# 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.









## **Product Highlights:**

- 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

## **Typical Applications:**

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





## **Electrical**

Maximum Voltage **Current Ratings** 

125VDC, 277VAC

Standard current coils: 100, 125, 150, 175, 225, 250 amps. 300, 350, 400, 500, 600, 700 amps

available as parallel pole

construction.

SPDT; 10.1 Amps @ 250VAC, 1.0 Auxiliary Switch Rating

> Amps @ 65VDC, 0.5 Amps @ 80VDC 0.1 Amps @ 125VAC (with

gold contacts).

Insulation Resistance Minimum: 100 Megohms at 500

**VDC** 

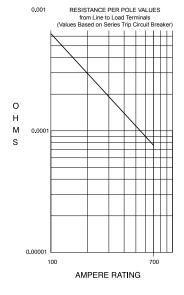
Dielectric Strength

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.

All F-Series Circuit Breakers will trip Trip Free

> 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).

Factory installed: DC Current Available Accessories

Metering Shunt (25 mV @lr)

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.

Withstands 0.060" excursion from Vibration

> 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.

Method 101, Condition A (90-95% Salt Spray

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

<sup>\*</sup>Manufacturer reserves the right to change product specification without prior notice.

## **Electrical Tables**

Table A: Lists UL Listed (489) and CSA Certified (C22.2 No. 5.1-M) configurations and performance capabilities as a Molded Case Circuit Breaker

F SERIES TABLE A : UL489 LISTED BRANCH CIRCUIT BREAKERS							
VOLTAGE			CURRENT RATING	INTERRUPTING CAPACITY (AMPS)			
CIRCUIT MAX CONFIGURATION RATING FREQUENCY PHA		PHASE	FULL LOAD AMPS	UL / CSA 1 - 3 POLES	TUV <sup>2</sup> 1 or 2 POLES		
	125	DC		50 - 250	50,000	25,000	
SERIES	ES 120 / 240 <sup>1</sup> 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 and 150-250 amp ratings only.

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	VO	LTAGE	CURRENT	INTERRUPTING CAPACITY (AMPS)		
		MAX. ATING FREQUENCY	RATING			
	MAX. RATING		FULL LOAD AMPS	WITHOUT BACKUP FUSE		
SERIES	125	DC	251 - 700	50,000		

## **Agency Certifications**

**UL Listed** 

UL 489 CULUS

UL 489A

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 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



## 1 SERIES

### 2 ACTUATOR

Handle, one per pole

Mid-Trip Handle, one per pole

Mid-Trip Handle, one per pole & Alarm Switch

## 3 POLES

One 2 Two 3 Three

**Parallel Pole Construction:** 

4 CIRCUIT A 1 Switch Switch Only (no coil) M 3,4 Series Trip (Current) with Metering Shunt N 3,4 Switch Only with Metering Shunt P 3 Series Trip (Current)

Series Trip (current) C <sup>2</sup> Series Trip (voltage)

Switch Only

## 5 AUXILIARY SWITCH 5

without Auxiliary Switch S.P.D.T. 0.110 Q.C. Terminals

S.P.D.T. 0.139 Solder Lug

S.P.D.T. 0.110 Q.C. Terminals (Gold Contacts)

S.P.S.T., 0.093 Q.C. Terminals

(Gold Contacts) S.P.S.T. 0.110 Q.C. Terminals S.P.S.T. 0.110 Q.C. Terminals (Gold Contacts)

S.P.S.T. 0.187 Q.C. Terminals S.P.D.T. 0.187 Q.C. Terminals R

700A

**A** 6 S.P.S.T., 0.093 Round

QC Terminals **B** 6 S.P.D.T., 0.093 Round QC Terminals

## **6 FREQUENCY & DELAY**

DC 50/60Hz, Switch Only DC Instantaneous

DC Ultra Short

DC Short

## DC Medium

16 DC Long AC Short AC Medium

AC Long

## 7 CURRENT RATING (AMPERES)

CODE AMPERES

**860** <sup>8</sup> 600.00 **870** <sup>8</sup> 700.00 **835** 8 350.00 **840** 8 400.00 210 100 000 820 200.00 225 00 912 125 00 922

825 250.00 **845** 8 450.00 150.00 815 **830** 8 300.00 175.00 **850** 8 500.00 917

