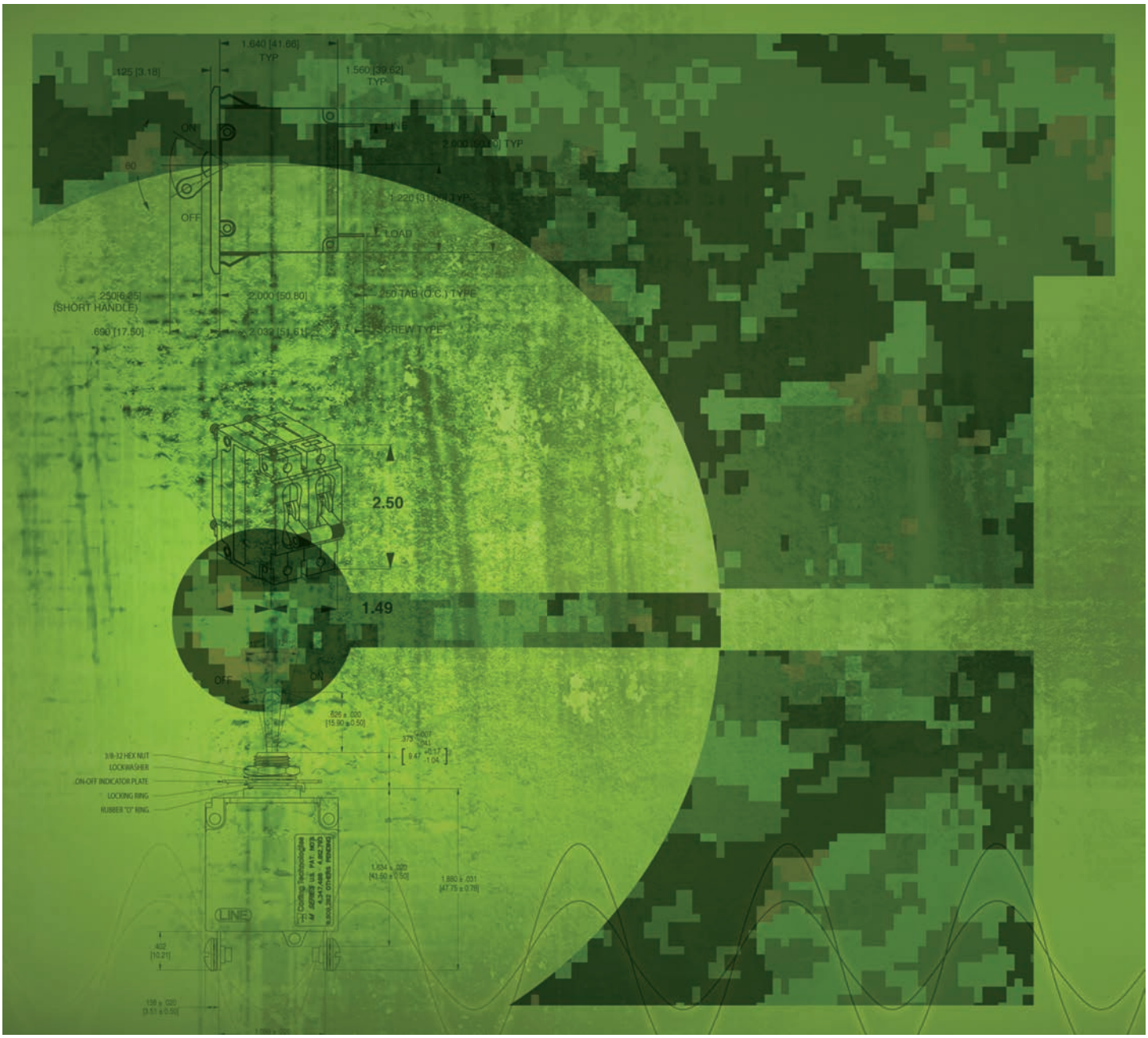
Carling Technologies™
Innovative Designs. Powerful Solutions.

Military Grade

COTS SWITCHES & CIRCUIT BREAKERS



About Carling Technologies:

Founded in 1920, Carling Technologies is a leading manufacturer of electrical and electronic switches and assemblies, hydraulic magnetic and thermal circuit breakers, electronic controls, power distribution units, digital switching systems, and multiplexed power distribution systems. With four ISO certified manufacturing facilities and corporate offices worldwide, Carling Technologies does much more than manufacture electrical components, it engineers powerful solutions! Our high standards of design and manufacturing quality have afforded us the ability to provide a full line of COTS (Commercial Off-The-Shelf) switches and circuit breakers that are guaranteed to withstand the rugged military environment while keeping costs down.

Carling Technologies™

Innovative Designs. Powerful Solutions.

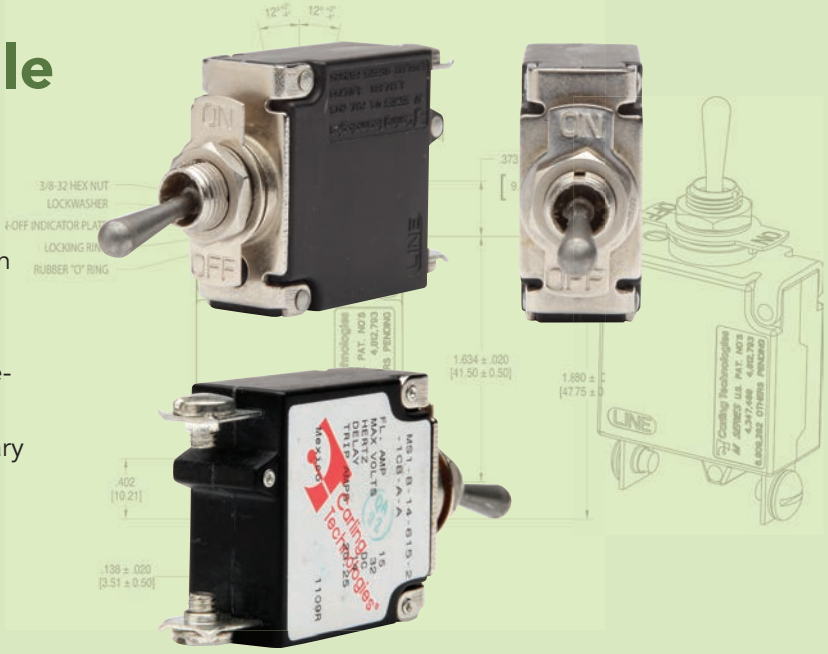
Military COTS Switches & Circuit Breakers:

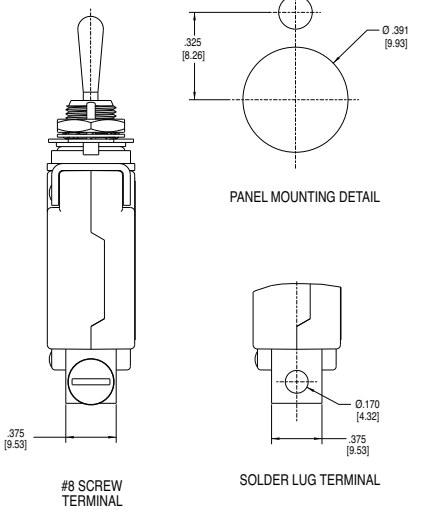
Your Military equipment is only as tough as the components used in building it! Carling Technologies products feature a wide range of switches and circuit breakers that were designed and tested to withstand the rigorous military environment. Carling Technologies COTS products provide military OEMs with a reliable and cost effective solution to their design requirements. By drawing upon over 90 years of design excellence, Carling Technologies is also able to provide switch and circuit breaker custom solutions that are sure to be compliant with the most demanding environmental requirements.

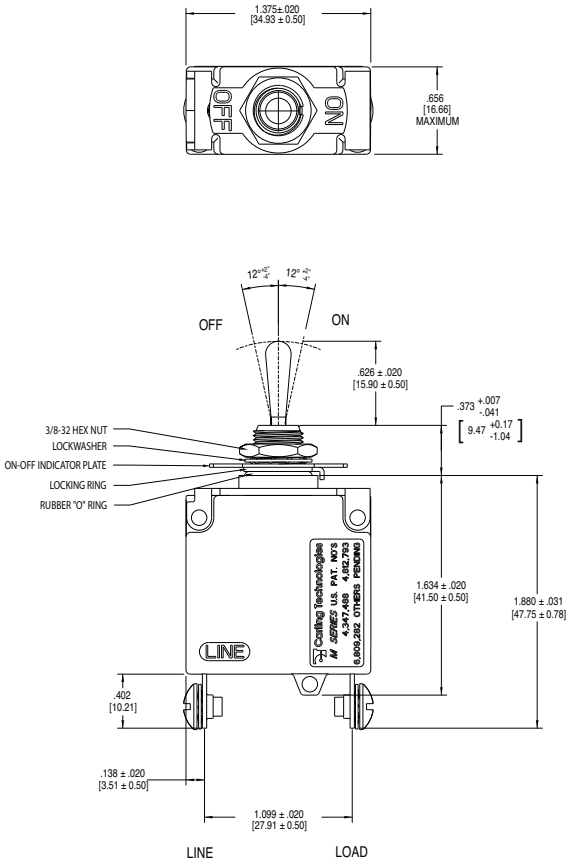
Contents

MS-Series Sealed Toggle Circuit Breaker

All MS Series circuit breakers feature a durable metal sealed toggle with a MIL-PRF-39019F ingress protection level rating when mounted in panel, a robust actuator, and sealed bushing. This class leading, low cost, COTS circuit breaker was designed in accordance with requirements of specification MIL PRF-55629 & MIL-STD-202G and is guaranteed to withstand the most rigorous military environment.







