm)
3-pole: 3.75 inches (95.3 mm)
4-pole: 4.5 inches (114.3 mm)

Depth 2.5inches (63.5mm).

Weight: 2-pole 16.0 oz. (453.6 gm)
3-pole: 21.4 oz. (606.7 gm)
4-pole: 26.9 oz. (762.6 gm)

Standard Colors Housing - gray;
Actuator - black, red, or white

Mounting Front Panel or Standard 35mm Symmetrical DIN Rail (35 x 7.5 or 35 x 15mm per DIN EN5002).

Termination Box Lug

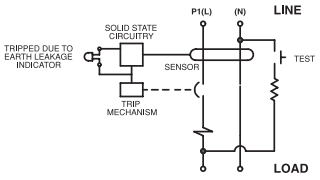
Environmental

Operating Temperature +10°C to +50°C

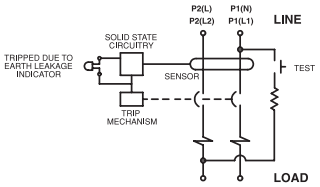
*Manufacturer reserves the right to change product specification without prior notice.

CIRCUIT SCHEMATICS

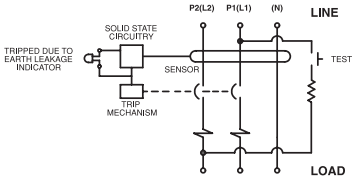
1-POLE CIRCUIT
PDA



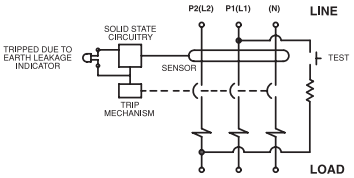
2-POLE CIRCUITS
PDB



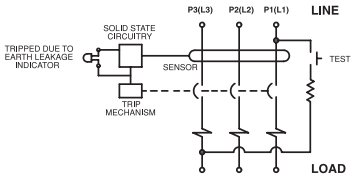
PDC (WITH UNSWITCHED NEUTRAL)



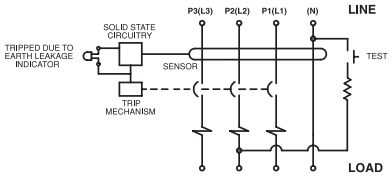
PDD (WITH SWITCHED NEUTRAL)



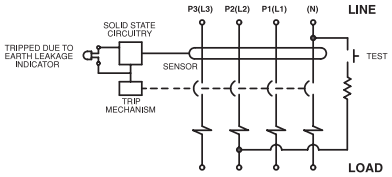
3-POLE CIRCUITS
PDE & PDP



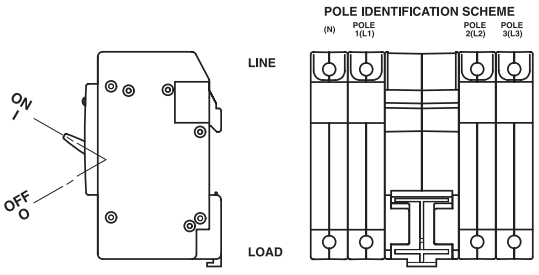
PDF & PDQ (WITH UNSWITCHED NEUTRAL)

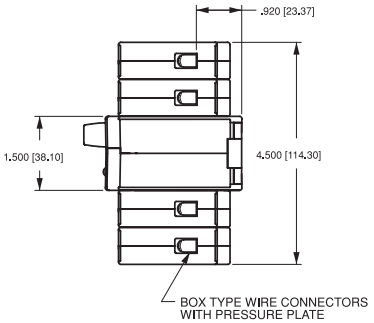


PDG & PDR (WITH SWITCHED NEUTRAL)



