# F-Series
## Circuit Breaker

The F-Series hydraulic/magnetic high amperage circuit breakers are designed to handle high current applications in extremely hot and/or cold locations. Due to its time-proven hydraulic/magnetic design, the F-Series load sensing mechanism is insensitive to changes in ambient or enclosure temperature, providing a consistent trip point over temperatures ranging from -40°C to +85°C. Additionally, the F-Series circuit breakers come with a choice of overload time delays, making them ideal for critical applications having inductive loads.

Further, the F-Series breakers are available up to 700A and an optional 25 millivolt metering shunt construction provides a safe method for monitoring current flowing through the breaker by simply connecting a meter with light gauge wire to the appropriate terminals located on the shunt housing at the rear of the breaker. Applications can be customized by measuring and displaying percentage of current, watts or safe/danger zones.

**Features:**

- AC ratings to UL 489
- DC voltage ratings up to 700A with metering shunt section
- Consistent trip point over temperatures ranging from -40°C to +85°C
- Optional 25 millivolt metering shunt construction

**Applications:**

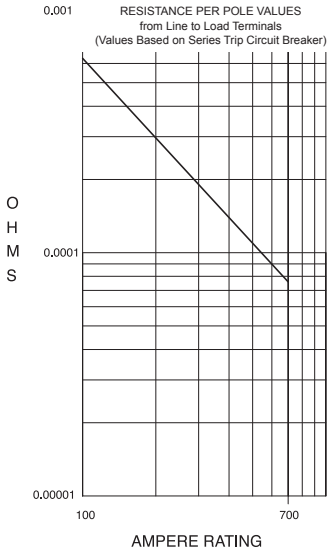
- Ideal for applications under extreme temperatures
- Higher Amperage Applications
- Battery Disconnect Systems
- Solar Power Systems
- Military

Carling Technologies®
Innovative Designs. Powerful Solutions.

**Carling Technologies, Inc.**
**60 Johnson Avenue • Plainville, CT 06062-1177**
**Phone: (860) 793-9281 • Fax: (860) 793-9231**
**Email: sales@carlingtech.com • www.carlingtech.com**

## Electrical

| | |
|---|---|
| Maximum Voltage | 125VDC, 277 VAC |
| Current Rating | Standard current coils: 100, 125, 150, 175, 225, 250 amps. 300, 350, 400, 500, 600, 700 amps available as parallel pole construction. |
| Auxiliary Switch Rating | SPDT; 10.1 Amps @ 250VAC, 1.0 Amps @ 65VDC, 0.5 Amps @ 80VDC 0.1 Amps @ 125VAC (with gold contacts). |
| Insulation Resistance | Minimum: 100 Megohms at 500 VDC |
| Dielectric Strength | 1960 VAC, 50/60 Hz for one minute between all electrically isolated terminals, except 2500 VAC for one minute between alarm/aux. switch and main terminals with contacts in open and closed position. F-Series circuit breakers comply with the 8mm spacing & 3750VAC 50/60 Hz dielectric requirements from hazardous voltage to operator accessible surfaces, between adjacent poles and from main circuits to auxilary circuits per Publications EN 60950 and VDE 0805. |
| Resistance, Impedance | Values from Line to Load Terminal - based on Series Trip Circuit Breaker. |




| CURRENT (AMPS) | TOLERANCE (%) |
|---|---|
| 100 - 700 | 50% |

## Mechanical

| | |
|---|---|
| Endurance | 4000 ON-OFF operations with rated Current & Voltage & 4000 operations with no load (8000 operations total) @ 5 per minute. Parallel Pole construction: 1000 operations with rated Current and Voltage @ 5 per minute. |
| Trip Free | All F-Series Circuit Breakers will trip on overload, even when the actuator is forcibly held in the ON position. |
| Trip Indication | The operating actuator moves positively to the OFF position when an overload causes the circuit breaker to trip. |

## Physical

| | |
|---|---|
| Number of Poles | 1 - 3 Poles Note: Ratings over 250 Amps only available with parallel pole. |
| Internal Circuit Config. | Series (with or without auxiliary switch), Switch Only (with or without auxiliary switch). |
| Available Accessories | Factory installed: DC Current Metering Shunt (25 mV @Ir) |
| Weight | Varies depending on construction. Consult factory. |
| Standard Colors | Housing - Black; Actuator- Black or White with contrasting ON-OFF legend. |

## Environmental

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

| | |
|---|---|
| Shock | Withstands 100 Gs, 6ms, sawtooth while carrying rated current per Method 213, Test Condition “I”. Instantaneous and ultra-short curves tested @ 90% of rated current. |
| Vibration | Withstands 0.060” excursion from 10-55 Hz, and 10 Gs 55-500 Hz, at rated current per Method 204C, Test Condition A. Instantaneous and ultrashort curves tested at 90% of rated current. |
| Moisture Resistance | Method 106D; ten 24-hour cycles @ + 25°C to +65°C, 80-98% RH.56 days @ +85°C, 85% RH. |
| Salt Spray | Method 101, Condition A (90-95% RH @ 5% NaCl Solution, 96 hrs). |
| Thermal Shock | Method 107D, Condition A (Five cycles @ -55°C to +25°C to +85°C to +25°C). |
| Operating Temperature | -40°C to +85°C. |

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

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## Electrical Tables

**Table A:** Lists UL Listed (489)and CSA Certified (C22.2 N0. 5.1-M) configurations and performance capabilities as a Molded Case Circuit Breaker

| F SERIES TABLE A : UL489 LISTED BRANCH CIRCUIT BREAKERS | | | | | | |
|---|---|---|---|---|---|---|
| CIRCUIT CONFIGURATION | VOLTAGE | | | CURRENT RATING | INTERRUPTING CAPACITY (AMPS) | |
| | MAX RATING | FREQUENCY | PHASE | FULL LOAD AMPS | UL / CSA 1 - 3 POLES | TUV [2] 1 or 2 POLES |
| SERIES | 125 | DC | --- | 50 - 250 | 50,000 | 25,000 |
| | 120 / 240 [1] | 50 / 60 | 1 | 100 - 250 | 10,000 | --- |
| | 277 | 50 / 60 | 1 | 100 - 250 | 10,000 | --- |
| | 208Y / 120 | 50 / 60 | 3 | 100 - 250 | 10,000 | --- |

Notes:
1 120/240V rating available in 2 or 3 poles. In a 3 pole construction the center pole is Neutral.
2 TUV constructions are not available with AC ratings.