# OR VOLTAGE COIL (MIN. TRIP RATING, VOLTS) $^7$ CODE AMPERES

3/8-16 Screw, Line & Load

**A06** 6 DC, 5 DC **A12** 12 DC, 10 DC **A18** 18 DC, 15 DC 24 DC, 20 DC A65 65 DC, 55 DC 32 DC, 25 DC 48 DC, 40 DC 125 DC, 100 DC A32 **B25** Δ48 6 AC 5 AC J06

## 8 TERMINAL

**Back Connected (Front Mounted Only) Max Rating** 3/8-16 Stud 250A **2** 14 3/8-16 Screw, Line & Load 700A 5 <sup>14</sup> 3/8-16 Short Stud 250A Front Connected (Back Mounted Only) 11 **Max Rating** Box Wire Connector, Line & Load 700A **4** 14

## 9 ACTUATOR COLOR & LEGEND 12,13

**Actuator Color** I-O ON-OFF Dual **Marking Color** White Α В Black Black D White

## 10 MOUNTING

Front Mounting Inserts

**Back Mounting Inserts** 10-32 screw clearance holes 10-32 screw clearance holes ISO M5

## 11 MAXIMUM APPLICATION RATING

**VOLTAGE** CURRENT В 125 VDC 700A **Č** 15 120/240 250A 277 VAC 250A **7** 16 120/208 VAC 250A

## 12 AGENCY APPROVAL

No approvals

UL489 Listed & CUL Certified G

UL489 Listed, CUL Certified & TUV Certified

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.

outy. Delay 10 and 20 are only available with voltage coils.

3 Codes M, N, P & Q (Parallel Poles) are supplied with factory installed Bus Bar on Line and Load.

4 Metering terminals are female pin type, ref. Molex part number 02-09-1101, model 1189-T. 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 Off multi-plue betavels, one Authlary switch is supplied, informed in the extreme right pole per figure A. Back-Mounted breakers require special mounting provisions when an Auxiliary Switch is specified.

Available with parallel pole construction (circuit codes P and Q, and breakers with circuit codes M and N).

Frequency and delay code 10 is only available with Voltage Coils. Voltage Coils are not

6

rated for continuous duty.

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

Per UL requirement, an "Anti-Flash Over Barrier" is supplied between poles on multipole

breakers with 3/8 - 16 stud terminals (Terminal Code 1) on AC rated breakers only. Front connected breakers can also be front mounted by utilizing the supplied front panel

mounting inserts. Terminal connections must be made before mounting.

Box Wire connector will accept #6 through 250 MCM copper wire.

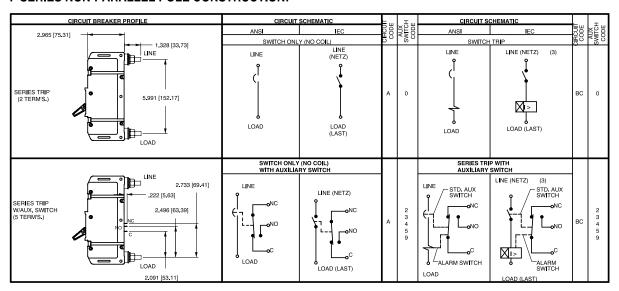
Agency codes G & T must have ON-OFF or dual legends. Agency code J must have 12

dual legend.
Other colors available. Consult factory.

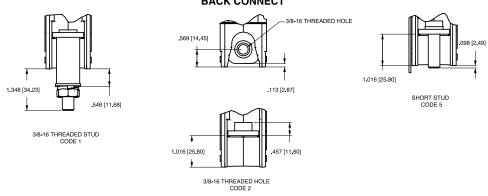
Terminals 2,4 & 5 are shipped without terminal hardware. 2 or 3 Pole Circuit Breaker Required for 120/240 VAC Rating. 3 Pole Circuit Breaker Required for 120/208 VAC Rating.

# **Circuit & Terminal Diagrams: in. [mm]**

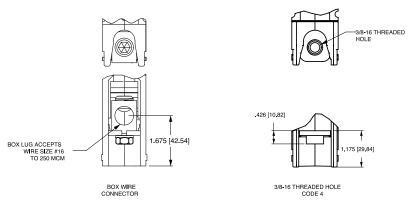
## F SERIES NON-PARALLEL POLE CONSTRUCTION:



## **TERMINAL DETAILS BACK CONNECT**



## FRONT CONNECT

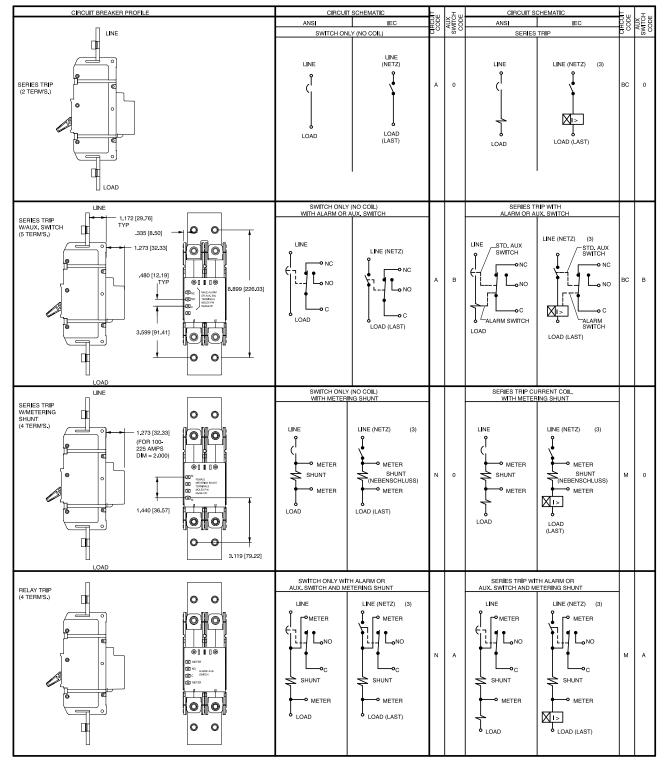


## Notes:

- All dimensions are in inches [millimeters].
  Tolerance ±.020 [.51] unless otherwise specified.

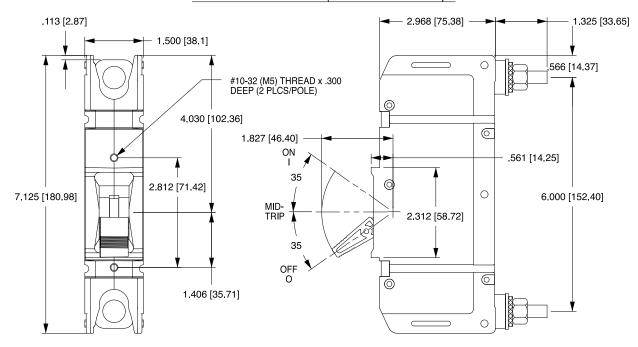
## **Circuit & Terminal Diagrams: in. [mm]**

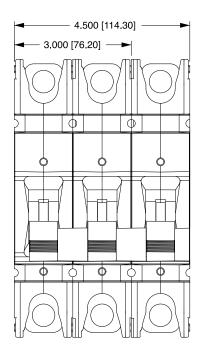
## F-SERIES PARALLEL POLE CONSTRUCTION:



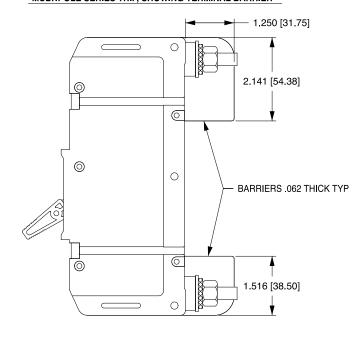
All dimensions are in inches [millimeters].
Tolerance ±.020 [.51] unless otherwise specified.