POLE IDENTIFICATION SCHEME



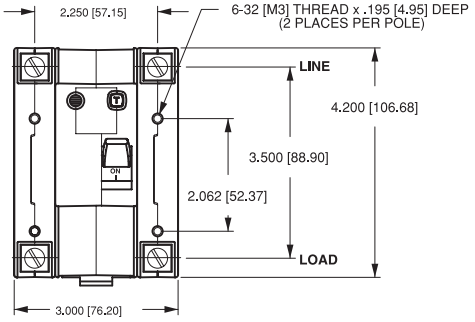


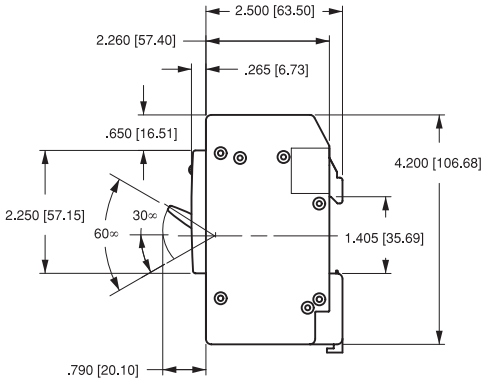
Notes:
1 All dimensions are in inches [millimeters].
2 Tolerance ±.020 [.51] unless otherwise specified.

TIME DELAY VALUES										
	PERCENT OF RATED CURRENT									
TRIP TIME (SECONDS)	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
	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

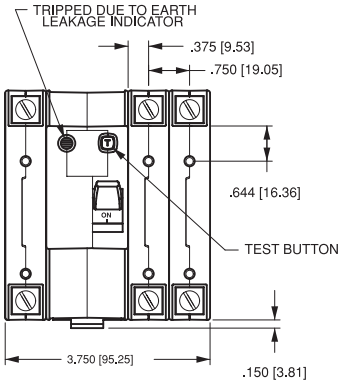
Notes:
Other time delay values available, consult factory.
Delay Curves 21,22,24,26: Breakers to hold 100% and must trip at 125% of rated current and greater within the time limit shown in this curve.
Delay Curve 20: Breakers to hold 100% and must trip at 150% of rated current and greater within the 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.

PDA & PDB

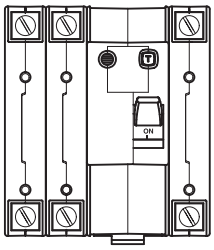




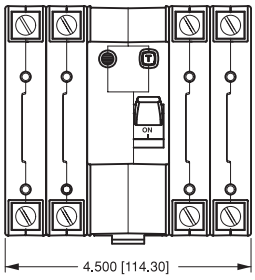
PDC & PDD

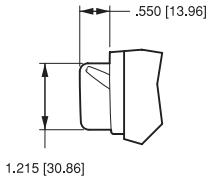


PDE &PDP

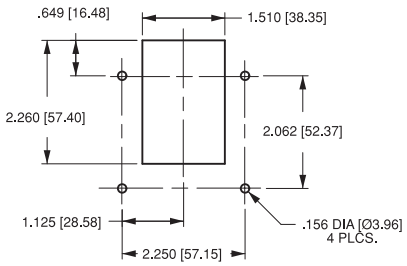


PDF, PDG PDQ & PDR

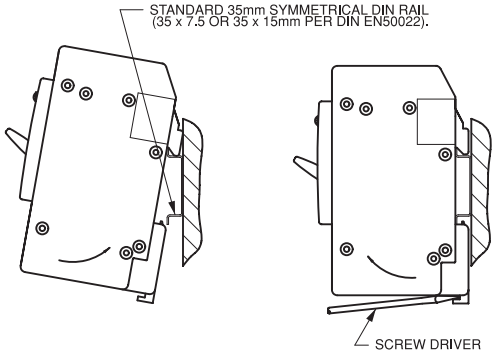




OPTIONAL HANDLE GUARD



PANEL CUT-OUT DETAIL



ASSEMBLY REMOVAL

Notes:
1 All dimensions are in inches [millimeters].
2 Tolerance ±.020 [.51] unless otherwise specified.