**Table B:** Lists UL Listed configurations and performance capabilities as Circuit Breakers for use in Communications Equipment (Guide DITT, File E189195), under UL489A

| F-SERIES TABLE B : UL489 LISTED BRANCH CIRCUIT BREAKERS | | | | |
|---|---|---|---|---|
| CIRCUIT CONFIGURATION | VOLTAGE | | CURRENT RATING | INTERRUPTING CAPACITY (AMPS) |
| | MAX. RATING | FREQUENCY | FULL LOAD AMPS | WITHOUT BACKUP FUSE |
| SERIES | 125 | DC | 251 - 700 | 50,000 |

## Agency Certifications

**UL Listed**

UL 489

Circuit Breakers , Molded Case (Guide DIVQ, File E129899) Complies with the requirements of the CSA Standard for Molded Case Circuit Breakers, CANCSA- C22.2 No. 5.1 –M

UL 489A

Circuit Breakers for Use in Communications Equipment (Guide DITT, File E189195)

**TUV Certified**

IEC 60947-2
Low Voltage Switchgear and Control Gear under TUV License No. R72031058

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| F | A | 2 | — | B | 0 | — | 14 | — | 820 | — | 1 | 2 | A | — | B | G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 Series | 2 Actuator | 3 Poles | | 4 Circuit | 5 Aux/Alarm Switch | | 6 Frequency & Delay | | 7 Current Rating | | 8 Terminal | 9 Actuator Color | 10 Mounting | | 11 Max. App. Rating | 12 Agency Approval |

## 1 SERIES
**F**

## 2 ACTUATOR
| | |
|---|---|
| **A** | Handle, one per pole |
| **S** | Mid-Trip Handle, one per pole |
| **T** | Mid-Trip Handle, one per pole & Alarm Switch |

## 3 POLES
| | | | | | |
|---|---|---|---|---|---|
| **1** | One | **2** | Two | **3** | Three |

## 4 CIRCUIT
| | |
|---|---|
| **A**[1] | Switch Only (no coil) |
| **B** | Series Trip (current) |
| **C**[2] | Series Trip (voltage) |

**Parallel Pole Construction:**

| | |
|---|---|
| **M**[3,4] | Series Trip (Current) with Metering Shunt |
| **N**[3,4] | Switch Only with Metering Shunt |
| **P**[3] | Series Trip (Current) |
| **Q**[3] | Switch Only |

## 5 AUXILIARY/ALARM SWITCH[5]
| | |
|---|---|
| **0** | w/o Aux Switch |
| **2** | S.P.D.T., 0.110 Q.C. Term. |
| **3** | S.P.D.T., 0.139 Solder Lug |
| **4** | S.P.D.T., 0.110 Q.C. Term. (Gold Contacts) |
| **5** | S.P.S.T., 0.093 Q.C. Term. (Gold Contacts) |
| **6** | S.P.S.T., 0.139 Solder Lug |
| **7** | S.P.S.T., 0.110 Q.C. Term. (Gold Contacts) |
| **8** | S.P.S.T., 0.187 Q.C. Terminals |
| **9** | S.P.D.T., 0.187 Q.C. Terminals. |
| **A**[6] | S.P.S.T., 0.093 Round QC Terminals. |
| **B**[6] | S.P.D.T., 0.093 Round Q.C. Terminals. |

## 6 FREQUENCY & DELAY
| | | | |
|---|---|---|---|
| **03** | DC 50/60Hz, Switch Only | **14** | DC Medium |
| **10**[7] | DC Instantaneous | **16** | DC Long |
| **11** | DC Ultra Short | **22** | AC Short |
| **12** | DC Short | **24** | AC Medium |
| | | **26** | AC Long |

## 7 CURRENT RATING (AMPERES)
| CODE | AMPERES | CODE | AMPERES | CODE | AMPERES | CODE | AMPERES |
|---|---|---|---|---|---|---|---|
| **810** | 100.00 | **820** | 200.00 | **835**[8] | 350.00 | **860**[8] | 600.00 |
| **912** | 125.00 | **922** | 225.00 | **840**[8] | 400.00 | **870**[8] | 700.00 |
| **815** | 150.00 | **825** | 250.00 | **845**[8] | 450.00 | | |
| **917** | 175.00 | **830**[8] | 300.00 | **850**[8] | 500.00 | | |

### OR VOLTAGE COIL (VOLTS, MIN. TRIP RATING)[7]
| CODE | AMPERES | CODE | AMPERES | CODE | AMPERES |
|---|---|---|---|---|---|
| **A06** | 6 DC, 5 DC | **A24** | 24 DC, 20 DC | **A65** | 65 DC, 55 DC |
| **A12** | 12 DC, 10 DC | **A32** | 32 DC, 25 DC | **B25** | 125 DC, 100 DC |
| **A18** | 18 DC, 15 DC | **A48** | 48 DC, 40 DC | **J06** | 6 AC, 5 AC |

## 8 TERMINAL
| Back Connected (Front Mounted Only) | | Max Rating |
|---|---|---|
| **1**[9] | 3/8-16 Stud | 250A |
| **2**[14] | 3/8-16 Screw, Line & Load | 700A |
| **5**[14] | 3/8-16 Short Stud | 250A |
| **Front Connected (Back Mounted Only)**[11] | | **Max Rating** |
| **3** | Box Wire Connector, Line & Load | 700A |
| **4**[14] | 3/8-16 Screw, Line & Load | 700A |

## 9 ACTUATOR COLOR & LEGEND[12,13]
| Acuator Color | I-O | ON-OFF | Dual | Marking Color |
|---|---|---|---|---|
| White | **A** | **B** | **1** | Black |
| Black | **C** | **D** | **2** | White |