Electrical

Current Rating .....2 - 25 Amps
Voltage Rating .....50 Volts DC
Dielectric Strength.....UL,CSA 1500V, 50/60 Hz for one minute between all electrically isolated terminals
Insultation Resistance .....Minimum of 100 Megohms @ 500VDC

Mechanical

Endurance.....10,000 On-Off operations @ 6 per minute with rated current and voltage
Trip Free.....Trips on short circuit, overload, even when actuator is forcibly held in the "On" position
Trip Indication .....The operating handle moves positively to the "Off" position when an overload causes the circuit breaker to trip

Physical

Number of Poles.....1 Pole
Weight .....Approximately 1.8 oz (50 G) per pole
Dimensions .....See reverse side

Environmental

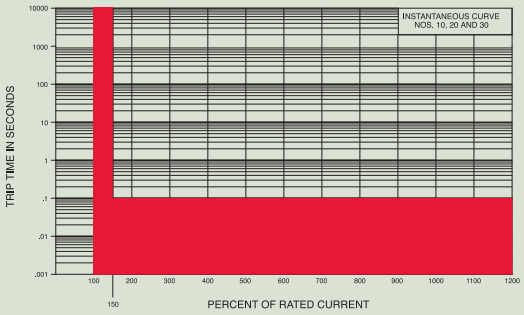
Designed in accordance with requirements of specification MIL PRF-55629 & MIL-STD-202G as follows:
Shock .....Withstands 100G's, 6ms, saw tooth while carrying rated current per Method 213, Condition I. Instantaneous curves tested at 80% of rated current.
Vibration .....Withstands 0.060" excursion from 10-55 Hz, and 10G's 55-500 Hz, at rated current per Method 204C, Test Condition A. Instantaneous curves tested at 80% of rated current.
Salt Spray.....Method 101, Condition A (90-95% RH @ 5% NaCl Solution, 96 hrs)
Moisture Resistance.....Method 106G
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
Ingress Protection Level.....MIL-PRF-55629C when mounted in panel.
Other .....Materials used in this product shall be non-nutrient to fungus growth

UL Approval Pending

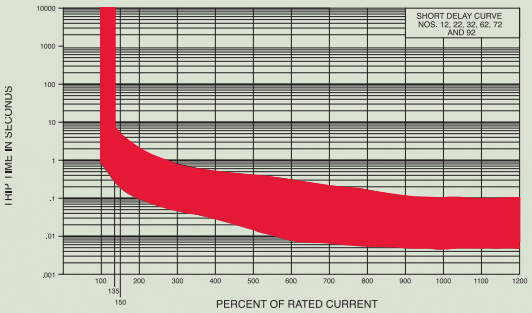
Delay Curves

Dual Rated AC/DC

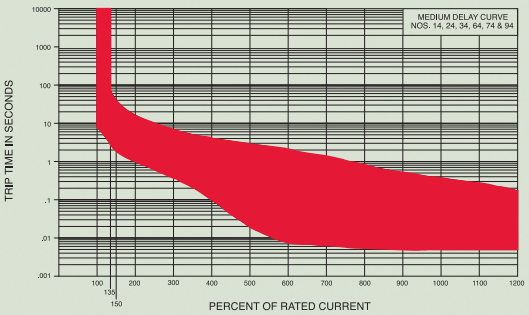
Instantaneous



Short

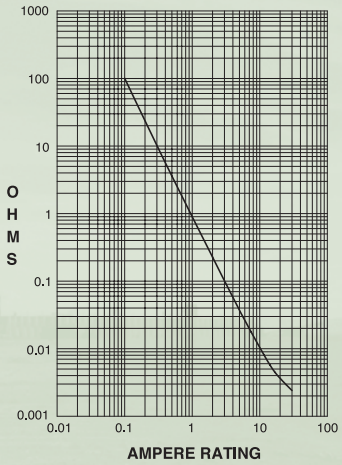


Medium



Resistance, Impedance Values

RESISTANCE, IMPEDANCE VALUES
from Line to Load Terminals
(Values Based on Series Trip Circuit Breaker)



CURRENT (AMPS)	TOLERANCE (%)
0.20 - 25.0	25%

A-Series Circuit Breaker

Compact in size and well known for its proven reliability, the A-Series utilizes the hydraulic magnetic principle which provides precise operation and performance even when exposed to extremely hot and/or cold application environments. When aesthetics demand a clean contemporary and functional design, the visi-rocker two-color actuator can be specified. A rockerguard and push-to-reset bezel helps prevent inadvertent actuation. A specially constructed version is now available for applications requiring CE markings. In addition, these breakers meet CSA Standard 22.2 No. 100 for the Generator & Welder markets. It can be configured as 1-6 poles (handle), 1-3 poles (rocker), 0.02 - 50 amps, up to 277 VAC or 80 VDC, with a choice of time delays, terminals and actuator colors.

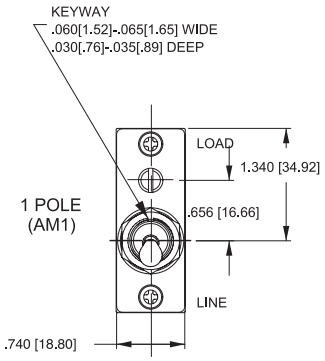
Agency Certifications

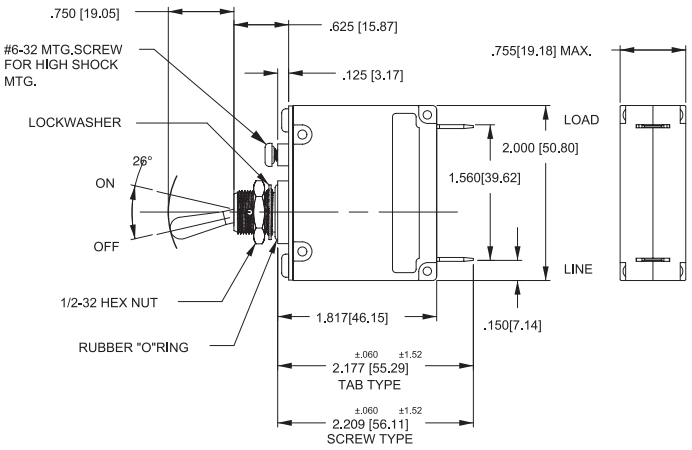
UL Recognized

UL Standard 1077	Component Recognition Program as Protectors Supplementary (Guide CCN/QVNU2, File E75596)
UL Standard 508	Switches, Industrial Control (Guide CCN/NRNT2, File E148683)
UL Standard 1500	Protectors, Supplementary for Marine Electrical & Fuel Systems (Guide PEQZ2, File E75596) Ignition Protection

UL Listed

UL Standard 489A	Communications Equipment (Guide CCN/DITT, File E189195)
CSA Accepted	Component Supplementary Protector under Class 3215 30, File 047848 0 000 CSA Standard C22.2 No. 235
TUV Certified	EN60934, under License No. R72040875
VDE Certified	EN60934, VDE 0642 under File No. 10537

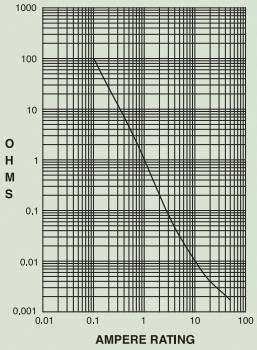




Electrical

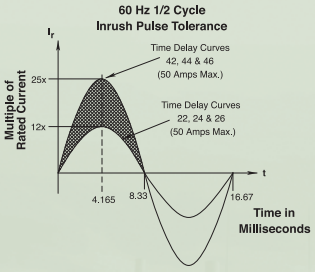
Maximum Voltage.....277VAC 50/60 Hz, 80VDC
Current Ratings.....Standard current coils: 0.100, 0.250, 0.500, 0.750, 1.00, 2.50, 5.00, 7.50, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0, 40.0, 50.0. Other ratings available - consult ordering scheme.
Standard Voltage Coils.....DC-6V, 12V; AC-120V, Other ratings available, consult ordering scheme.
Auxiliary Switch Rating.....SPDT; 10.1 A - 250VAC, 1.0 A - 65VDC/0.5 A - 80 VDC, 0.1A - 125VAC (with gold contacts).
Insulation Resistance .....Minimum: 100 Megohms at 500 VDC
Dielectric Strength.....UL, CSA - 1500V 60 Hz for one minute between all electrically isolated terminals. A-Series rocker circuit breakers comply with the 8mm spacing & 3750V dielectric requirements from hazardous voltage to operator accessible surfaces per EN 60950 and VDE 0805.
Resistance, Impedance.....Values from Line to Load Terminal - based on Series Trip Circuit Breaker.

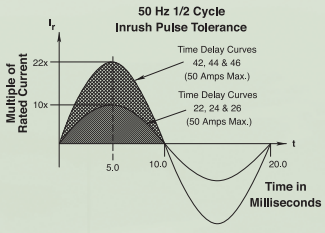
RESISTANCE, IMPEDANCE VALUES
from Line to Load Terminals
(Values Based on Series Trip Circuit Breaker)



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

Pulse Tolerance Curves





Mechanical

Endurance.....10,000 ON-OFF operations @ 6 per minute; with rated Current & Voltage.
Trip Free.....All A-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. When mid-trip handle is specified, the handle moves to the mid position on electrical trip of the circuit breaker. When mid-trip handle with alarm switch is specified, the handle moves to the mid position & the alarm switch actuates when the circuit breaker is electrically tripped.