## SERIES TRIP BACK CONNECT (STUD TERMINALS SHOWN)



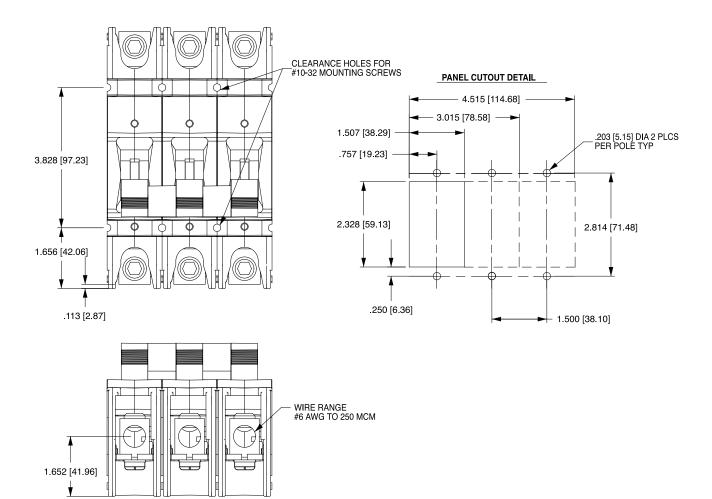


## MULTIPOLE SERIES TRIP, SHOWING TERMINAL BARRIER



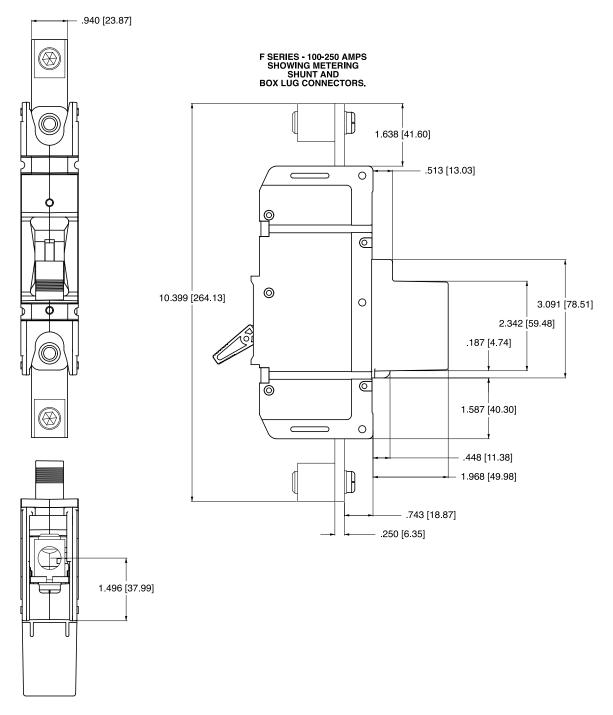
Notes:
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2 Tolerance ±020 [.51] unless otherwise specified.

# SERIES TRIP FRONT CONNECT (BOX LUG TERMINALS SHOWN)



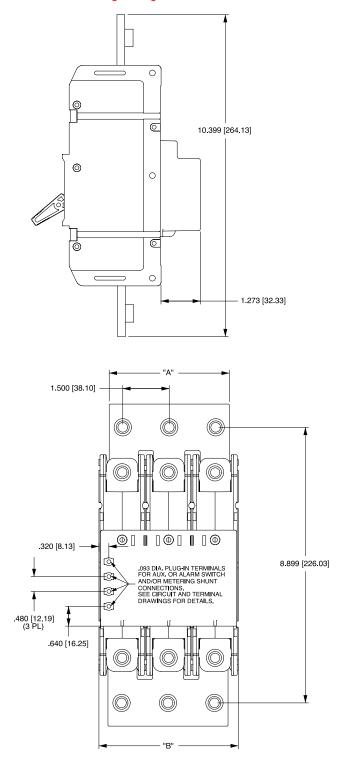
## Notes

- All dimensions are in inches [millimeters].
  Tolerance ±.020 [.51] unless otherwise specified.



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.

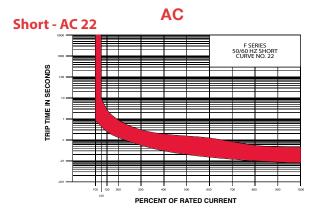
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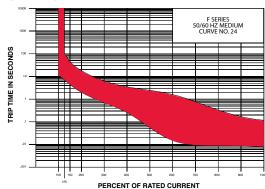
# F-SERIES PARALLEL POLE 250-700 AMPS SHOWING FRONT CONNECT SCREW TERMINALS

- 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	.013125	.010070	.008032	.006020	.005020	.004020	.004020
	12	No Trip	.475 - 10.0	.275 - 2.80	.140850	.030190	.015125	.010050	.008038
	14	No Trip	10.0 - 110	6.00 - 40.0	2.50 - 15.0	.500 - 3.00	.180 - 1.00	.010280	.008080
	16	No Trip	110 - 1000	60.0 - 400	22.0 - 150	4.00 - 25.0	1.00 - 5.50	.010 - 1.80	.008390
	22	No Trip	0.44 - 10.0	0.25 - 2.80	0.13 - 0.90	0.030 - 0.19	0.015 - 0.125	0.010 - 0.055	0.008 - 0.045
	24	No Trip	7.20 - 110	4.40 - 45.0	2.00 - 18.0	0.25 - 3.50	0.016 - 1.60	0.009 - 0.33	0.008 - 0.11
	26	No Trip	100 - 1100	32.0 - 400	14.0 - 150	2.50 - 25.0	0.020 - 11.0	0.010 - 3.10	0.008 - 0.39







Long - AC 26