## 10 MOUNTING
| Front Mounting Inserts | | Back Mounting Inserts |
|---|---|---|
| **A** | 10-32 | 10-32 screw clearance holes |
| **B** | ISO M5 | 10-32 screw clearance holes |

## 11 MAXIMUM APPLICATION RATING
| | VOLTAGE | CURRENT |
|---|---|---|
| **B** | 125 VDC | 700A |
| **C**[15] | 120/240 | 250A |
| **F** | 277 VAC | 250A |
| **7**[16] | 120/208 VAC | 250A |

## 12 AGENCY APPROVAL
| | |
|---|---|
| **A** | No approvals |
| **G** | UL 489 Listed & CUL Certified |
| **J** | UL 489 Listed, CUL Certified & TUV Certified |
| **T** | UL489A (Telecom) Listed |

Notes:
1. For 100 to 250 amps, select Current Code 825. For 300-400 amps, select Current Code 840. For 450-700 amps, select Current Code 870.
2. Available with Frequency and Delay code 10 or 20 only, and are not rated for continuous duty. Delay 10 and 20 are only available with voltage coils.
3. 3 Codes M, N, P & Q (Parallel Poles) are supplied with factory installed Bus Bar on Line and Load.
4. 4 Metering terminals are female pin type, ref. Molex part number 02-09-1101, model 1189-T.
5. Auxiliary Switch breakers are only available with Series Trip and Switch Only circuits. On multi-pole breakers, one Auxiliary Switch is supplied, mounted in the extreme right pole per figure A. Back-Mounted breakers require special mounting provisions when an Auxiliary Switch is specified.
6. Available with parallel pole construction (circuit codes P and Q, and breakers with circuit codes M and N).
7. Frequency and delay code 10 is only available with Voltage Coils. Voltage Coils are not rated for continuous duty.
8. Ratings over 250 amps are only available with Agency Approval code T (UL489A) and are Parallel Pole configuration (circuit codes M, N, P and Q.) 300-450 amp ratings are available on two pole breakers. 500-700 amp ratings are available on three pole breakers.
9. Per UL requirement, an “Anti-Flash Over Barrier” is supplied between poles on multipole breakers with 3/8 - 16 stud terminals (Terminal Code 1)
10. Front connected breakers can also be front mounted by utilizing the supplied front panel mounting inserts.Terminal connections must be made before mounting.
11. Box Wire connector will accept #6 through 250 MCM copper wire.
12. Agency codes G & T must have ON-OFF or dual legends. Agency code J must have dual legend.
13. Other colors available. Consult factory.
14. Terminals 2,4 & 5 are shipped without terminal hardware.
15. 2 or 3 Pole Circuit Breaker Required for 120/240 VAC Rating.
16. 3 Pole Circuit Breaker Required for 120/208 VAC Rating.

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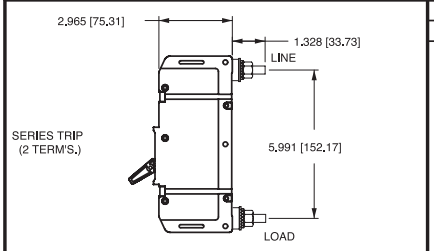
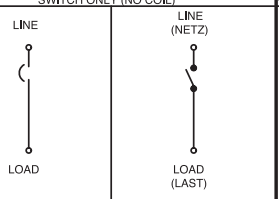
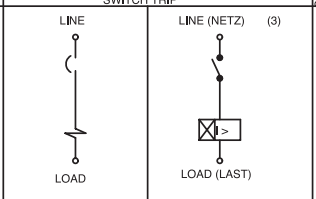
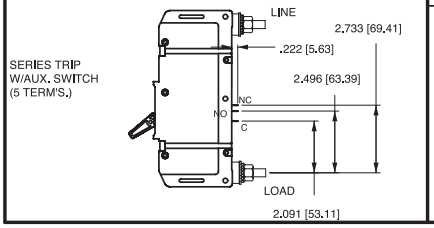
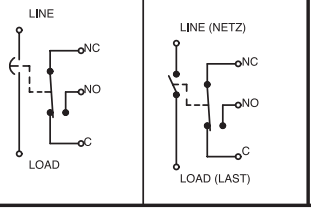
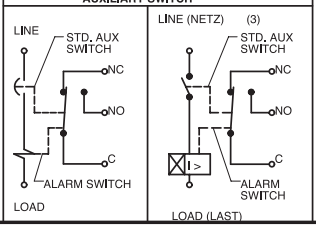
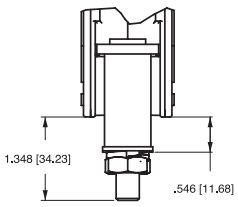
## F SERIES NON-PARALLEL POLE CONSTRUCTION:

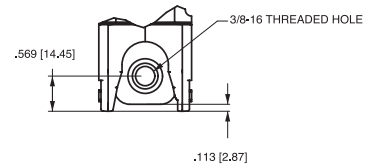
| CIRCUIT BREAKER PROFILE | CIRCUIT SCHEMATIC | CIRCUIT CODE | AUX SWITCH CODE | CIRCUIT SCHEMATIC | CIRCUIT CODE | AUX SWITCH CODE |
|---|---|---|---|---|---|---|
|  | ANSI / IEC<br>SWITCH ONLY (NO COIL)<br>  | A | 0 | ANSI / IEC<br>SWITCH TRIP<br>  | BC | 0 |
|  | SWITCH ONLY (NO COIL)<br>WITH AUXILIARY SWITCH<br>  | A | 2<br>3<br>4<br>5<br>9 | SERIES TRIP WITH<br>AUXILIARY SWITCH<br>  | BC | 2<br>3<br>4<br>5<br>9 |