Physical

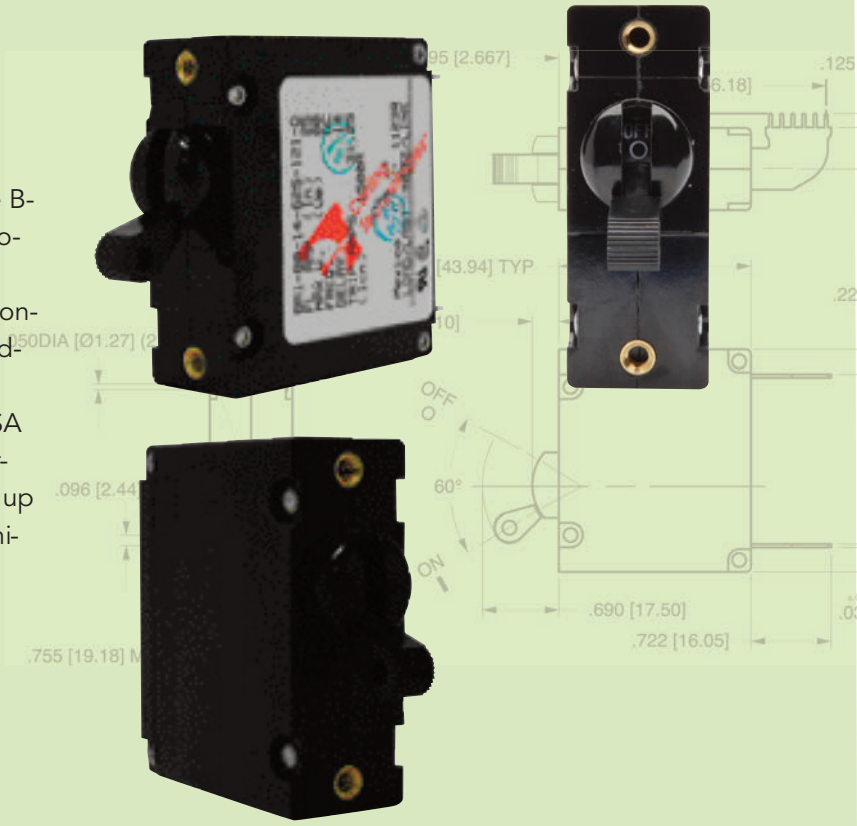
Number of Poles.....1 - 6 Poles (handle) and 1-3 poles (rocker) at 30 Amps or less. 1 and 2 poles at 31 Amps thru 50 Amps.
Internal Circuit Configurations .....Series, (with or without auxiliary switch), Shunt and Relay with current or voltage trip coils, Dual Coil, Switch Only with or without auxiliary switch.
Weight .....Approximately 65 grams/pole. (Approximately 2.32 ounces/pole)
Standard Colors.....Housing - Black; Actuator- See Ordering Scheme.

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

B-Series Circuit Breaker

Designed specifically for world market applications, the B-series utilizes the hydraulic magnetic principle which provides precise operation and performance even when exposed to extremely hot and/or cold application environments. Typical applications include power supplies, medical equipment, office equipment, control panels and marine equipment. In addition, these breakers meet CSA Standard 22.2 No. 100 for the Generator & Welder markets. It can be configured as 1-6 poles, 0.02 - 50 amps, up to 277 VAC or 80 VDC, with choice of time delays, terminals and actuator colors.



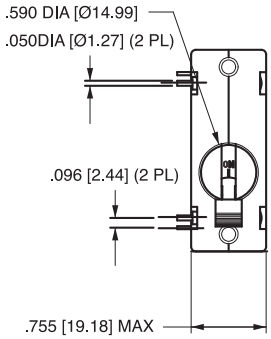
Agency Certifications

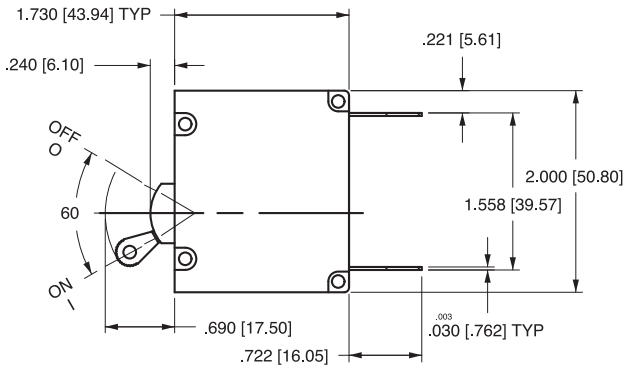
UL Recognized

UL Standard 1077	Component Recognition Program as Protectors Supplementary (Guide CCN/QVNU2, File E75596)
UL Standard 508	Switches, Industrial Control (Guide CCN/NRNT2, File E148683)
UL Standard 1500	Protectors, Supplementary for Marine Electrical & Fuel Systems (Guide PEQZ2, File E75596) Ignition Protection

UL Listed

UL Standard 489	Circuit Breakers, Molded Case, (Guide DIVQ, File E189195)
UL Standard 489A	Communications Equipment (Guide CCN/DITT, File E189195)
CSA Accepted	Component Supplementary Protector under Class 3215 30, FIle 047848 0 000 CSA Standard C22.2 No. 235
TUV Certified	EN60934, under License No. R72040875
VDE Certified	EN60934, VDE 0642 under File No. 10537

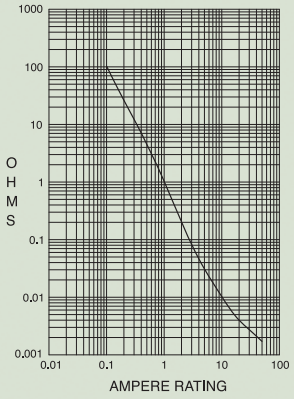




Electrical

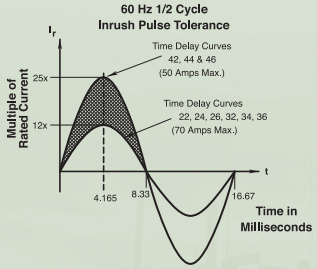
Maximum Voltage.....277VAC 50/60 Hz, 80VDC
Current Ratings.....Standard current coils: 0.100, 0.250, 0.500, 0.750, 1.00, 2.50, 5.00, 7.50, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0, 40.0, 50.0. Other ratings available - consult ordering scheme.
Standard Voltage Coils .....DC-6V, 12V; AC-120V, Other ratings available, consult ordering scheme.
Auxiliary Switch Rating.....SPDT; 10.1 A - 250VAC, 1.0 A-65VDC/0.5 A - 80 VDC, 0.1A - 125VAC (with gold contacts).
Insulation Resistance .....Minimum: 100 Megohms at 500 VDC
Dielectric Strength.....UL, CSA - 1500V 60 Hz for one minute between all electrically isolated terminals. A-Series rocker circuit breakers comply with the 8mm spacing & 3750V dielectric requirements from hazardous voltage to operator accessible surfaces per EN 60950 and VDE 0805.
Resistance, Impedance.....Values from Line to Load Terminal - based on Series Trip Circuit Breaker.

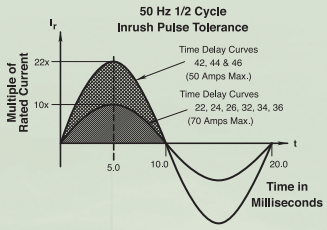
RESISTANCE, IMPEDANCE VALUES
from Line to Load Terminals
(Values Based on Series Trip Circuit Breaker)



CURRENT (AMPS)	TOLERANCE (%)
0.10 - 5.0	15%
5.1 - 20.0	25%
20.1 - 100.0	35%

Pulse Tolerance Curves





Mechanical

Endurance.....10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.
Trip Free.....All B-Series Circuit Breakers will trip on overload, even when Handle is forcibly held in the ON position.
Trip Indication .....The operating Handle moves positively to the OFF position when an overload causes the breaker to trip.

Physical

Number of Poles.....1 - 6 poles at 30 Amps or less. 1 and 2 poles at 31 Amps thru 50 Amps.
Internal Circuit Config. .....Series, (with or without auxiliary switch), Shunt and Relay with current or voltage trip coils, Dual Coil, Switch Only (with or without auxiliary switch).
Weight .....Approximately 65 grams/pole. (Approximately 2.32 ounces/pole)
Standard Colors.....Housing- Black; Actuator - See Ordering Scheme.