PD	R	–	B	–	24	–	650	–	B	–	2	A	1	–	1	–	C
1 Series	*2 System Voltage/Poles*		*3 Circuit*		*4 Frequency & Delay*		*5 Current Rating*		*6 Equipment Leakage - Trip Current*		*7 Terminal*	*8 Actuator*	*9 Actuator Color*		*10 Mounting*		*11 Agency Approval*

1 SERIES
PD

2 SYSTEM VOLTAGE / POLES[1]

	System Voltage	Poles
A	120VAC 1Ø	One plus unswitched neutral
B	120/240 VAC 1Ø	Two
C	120/208 VAC 1Ø, 120/240 VAC 1Ø	Two plus unswitched neutral
D	120/208 VAC 1Ø, 120/240 VAC 1Ø	Two plus switched neutral
E	208/240 VAC 3Ø	Three
F	208/240 VAC 3Ø	Three plus unswitched neutral
G	208/240 VAC 3Ø	Three plus switched neutral
P	480Y VAC 3Ø	Three
Q	480Y VAC 3Ø	Three plus unswitched neutral
R	480Y VAC 3Ø	Three plus switched neutral

3 CIRCUIT
B Series Trip (Current)

4 FREQUENCY & DELAY

20	50/60Hz Instantaneous	**24**	50/60Hz Medium
22	50/60Hz Short	**26**	50/60Hz Long

5 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		

6 EQUIPMENT LEAKAGE - TRIP CURRENT (MILLIAMPS)[2]

B	7	**D**	15	**F**	50
C	10	**E**	30	**G**	100

7 TERMINAL
2 Front Connected Box Lug

8 ACTUATOR
A Handle
B Handle w/ handleguard

9 ACTUATOR COLOR & LEGEND[4]

Acuator Color	I-O	ON-OFF	Dual	Legend Color
White	**A**	**B**	**1**	Black
Black	**C**	**D**	**2**	White
Red	**E**	**F**	**3**	White

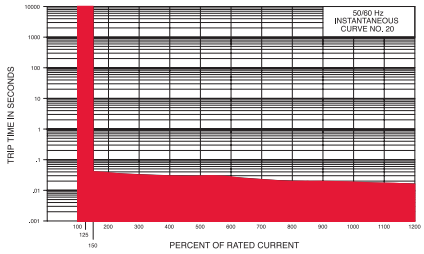
10 MOUNTING[3]
1 THREADED INSERT 6-32 X 0.195 INCHES
2 THREADED INSERT ISO M3 X 6.5 MM

11 AGENCY APPROVAL
C UL Recognized & CSA Certified
U TUV Certified

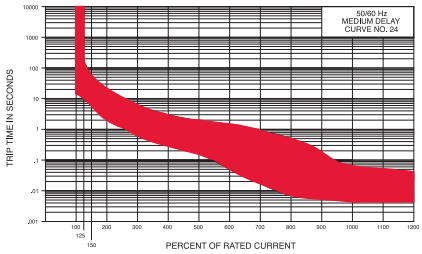
Notes:
1. Units with a switched or unswitched neutral connection are the same size as a unit with an additional breaker pole (e.g. a 2-pole unit with a switched or unswitched neutral is the same physical size as a 3-pole unit.) Switched neutral poles contain the same overcurrent protection as the other poles.
2. The leakage currents shown will cause the breaker to trip (must-trip current). The must-hold current is 67% of the must-trip current.
3. All breakers are front panel mountable using screw size shown. Breakers may also be mounted on either 35mm x 7.5mm or 35mm x 15mm symmetrical DIN rail.
4. TUV certifed units must have I-O or Dual legends

Time Delay Curves

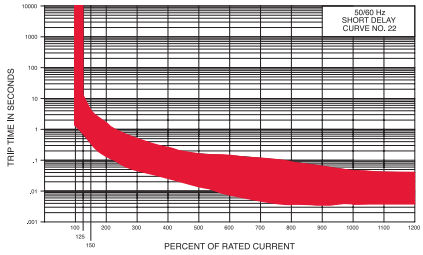
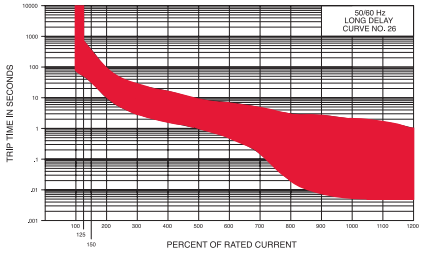
Instantaneous



Medium



Short



Long