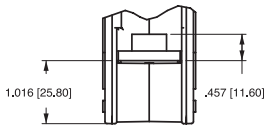
## TERMINAL DETAILS

### BACK CONNECT

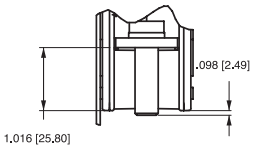



3/8-16 THREADED STUD
CODE 1



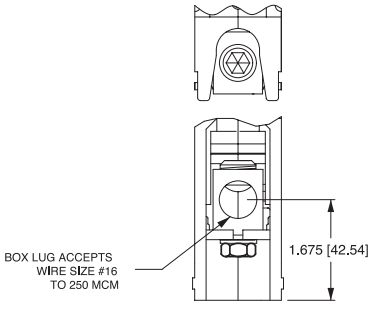




3/8-16 THREADED HOLE
CODE 2

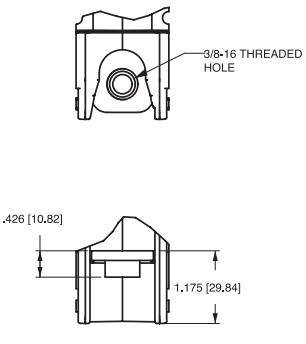



SHORT STUD
CODE 5

### FRONT CONNECT



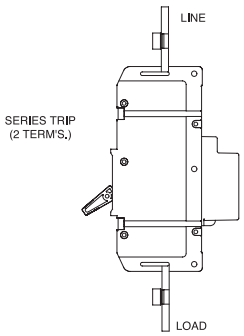
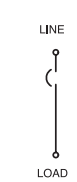
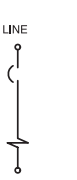
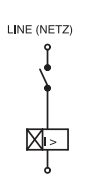
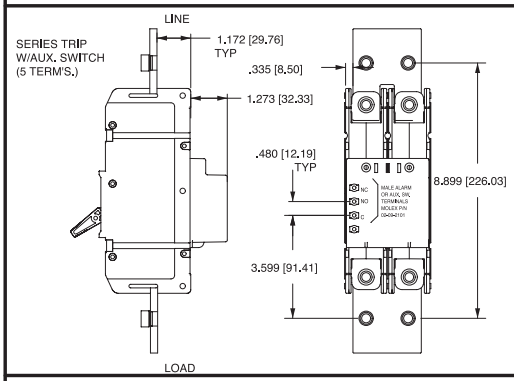
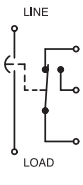
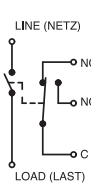
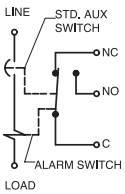
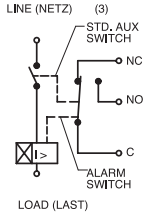
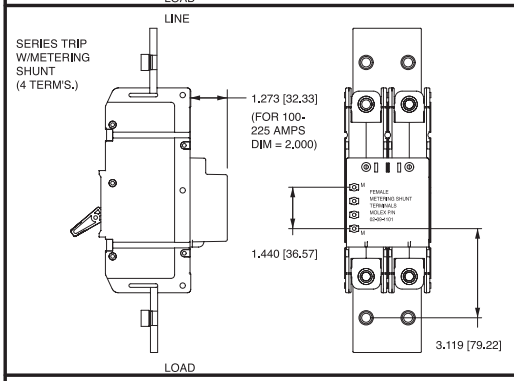
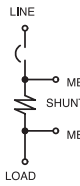
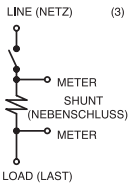
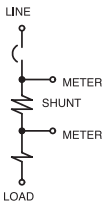
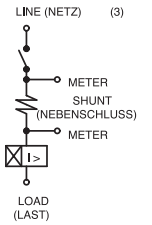
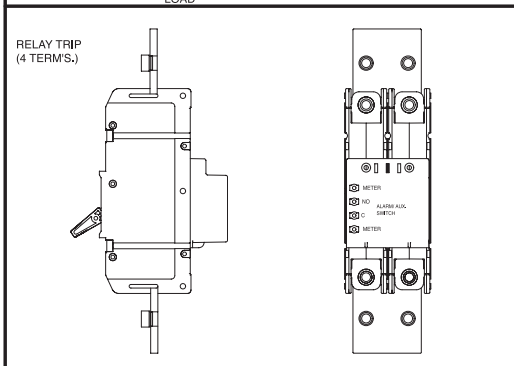
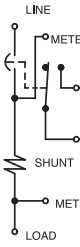
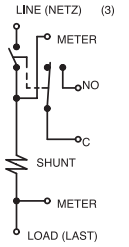
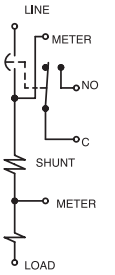
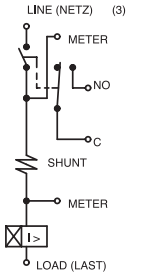

BOX WIRE
CONNECTOR




3/8-16 THREADED HOLE
CODE 4

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

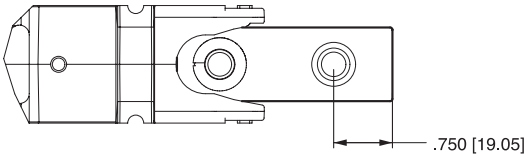
## F-SERIES PARALLEL POLE CONSTRUCTION:

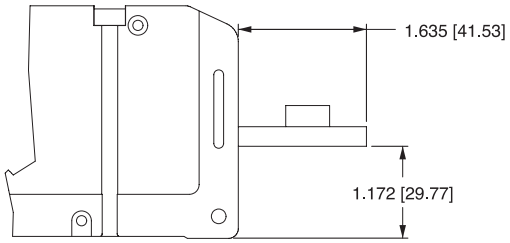
| CIRCUIT BREAKER PROFILE | CIRCUIT SCHEMATIC ANSI | CIRCUIT SCHEMATIC IEC | CIRCUIT CODE | AUX SWITCH CODE | CIRCUIT SCHEMATIC ANSI | CIRCUIT SCHEMATIC IEC | CIRCUIT CODE | AUX SWITCH CODE |
|---|---|---|---|---|---|---|---|---|
| | SWITCH ONLY (NO COIL) | | | | SERIES TRIP | | | |
|  |  | | A | 0 |  |  | BC | 0 |
|  | SWITCH ONLY (NO COIL) WITH ALARM OR AUX. SWITCH | | | | SERIES TRIP WITH ALARM OR AUX. SWITCH | | | |
| |  |  | A | B |  |  | BC | B |
|  | SWITCH ONLY (NO COIL) WITH METERING SHUNT | | | | SERIES TRIP CURRENT COIL, WITH METERING SHUNT | | | |
| |  |  | N | 0 |  |  | M | 0 |
|  | SWITCH ONLY WITH ALARM OR AUX. SWITCH AND METERING SHUNT | | | | SERIES TRIP WITH ALARM OR AUX. SWITCH AND METERING SHUNT | | | |
| |  |  | N | A |  |  | M | A |