Environmental

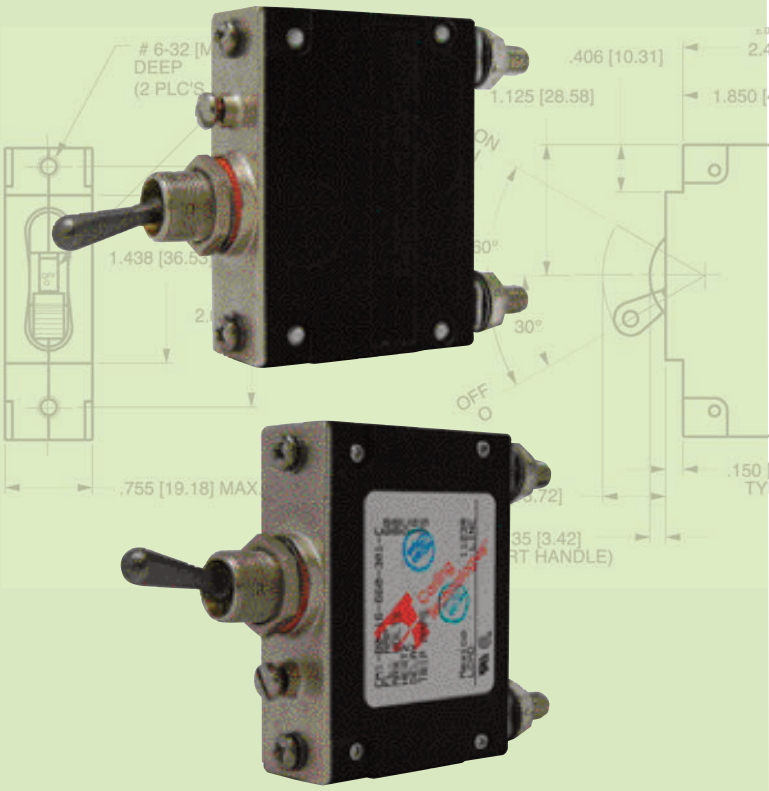
Designed and tested in accordance with requirements of specification MIL-PRF- 55629 and MIL-STD-202 as follows:
Shock .....Withstands 100 Gs, 6ms, sawtooth while carrying rated current per Method 213, Test Condition "I". Instantaneous and ultra-short curves tested @ 90% of rated current.
Vibration .....Withstands 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, i.e., ten 24-hour cycles @ + 25°C to +65°C, 80-98% 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

C-Series Circuit Breaker

The C-Series circuit breaker was designed for applications that require higher amperage and voltage handling capabilities in a compact design. It is available with American Standard or Metric Threaded Stud terminals, or Saddle Clamp screw terminals. Additional options include mid-trip handle style actuator, solid color rocker actuators and Visi-rocker two color actuators. The Visi-rocker option can be specified to indicate either the ON or TRIPPED/OFF mode while the optional Rockerguard and Push-To-Reset bezel can help prevent inadvertent actuation.

The C-Series UL489 breakers employ a unique arc chute design which results in obtaining higher interrupting capacities, up to 50,000 amps. Thermoset glass filled polyester half shell construction increases mechanical & electrical strength and the Wiping Contacts - Mechanical linkage with two-step actuation – cleans contacts, provides high, positive contact pressure & longer contact life;

1-6 poles, 0.02 - 100 amps, up to 480 VAC or 80 VDC, UL489 up to 240 VAC or 125 VDC, with choice of time delays and actuator colors.



Agency Certifications

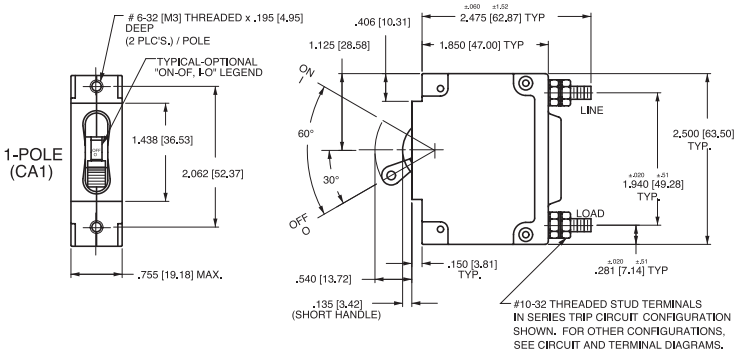
UL Recognized

UL Standard 1077	Component Recognition Program as Protectors Supplementary (Guide CCN/QVNU2, File E75596)
UL Standard 508	Switches, Industrial Control (Guide CCN/NRNT2, File E148683)
UL Standard 1500	Protectors, Supplementary for Marine Electrical & Fuel Systems (Guide PEQZ2, File E75596) Ignition Protection

UL Listed

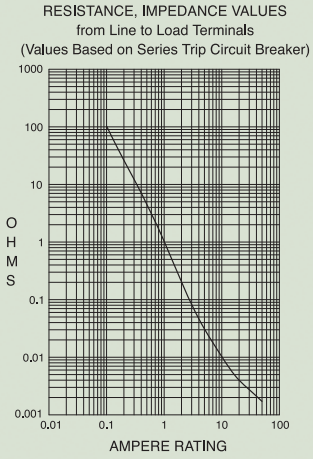
UL Standard 489	Circuit Breakers, Molded Case, (Guide DIVQ, File E189195)
UL Standard 489A	Communications Equipment (Guide CCN/DITT, File E189195)
tCSA Accepted	Component Supplementary Protector under Class 3215 30, FIle 047848 0 000 CSA Standard C22.2 No. 235

CSA Certified	Circuit Breaker Model Case (Class 1432 01, File 093910), CSA Standard C22.2 No. 5.1 - M
TUV Certified	EN60934, under License No. R72040875
VDE Certified	EN60934, VDE 0642 under File No. 10537



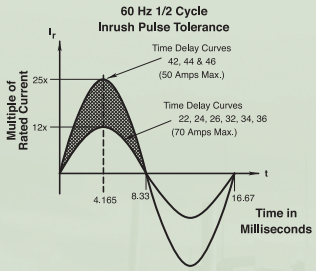
Electrical

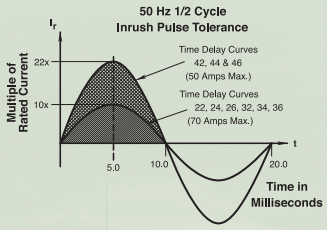
Maximum Voltage.....277VAC 50/60 Hz, 80VDC
Current Ratings.....Standard current coils: 0.100, 0.250, 0.500, 0.750, 1.00, 2.50, 5.00, 7.50, 10.0, 15.0, 20.0, 25.0, 30.0, 35.0, 40.0, 50.0. Other ratings available - consult ordering scheme.
Standard Voltage Coils .....DC-6V, 12V; AC-120V, Other ratings available, consult ordering scheme.
Auxiliary Switch Rating.....SPDT; 10.1 A - 250VAC, 1.0 A-65VDC/0.5 A - 80 VDC, 0.1A - 125VAC (with gold contacts).
Insulation Resistance .....Minimum: 100 Megohms at 500 VDC
Dielectric Strength.....UL, CSA - 1500V 60 Hz for one minute between all electrically isolated terminals. A-Series rocker circuit breakers comply with the 8mm spacing & 3750V dielectric requirements from hazardous voltage to operator accessible surfaces per EN 60950 and VDE 0805.
Resistance, Impedance.....Values from Line to Load Terminal - based on Series Trip Circuit Breaker.



CURRENT (AMPS)	TOLERANCE (%)
0.10 - 5.0	15%
5.1 - 20.0	25%
20.1 - 100.0	35%

Pulse Tolerance Curves





Mechanical

Endurance.....10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.
Trip Free.....All B-Series Circuit Breakers will trip on overload, even when Handle is forcibly held in the ON position.
Trip Indication .....The operating Handle moves positively to the OFF position when an overload causes the breaker to trip.

Physical

Number of Poles.....1 - 6 poles at 30 Amps or less. 1 and 2 poles at 31 Amps thru 50 Amps.
Internal Circuit Config. .....Series, (with or without auxiliary switch), Shunt and Relay with current or voltage trip coils, Dual Coil, Switch Only (with or without auxiliary switch).
Weight .....Approximately 65 grams/pole. (Approximately 2.32 ounces/pole)
Standard Colors.....Housing- Black; Actuator - See Ordering Scheme.

Environmental

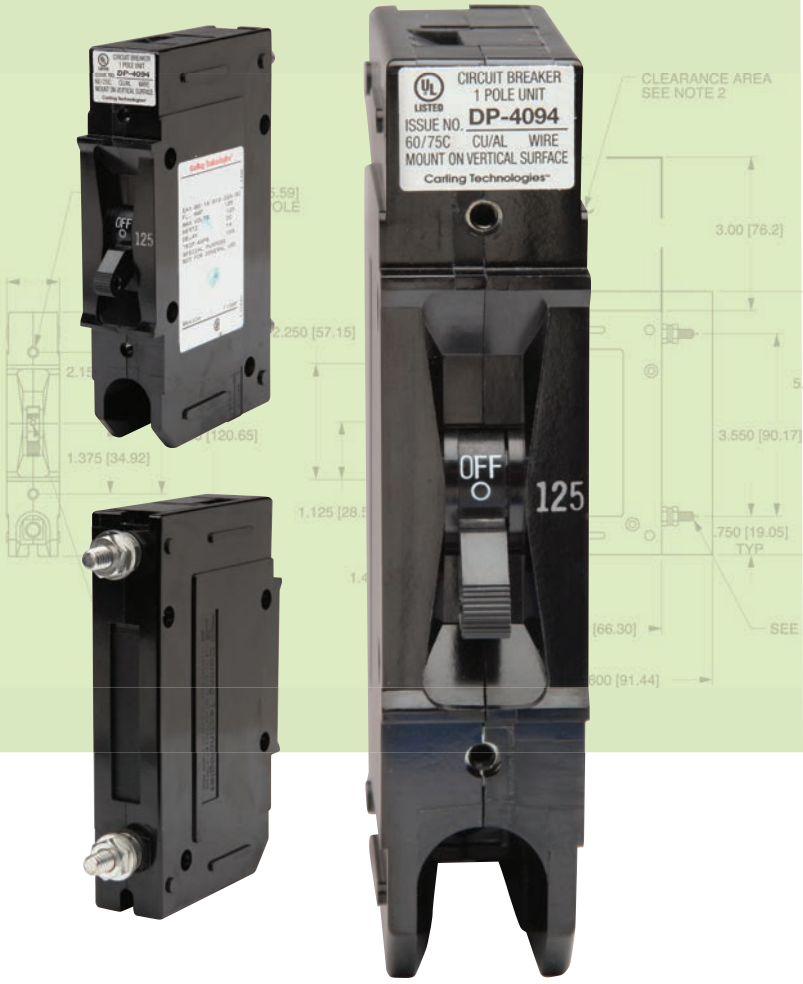
Designed and tested in accordance with requirements of specification MIL-PRF- 55629 and MIL-STD-202 as follows:
Shock .....Withstands 100 Gs, 6ms, sawtooth while carrying rated current per Method 213, Test Condition "I". Instantaneous and ultra-short curves tested @ 90% of rated current.
Vibration .....Withstands 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, i.e., ten 24-hour cycles @ + 25°C to +65°C, 80-98% 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

E-Series Circuit Breaker

Ideally suited for higher amperage applications, the E-Series is available with front and back mounting, screw terminals, stud terminals and heavy duty box wire connectors for solid wire or a pressure plate connector for stranded wire. Consult factory for an optional power selector device.