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

# TERMINAL DETAILS

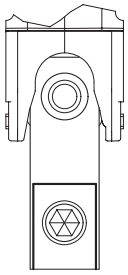
## BACK CONNECT

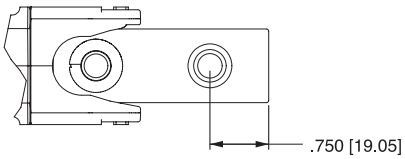


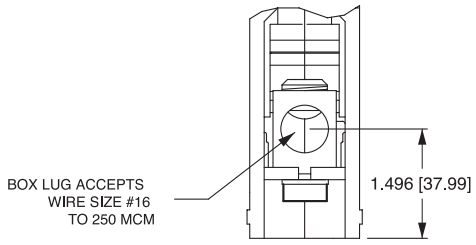




3/8-16 THREADED HOLE
CODE 2

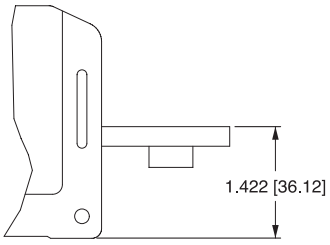
## FRONT CONNECT





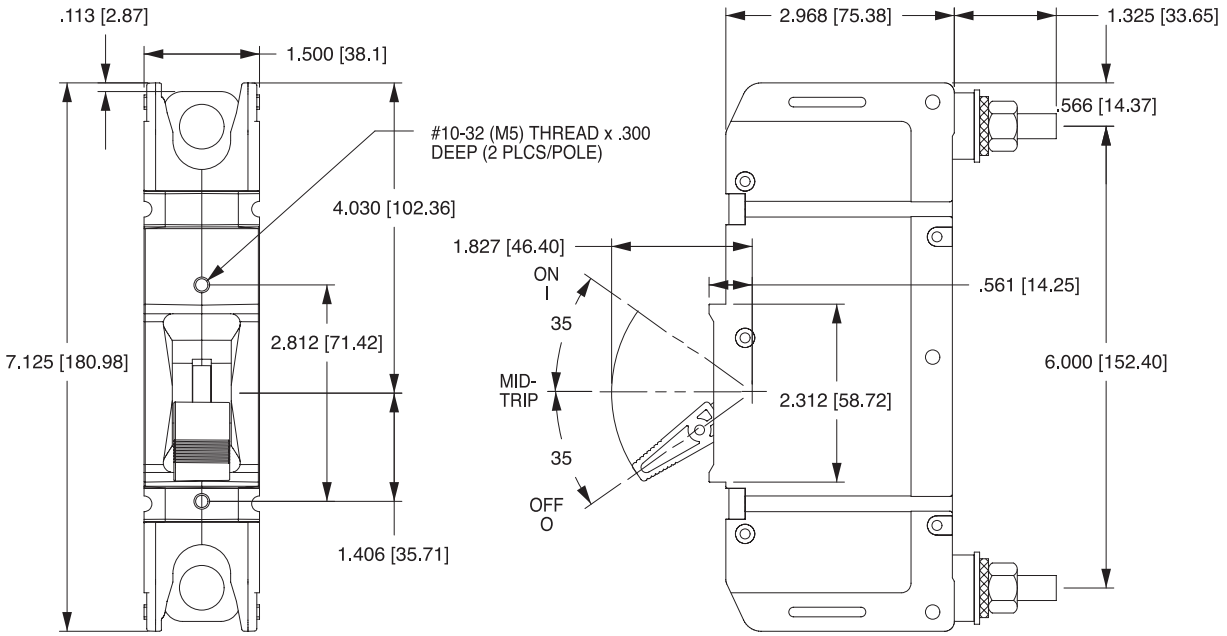

BOX WIRE
CONNECTOR

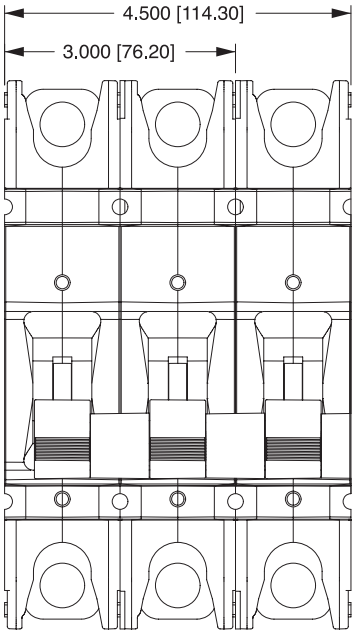



3/8-16 THREADED HOLE
CODE 4

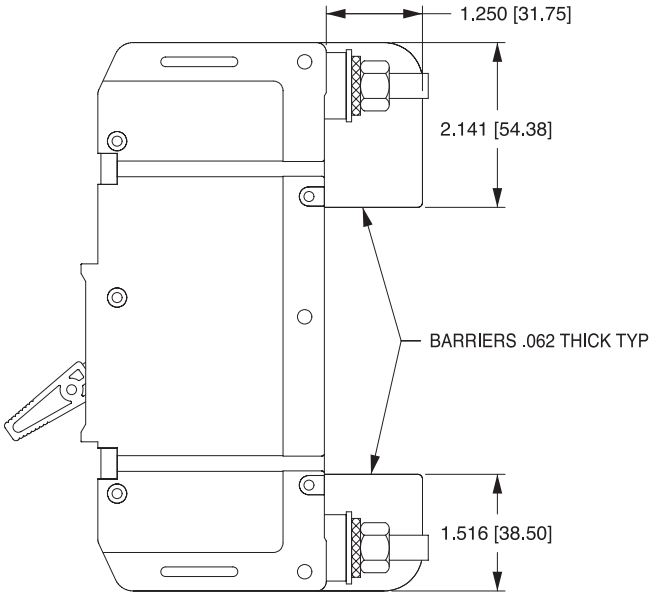
Notes:
1 All dimensions are in inches [millimeters].
2 Tolerance ±.020 [.51] unless otherwise specified.

**SERIES TRIP BACK CONNECT (STUD TERMINALS SHOWN)**



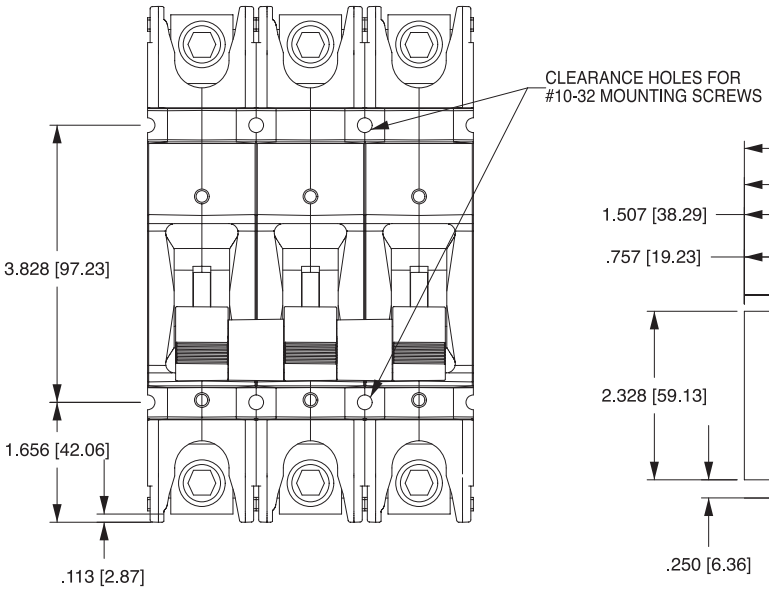



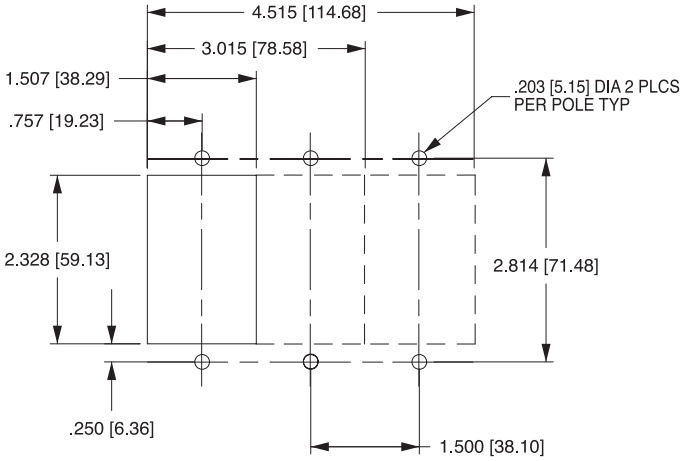

**MULTIPOLE SERIES TRIP, SHOWING TERMINAL BARRIER**



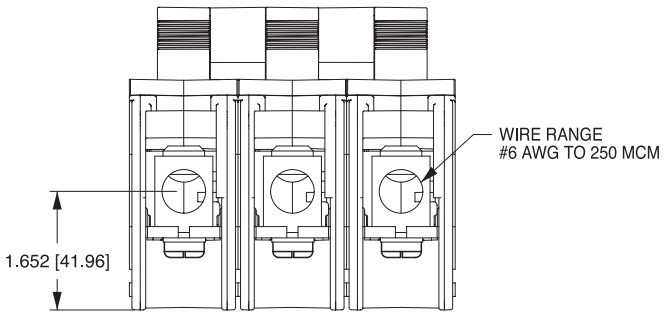

Notes:
1 All dimensions are in inches [millimeters].
2 Tolerance ±.020 [.51] unless otherwise specified.