The E-Series is UL Listed and CSA Certified for Branch Circuit protection which does not require a fuse backup. It is also UL Recognized and CSA Certified as a Supplementary Protector and as a Manual Motor Controller.

1-6 poles, .1 - 100 amps, up to 600 VAC or 125 VDC, with choice of time delays and actuator colors.



Actual size

Agency Certifications

UL Recognized

UL Standard 1077	Component Recognition Program as Protectors, Supplementary (Guide QVNU2, File E75596)
UL Standard 508	Component Recognition Program as Manual Motor Controls (Guide NLRV2, File E135367)
UL Standard 1500	Protectors, Supplementary for Marine Electrical & Fuel Systems (Guide PEQZ2, File E75596) Ignition Protection

UL Listed

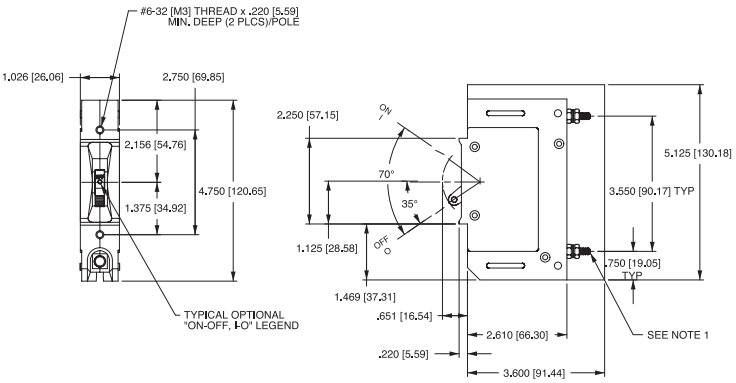
UL Standard 489	Circuit Breakers, Molded Case (Guide DIVQ, File E129899)
CSA Accepted	Component Supplementary Protector (Class 3215 30, File 047848 0 000) CSA Standard C22.2 No. 235
CSA Certified	Circuit Breaker Molded Case (Class 1432 01, File 093910), CSA Standard C22.2 No. 5.1 - M
TUV Certified	EN60934 under License No. R72031056
VDE Certified	EN60934, VDE 0642 under File No. 10537

Electrical

Table A:

Lists UL Listed (489) & CSA Certified (C22.2 No. 5) configurations & performance capabilities as a Molded Case Circuit Breaker.

E-SERIES TABLE A : UL489 LISTED BRANCH CIRCUIT BREAKERS					
CIRCUIT CONFIGURATION	VOLTAGE			CURRENT RATING	INTERRUPTING CAPACITY (AMPS)
	MAX. RATING	FREQUENCY	PHASE	FULL LOAD AMPS	WITHOUT BACKUP FUSE
SERIES	80	DC	---	0.10 - 125	50,000
	125	DC	---	0.10 - 125	10,000
	120	50 / 60	1	0.10 - 125	10,000
	120 / 240	50 / 60	1	0.10 - 125	10,000
	240	50 / 60	1 & 3	0.10 - 100	5,000



Electrical

Maximum Voltage.....600VAC 50/60 Hz, 125VDC (See Table A)

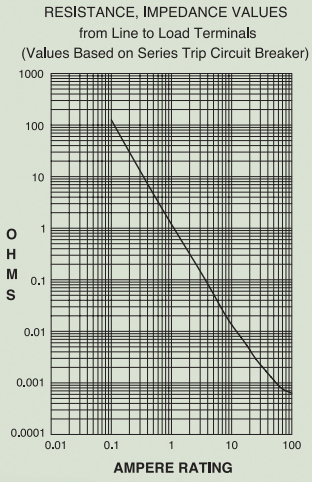
Current Ratings.....Standard current coils: 0.100, 0.250, 0.500, 1.00, 2.50, 5.00, 7.50, 10.0, 15.0, 20.0, 25.0, 30.0, 50.0, 60.0, 70.0 & 100 Amp.

Auxiliary Switch Rating.....SPDT; 10.1A 250VAC, 1.0A 65VDC; 0.5A 80VDC, 0.1A 125VAC (with gold contacts).

Insulation Resistance .....Minimum of 100 Megohms at 500 VDC.

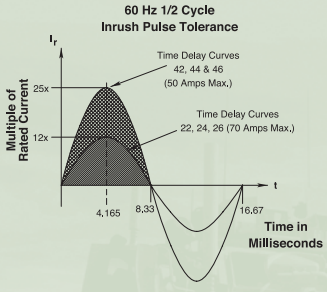
Dielectric Strength.....UL, CSA: 2200 V 50/60 Hz for one minute between all electrically isolated terminals. E-Series Circuit Breakers comply with the 8mm spacing and 3750V 50/60 Hz dielectric requirements from hazardous voltage to operator accessible surfaces, between adjacent poles and from main circuits to auxiliary circuits per Publications EN 60950 and VDE 0805.

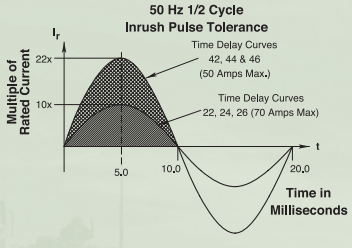
Resistance, Impedance.....Values from Line to Load Terminal - based on Series Trip Circuit Breaker.



CURRENT (AMPS)	TOLERANCE (%)
0.10 - 5.0	± 15%
5.1 - 20.0	± 25%
20.1 - 125.0	± 35%

Pulse Tolerance Curves





Mechanical

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

Trip Free.....All E-Series Circuit Breakers will trip on overload, even when Handle is forcibly held in the ON position.

Trip Indication .....The operating Handle moves positively to the OFF position when an overload causes the breaker to trip.

Physical

Number of Poles.....1 - 6

Mounting .....A 3" minimum spacing must be provided between the circuit breaker arc venting area on back connected E-Series circuit breakers and grounded obstructions. E-Series circuit breakers must be mounted on a vertical surface.

Connectors, Box Type.....Front connected E-Series circuit breakers are supplied with box type pressure connectors that accept copper or aluminum conductors as follows: 1/0-14 Copper, 1/0-12 Aluminum.

Internal Circuit Configuration .....Series and Switch Only, (with or without auxiliary switch). Shunt with current coils.

Weight .....Approximately 252 grams/pole (Approximately 9 ounces/pole)

Standard Colors.....Housing-Black; Actuator - See Ordering Scheme.

Environmental

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

Shock .....Withstands 100 Gs, 6ms, sawtooth while carrying rated current per Method 213, Test Condition "I".

Vibration .....Withstands 0.060" excursion from 10-55 Hz, and 10 Gs 55-500 Hz, at rated current per Method 204C, Test Condition A.

Moisture Resistance.....Method 106D, i.e., ten 24-hour cycles @ + 25°C to +65°C, 80-98% 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

F-Series Circuit Breaker

F-Series breakers are available with current ratings up to 700 Amps. The 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. This allows applications to be customized by measuring and displaying percentage of current, watts or safe/danger zones.

Actual size

Agency Certifications

UL Listed

UL Standard 489A

Circuit Breakers, Molded Case, (Guide DIVQ7, File E129899), UL Standard 489; Complies with the requirements of CSA Standard for Molded Case Circuit Breakers, CAN/CSA - C22.2 No. 5.1 - M

TUV Certified

EN60947-2
Low Voltage Switchgear and Control Gear under License No. R72031058

Electrical

Table A:

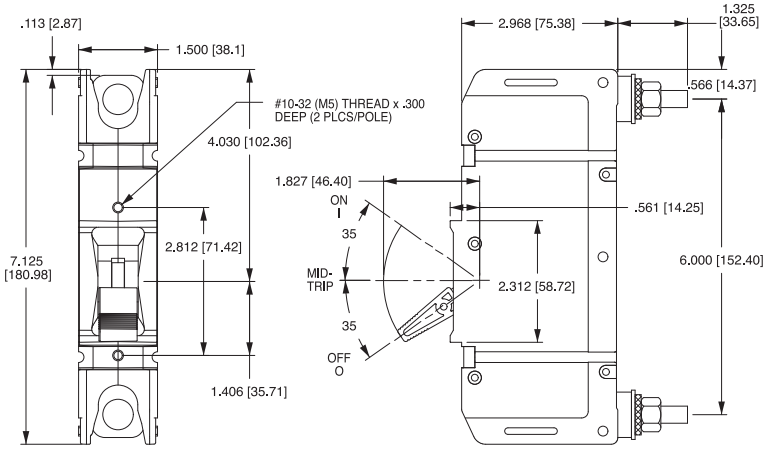
Lists UL Listed (489)and CSA Certified (C22.2 N0. 5.1-M) configurations and performance capabilities as a Molded Case Circuit Breaker

F-SERIES TABLE A : UL489 LISTED BRANCH CIRCUIT BREAKERS					
CIRCUIT CONFIGURATION	VOLTAGE		CURRENT RATING	INTERRUPTING CAPACITY (AMPS)	
	MAX. RATING	FREQUENCY	FULL LOAD AMPS	UL / CSA 1 - 3 POLES	TUV 1 or 2 POLES
SERIES	125	DC	50 - 250	50,000	25,000

Table B:

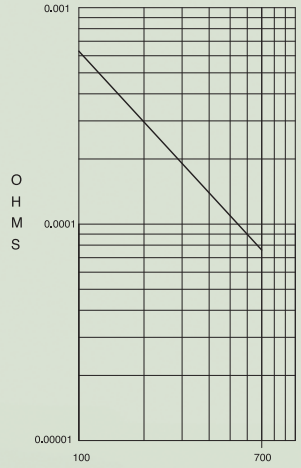
Lists UL Listed configurations and performance capabilities as Circuit Breakers for use in Communications Equipment (Guide DITT, File E189195), under UL489A

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



Electrical

Maximum Voltage.....125VDC
Current Ratings.....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.