**SERIES TRIP FRONT CONNECT**
**(BOX LUG TERMINALS SHOWN)**

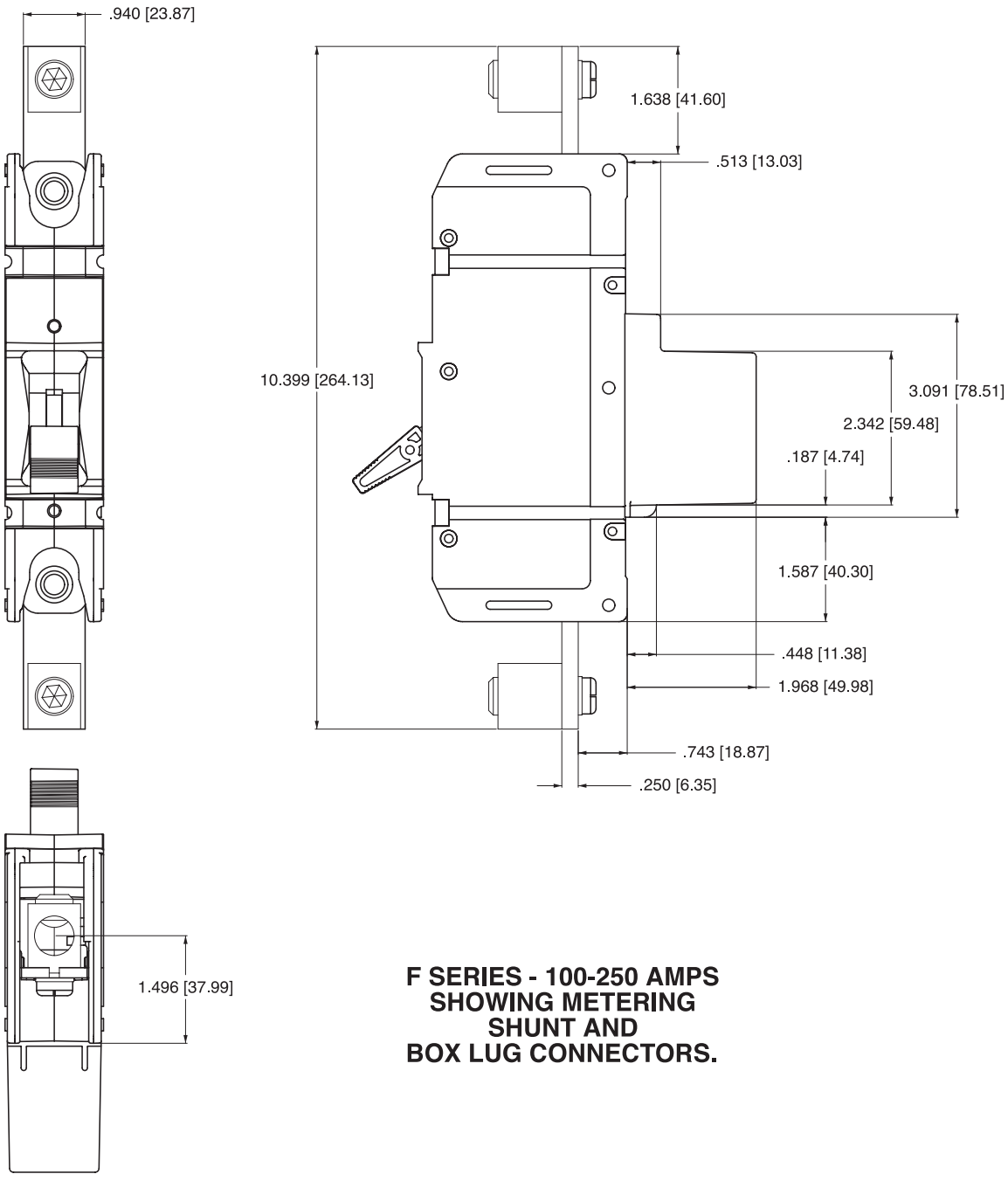



**PANEL CUTOUT DETAIL**



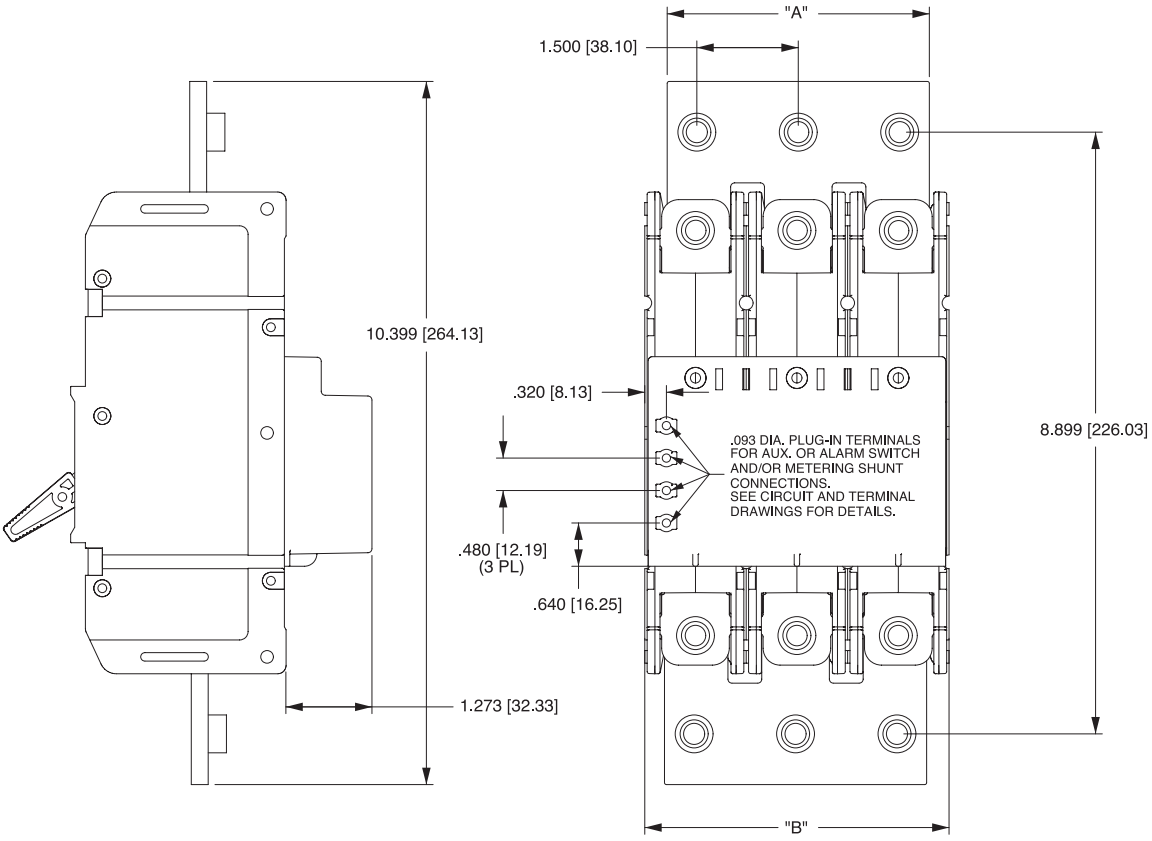

Notes:
1 All dimensions are in inches [millimeters].
2 Tolerance ±.020 [.51] unless otherwise specified.




**F SERIES - 100-250 AMPS SHOWING METERING SHUNT AND BOX LUG CONNECTORS.**

F-Series breakers are available up to 700A, and are also available with a 25 millivolt metering shunt construction. This optional construction provides a safe method for monitoring current flowing through the breaker by simply connecting a meter with light gauge wire to the appropriate terminals located on the shunt housing at the rear of the breaker. You can customize the application by measuring and displaying percentage of current, watts or safe/danger zones.