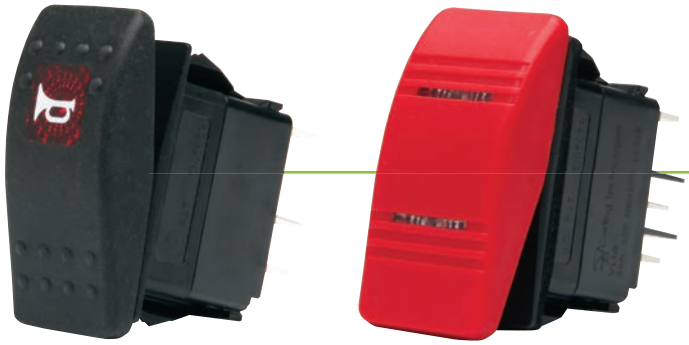
Environmental

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

V-Series Contura Switches

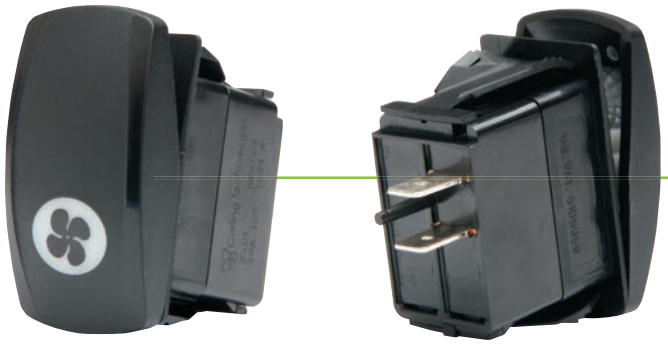
V-Series switches offer countless unique options including choices for ratings, colors, illuminations and symbols. These switches feature removable actuators in a choice of actuator styles and colors, and are available in single or double pole configurations. The V-Series switches can be illuminated with either square, oval and/or bar shaped lenses.

Typical Vehicles Applications: Amphibious, Special Task, Armored, SWAT/Assault, Law Enforcement, Mobile Crime Lab, Security and Medical Vehicles.



Contura II & III

The Contura II & III actuators are constructed of thermoplastic polycarbonate and are offered with either a hard nylon overlay or a "soft-touch" elastomer overlay. These Contura models incorporate aesthetic designs on the top and bottom of the rocker featuring two rows of raised "bumps" on the Contura II and three "indented" lines on the Contura III.

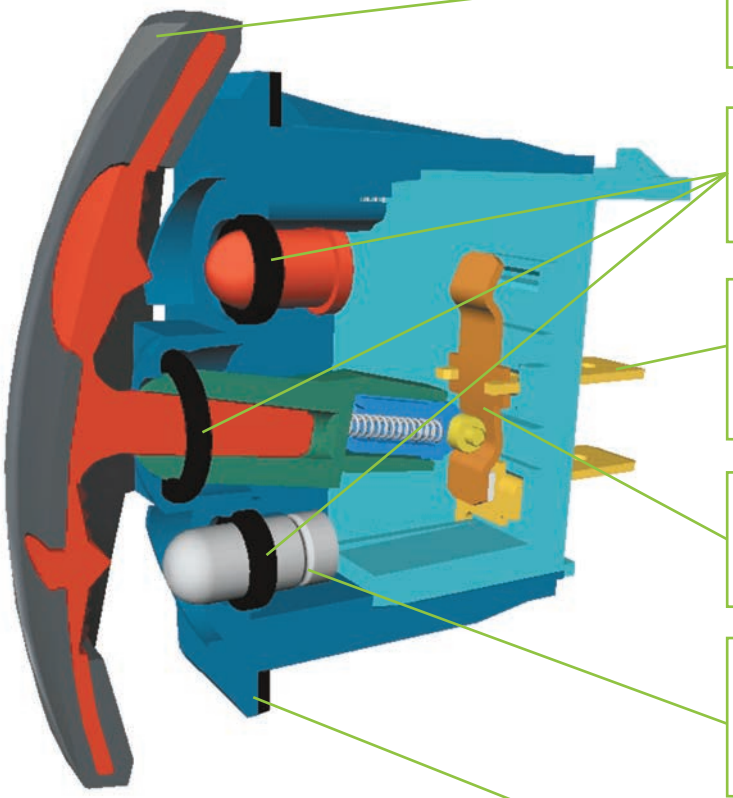


Contura V

The symmetrically curved Contura V actuator provides the perfect complement to the Contura IV's "Shape to create a Shape" design concept. With its flush style mounting bracket, Contura V can be mounted in between two Contura IV's, by itself, or in groups.

Contura X & XI

The raised bracket/bezel on the Contura X & XI helps prevent inadvertent actuation of the rocker, as well as preventing debris from being trapped under the actuator. Both The Contura X concave rocker and the convex style Contura XI are available with a variety of lenses and legends.



MAXIMUM DESIGN OPTIONS WITH MINIMUM INVENTORIES

Panel redesign is a snap, requiring no tooling change, with our removable interchangeable actuators. A unique balance between aesthetics and functionality.

SEALS OUT WATER, DUST AND DEBRIS

Dual seal protection locks out elements. Certified to IP66/IP68 for front panel components.

CLEAN CONNECTIONS

Offered in both eight and ten terminal base options to accommodate most any circuit need. AMP & Packard compatible connectors available.

WITHSTANDS EXTREME TEMPERATURES

Roller pin mechanism eliminates need for lubricants, so it can withstand from -40°C to +85°C.

MULTIPLE LIGHTING OPTIONS

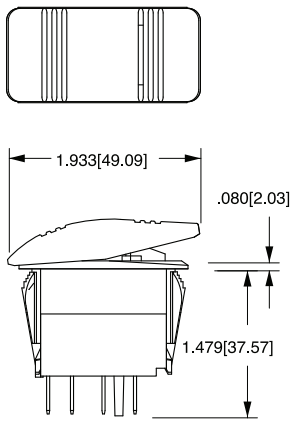
Incandescent lamps & LED lighting. Our LED illumination is offered in a wide array of light intensities, colors, as well as dual level, tri-color, and flashing options.

OPTIONAL PANEL SEAL

Helps prevent water/dust ingress behind panel.

DIMENSIONAL SPECIFICATIONS: IN. [MM]

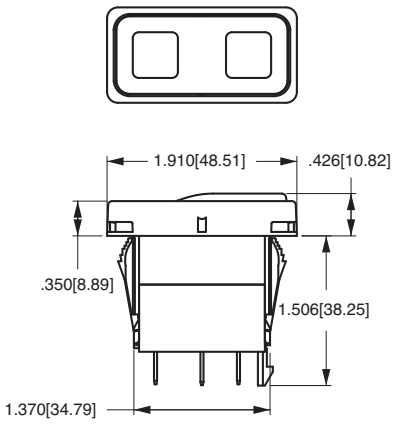
CONTURA II & III STYLE



8 TERMINAL BASE
W/O BARRIERS

CONTURA X & XI STYLE

SHOWN WITH RAISED BRACKET AND TWO SQUARE LENSES



10 TERMINAL BASE
W/O BARRIERS

Electrical

Contact Rating.....0.4VA @ 24VDC (MAX) resistive
15 amps, 125VAC
10 amps, 250VAC
1/2 HP 125-250VAC
20 amps, 4-14VDC
15 amps, 15-28VDC
10A, 14VT
6A, 125VAC L
Dielectric Strength.....1500 Volts RMS
Insulation Resistance .....50 Megaohms
Initial Contact Resistance...10 milliohms max. @ 4VDC
Life .....50,000- 100,000 cycles
circuit dependent
Contacts.....Silver alloy, silver tin-oxide, fine silver
Terminals.....Brass or copper/silver plate 1/4" (6.3mm) Quick Connect terminations standard. Solder lug, Wire Lead

Mechanical

Endurance.....150,000 cycles minimum

Physical

Lighted.....Incandescent - rated 10,000 hours
Neon - rated 25,000 hours
LED - rated 100,000 hours 1/2 life (LED is internally ballasted for voltages to 24VDC)
Seals.....Internal
Optional external gasket panel seal
Base .....Polyester blend rated to 125°C with a UL flammability rating of 94V0.
Contura II, III, IV, V, VI
Actuator .....Hard Surface: Basic actuator structure molded of thermoplastic polycarbonate with a hard Nylon 66 thermoplastic surface overlay. Soft Surface: Basic actuator structure molded of thermoplastic polycarbonate with an elastomer overlay.
Contura X, XI, XII
Actuator, VP .....Nylon 66 Reinforced rated to 105°C
Lens .....Polycarbonate rated at 100°C

Actuator Travel (Angular Displacement)

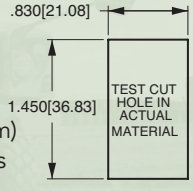
2 position.....18°
3 positions .....9° from center