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




**F-SERIES PARALLEL POLE 250-700 AMPS**
**SHOWING FRONT CONNECT SCREW TERMINALS**

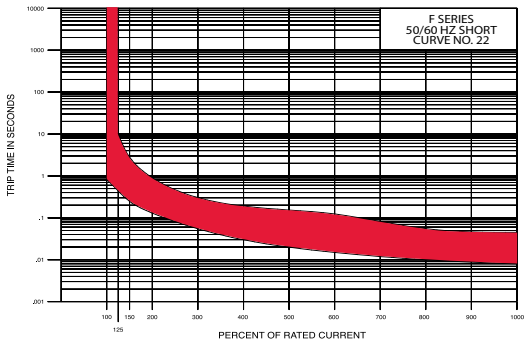
Notes:
1 All dimensions are in inches [millimeters].
2 Tolerance ±.020 [.51] unless otherwise specified.

## F-SERIES TIME DELAY VALUES

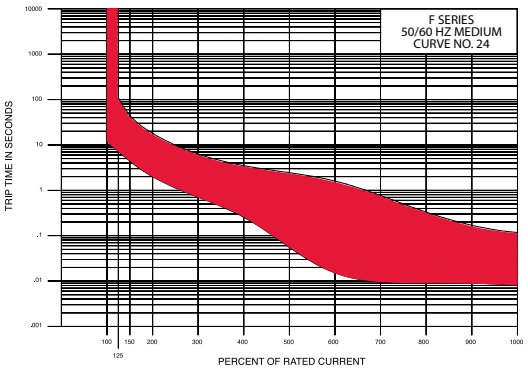
| TRIP TIME SECONDS | PERCENT OF RATED CURRENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Delay | 100% | 125% | 150% | 200% | 400% | 600% | 800% | 1000% |
| | 11 | No Trip | .013 - .125 | .010 - .070 | .008 - .032 | .006 - .020 | .005 - .020 | .004 - .020 | .004 - .020 |
| | 12 | No Trip | .475 - 10.0 | .275 - 2.80 | .140 - .850 | .030 - .190 | .015 - .125 | .010 - .050 | .008 - .038 |
| | 14 | No Trip | 10.0 - 110 | 6.00 - 40.0 | 2.50 - 15.0 | .500 - 3.00 | .180 - 1.00 | .010 - .280 | .008 - .080 |
| | 16 | No Trip | 110 - 1000 | 60.0 - 400 | 22.0 - 150 | 4.00 - 25.0 | 1.00 - 5.50 | .010 - 1.80 | .008 - .390 |
| | 22 | No Trip | .700 - 12.0 | .350 - 4.00 | .130 - 1.30 | .027 - .220 | .008 - .130 | .004 - .090 | .004 - .045 |
| | 24 | No Trip | 10.0 - 160 | 6.00 - 60.0 | .220 - 20.0 | .300 - 3.00 | .050 - 1.30 | .007 - .500 | .005 - .060 |
| | 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 |

## AC

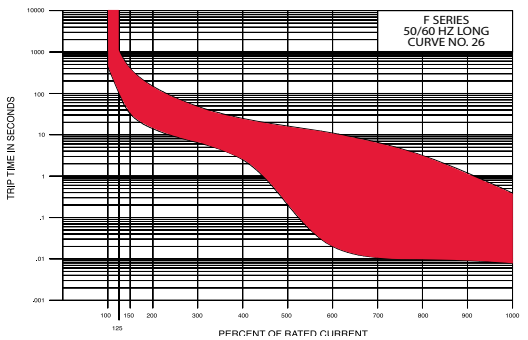
### Short - AC 22




### Medium - AC 24

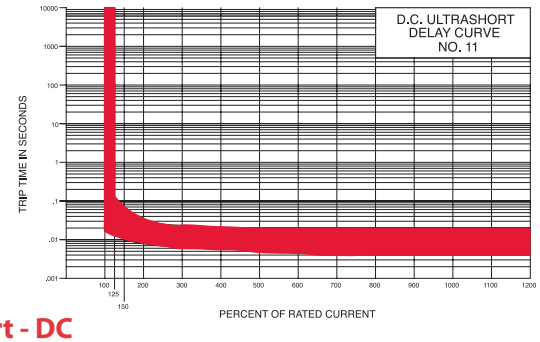



### Long - AC 26

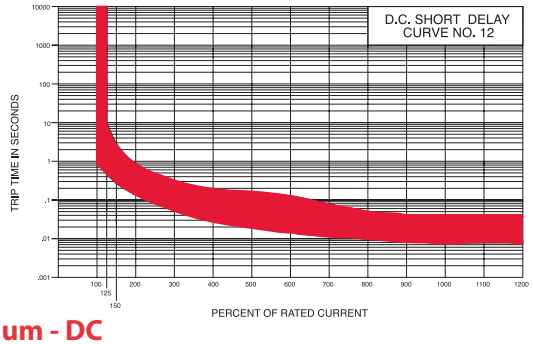



## DC

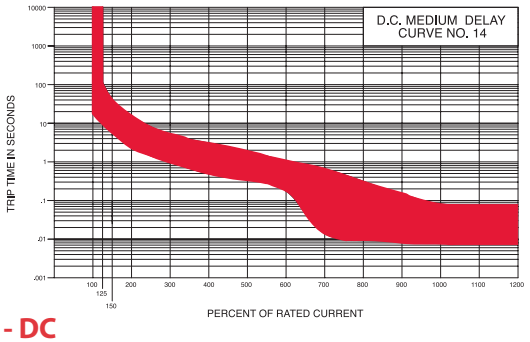
### Ultrashort - DC



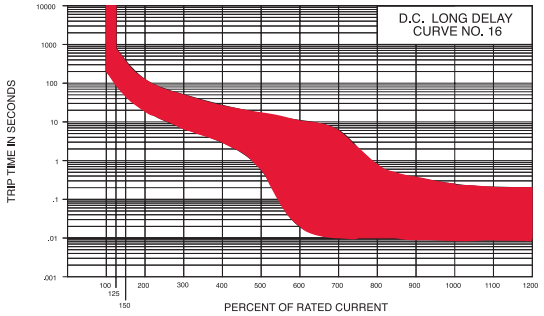

### Short - DC




### Medium - DC




### Long - DC

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