Mounting Specifications

Panel Thickness Range

# of gaskets	Acceptable Panel Thickness
0	030 to .250 (.76mm to 4.76mm)
1	030 to .109 & .147 to .157 (.76 to 2.77mm & 3.73 to 3.98mm)

Recommended: No gasket with panel thickness of .032, .062, .093, .125,.187 or .250



SWITCH MOUNTING HOLE

Agency Certifications

Environmental

Environmental.....Sealed version: IP68, in accordance with IEC 529, BS 5490, DIN 400 50 & NFC 20 010. This rating applies to front panel components of the actual switch only, and signifies protection against dust and the prolonged effects of immersion under pressure. The standard test for immersion under pressure requires submersion under one meter of water for 30 minutes. The V-Series switch has exceeded these parameters, having been actuated and illuminated during submersion.
Corrosion .....Flowing Mixed Gas (FMG)
Class III 3 year accelerated exposure per ASTM B-827, B-845
Silver and gold contacts
Operating Temperature.....-40°C to + 85°C
Vibration 1.....Per Mil-Std 202F, Method 204D Test Condition A 0.06 DA or 10G's 10-500 Hz. Tested with VCH connector. Test criteria - No loss of circuit during test and pre and post test contact resistance.
Vibration 2.....Resonance search
24-50 Hz 0.40 DA
50-2000 ±10 G's peak
Results Horizontal Axis 3-5 G's max.
Random

24 Hz	0.06 PSD-Gsq/Hz
60 Hz	0.50
100 Hz	0.50
200 Hz	0.025
2000 Hz	0.025

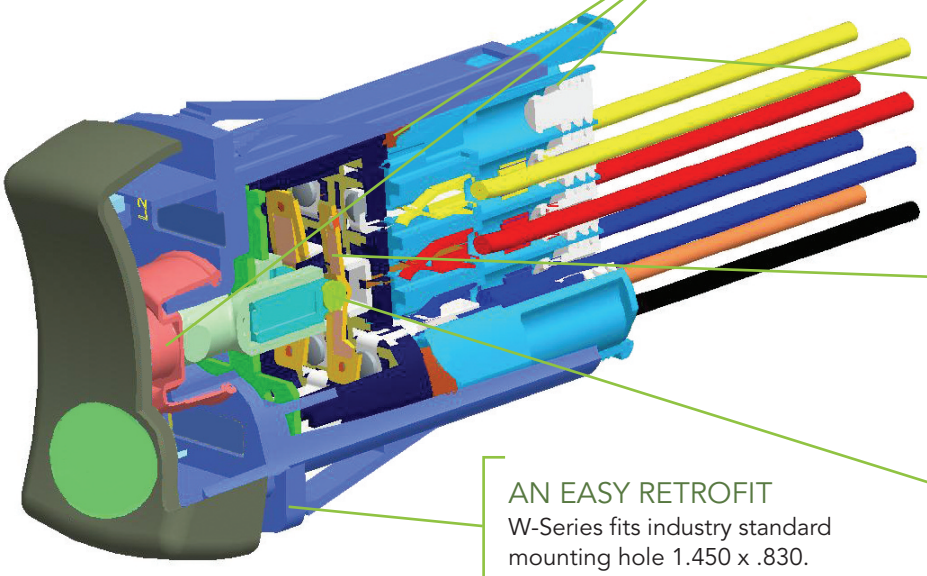
No loss of circuit during test; <10µ seconds chatter.
Shock.....Per Mil-Std 202F, Method 213B, Test Condition K @ 30G's. Tested with VCH connector. Test criteria - No loss of circuit during test, pre and post test contact resistance.
Salt Spray .....Per Mil-Std 202F, Method 101D, Test Condition A, 48 Hrs. Sealed version only.
Dust.....Per Mil-Std 810C, Method 510.2 Air Velocity 300 ±200 Feet/Min, Test Duration 16 Hrs.
Thermal Shock .....Per Mil-Std 202F, Method 107F, Test Cond. A, -55°C to 85°C. Test criteria - pre and post test contact resistance
Moisture Resistance .....Per Mil-Std 202F, Method 106F, Test Criteria - pre and post test contact resistance
Ignition Protection .....All Contura switches with sealed construction meet the requirements of UL1500/ISO8846 for ignition protection, in addition to conformance with EC directive 94/25/EC for marine products.

W-Series Fully Sealed Rocker Switches

Carling Technologies set the standard for performance, reliability and aesthetics with the widely successful, often imitated, but never duplicated, V-Series rocker switches. Building further upon that platform, Carling has once again raised the bar with the fully sealed W-Series. The W-Series traditional appearance features complete IP68 protection, even below the panel, where the critical connection is made from your wiring harness. When used in conjunction with the integrated connector, the totally submersible W-Series provides a seal for up to ten individual wires, assuring compatibility with even the most complex circuitry.

The W-Series also offers a wide variety of accoutrements including endless illumination options featuring dual level and multicolor LEDs, progressive and hazard warning circuits, ratings up to 10A 24V, choice of paddle, rocker, locking or laser etched actuators, hundreds of standard legend choices and the electrical performance and reliability that is the hallmark of Carling Technologies products.

Typical Vehicles Applications: Amphibious, Special Task, Armored, SWAT/Assault, Law Enforcement, Mobile Crime Lab, Security and Medical Vehicles.



TRI-SEAL DESIGN

Affords IP68 protection for the entire switch including teminals and connector.

CONNECTOR WITH TWIN LOCKING TABS

Provides sealed water tight connections as well as simple removal using only your hands.

PROVEN SWITCH MECHANISM

Butt-Action contacts are available in a wide variety of circuitry and platings to accommodate most any application.

FUNCTIONALITY UNDER EXTREME CONDITIONS

Roller pin mechanism is lubricant free, withstanding temperatures from -40°C to +85°C.

AN EASY RETROFIT

W-Series fits industry standard mounting hole 1.450 x .830.

Electrical

Contact Rating.....0.4VA @ 24VDC
10 amps, 3-24VDC
Dielectric Strength.....1500 Volts RMS
Insulation Resistance .....50 Megaohms
Initial Contact Resistance...10 milliohms max. @ 4 VDC
Life .....100,000 cycles
Contacts.....Silver tin-oxide, 88/12
Terminals.....Copper with silver or gold plating. Quick Connect terminations.
Voltage.....3-24 VDC
Overcurrent.....15A for 50 cycles

Mechanical

Endurance.....250,000 cycles minimum

Physical

Lighted.....LED - rated 100,000 hours 1/2 life (LED is internally ballasted for voltages to 24 VDC)
Seals.....Neoprene
Base .....Polyester blend rated to 125C with a UL flammability rating of 94V0.
Actuator .....Basic actuator structure molded of thermoplastic polycarbonate with a hard Nylon 66 thermoplastic surface overlay.
Lens .....Polycarbonate rated at 100°C
Function.....2 & 3 Position Rocker Style
Operation .....Maintained & Momentary
Base .....PA 6/6 30GF (glass filled)
Actuator .....PA 6/6 13GF
Bracket.....PBT 10GF
Connector.....PBT 10GF, polarized

Actuator Travel (Angular Displacement)

24° full throw

Environmental

Environmental.....IP68, Fully sealed
Corrosion/
Chemical Splash .....Flowing Mixed Gas (FMG) Class III 3 year accelerated exposure per ASTM B-827, B-845
Operating Temperature.....-40°C to +85°C, 22 cycles, 300 hours
Vibration 1 .....Per Mil-Std 202F, Method 204D Test Condition A 0.06 DA or 10G's 10-500 Hz.
Vibration 2 .....Resonance search
24-50 Hz 0.40 DA
50-2000 ±10 G's peak
Results Horizontal Axis 3-5 G's max.
Random

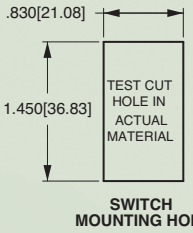
24 Hz	0.06 PSD-Gsq/Hz
60 Hz	0.50
100 Hz	0.50
200 Hz	0.025
2000 Hz	0.025

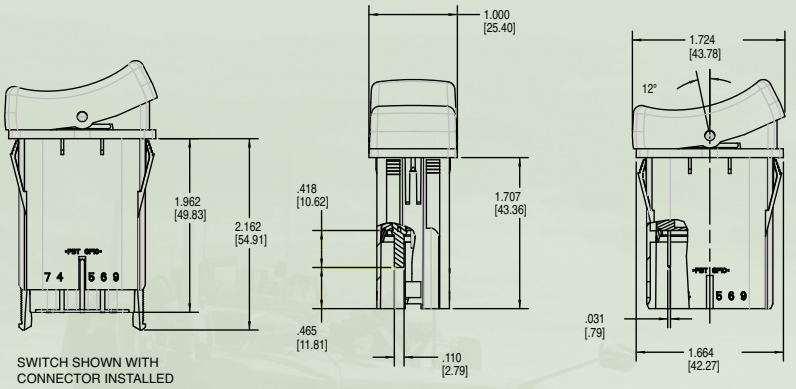
Handling/Drop.....One meter onto concrete floor
Salt Spray.....Per Mil-Std 202F, Method 101D, Test Condition A, 48 Hrs.
Dust IP6X
Thermal Shock .....Per Mil-Std 202F, Method 107F, Test Condition A, -55°C to 85°C. Test criteria - pre and post test contact resistance
Moisture Resistance/
Humidity .....Per Mil-Std 202F, Method 106F, Test Criteria - pre and post test contact resistance

Mounting Specifications

Panel Thickness Range .032 to .125

For optimum panel fit, the following panel thicknesses are suggested:
.032, .062, .093, .125





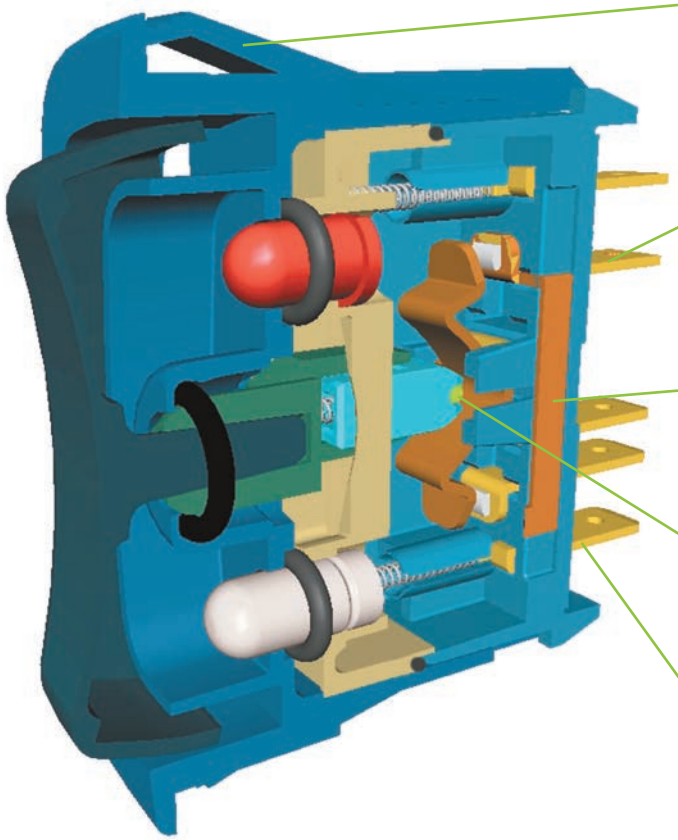
DIMENSIONAL SPECIFICATIONS: IN. [MM]

Notes:
WCH connector is intended for use with Tyco/Amp .110 Junior Power Timer, female contacts, and wire seals. For 14-16 awg wire, specify Tyco/Amp P/N 927766-3. For 16-20 awg wire, specify Tyco/Amp P/N 927770-3. Tyco/Amp cable seal P/N 828904-1 (20-18 awg wire) or P/N 828905-1 (16-14 awg wire) is revquired for each individual wire lead, and Tyco/Amp cable plug, P/N 828922-1, is required to seal each unused connector opening. Consult Tyco/Amp for the cable seal recommended for your specific wire gauge and thickness.

L-Series Sealed Switches

Making the right connections has never been easier — with the L-Series Rocker Switch from Carling Technologies. Not only does this innovative switch offer total design flexibility, it has set new standards for both performance and reliability. It's IP67 certified, and able to withstand temperatures from -40°C to +85°C. A 12 terminal switch base accommodates countless switch and lamp circuit combinations. Additional features include LED illuminated lenses or laser etched rockers, as well as hundreds of legend choices and several accessories.

Typical Vehicles Applications: Amphibious, Special Task, Armored, SWAT/Assault, Law Enforcement, Mobile Crime Lab, Security and Medical Vehicles.



ELIMINATES NEED FOR RETOOLING

Neatly proportioned, our L-Series fits an industry standard mounting hole of 1.734" x .867" (44.0 mm x 22.0 mm).

INTEGRATES EASILY INTO YOUR SYSTEM

You can choose from a variety of termination options, including .250 TAB QC & .187 TAB QC. Optional connector allows for prewiring of wire harnesses.

ENSURES GREATER SHOCK PROTECTION

Welded lamp connection and one-piece internal, jumperless terminal withstand extreme shock and vibration.

WITHSTANDS EXTREME TEMPERATURES

Roller pin mechanism eliminates need for lubricants, so it can withstand from -40°C to +85°C.

MAXIMIZES YOUR DESIGN FLEXIBILITY

Twelve terminals offer you an extensive range of switch and lamp circuit options, including LED or incandescent illumination.

Electrical

Contact Rating	0.4VA @ 24VDC (MAX) resistive, 15 amps, 125VAC, 10 amps, 250VAC, 20 amps, 4-14VDC, 15 amps, 15-28VDC
Dielectric Strength	1250 Volts RMS between pole to pole, 3750 Volts RMS between live parts and accessible surfaces
Insulation Resistance	50 Megaohms
Initial Contact Resistance	10 milliohms max. @ 4VDC
Life	100,000 cycles maintained, 50,000 cycles momentary at rated voltage and current
Contacts	90/10 silver-nickel, silver tin-oxide, gold
Terminals	Brass or copper/silver plate 3/16" (4.76mm) & 1/4" (6.3mm) Quick Connect terminations standard.

Mechanical

Endurance	250,000 cycles minimum

Physical

Lighted	Incandescent - rated 10,000 hours LED - rated 100,000 hours 1/2 life (LED is internally ballasted for voltages to 24 VDC)
Seals	Rocker, base & bracket are sealed.
Base	Nylon 66 GF rated to 85°C with a flammability rating of 94V0.
Rocker	Nylon 66 Reinforced, rated to 105°C (modular lens). Locking rocker, standard rocker & paddle. Laser etching with a polycarbonate actuator.
Lock	Acetal
Lens	Polycarbonate rated at 100°C.
Bracket	Nylon Zytel
Connector	Nylon 66 rated at 85°C. Polarized.

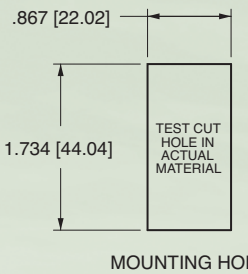
Actuator Travel (Angular Displacement)

2 position	26°
3 positions	13° from center

Environmental

Environmental	IP67 for above panel components of the actual switch, representing an index of protection as applied to electrical equipment in accordance with IEC 529, BS 5490, DIN 400 50 & NFC 20 010.
Corrosion Resistance	Mixed Flowing Gas MFG Class III per ASTM B-827 & B-845, Method H, with 3 years exposure.
Operating Temperature	-40°C to + 85°C
Vibration 1	Per Mil-Std 202F, Method 204D Test Condition A 0.06 DA or 10G's 10-500 Hz. Tested with VCH connector. Test criteria - No loss of circuit during test and pre and post test contact resistance.
Vibration 2	Resonance search 24-50 Hz 0.40 DA50-2000 ±10 G's peak. Results Horizontal Axis 3-5 G's max. Random 24 Hz 0.06 PSD-Gsq/Hz 60 Hz 0.50 100 Hz 0.50 200 Hz 0.025 2000 Hz 0.025 No loss of circuit during test; <10µ chatter.
Shock	Per Mil-Std 202F, Method 213B, Test Condition K @ 30G's. Tested with VCH connector. Test criteria - No loss of circuit during test, pre, and post test contact resistance.
Salt Spray	Per Mil-Std 202F, Method 101D, Test Condition A, 48 Hrs.
Thermal Shock	Per Mil-Std 202F, Method 107F, Test Condition A, -55°C to 85°C. Test criteria - pre and post test contact resistance.
Moisture Resistance	Per Mil-Std 202F, Method 106F, Test Criteria - pre and post test contact resistance.

Mounting Specifications

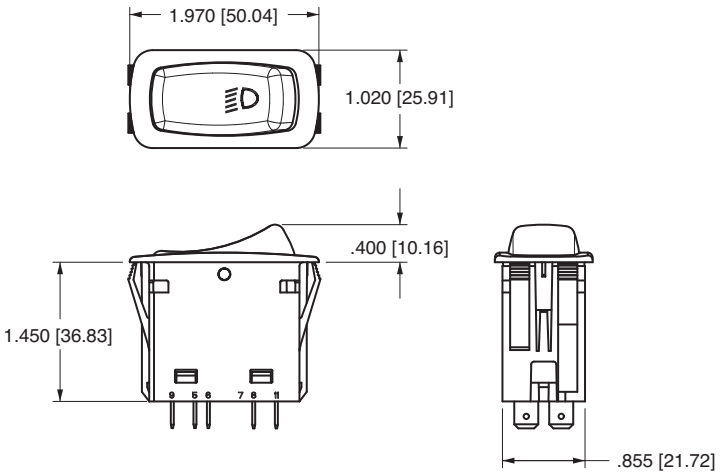


MOUNTING HOLE

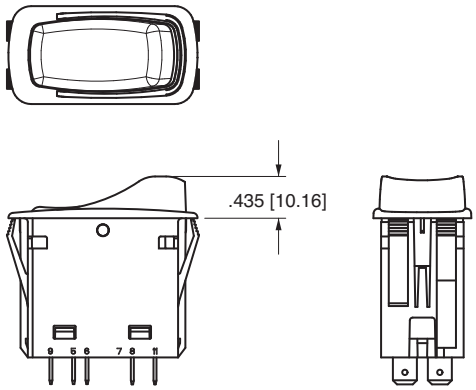
Panel Thickness Range
Acceptable Panel Thickness
.030 to .156 (.76mm to 3.96mm)
Recommended:
.030, .062, .093, .125 and .156

DIMENSIONAL SPECIFICATIONS: IN. [MM]

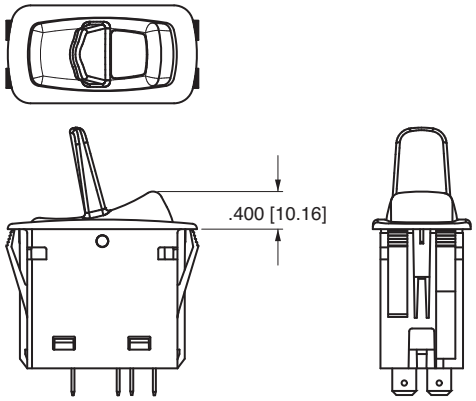
L-SERIES
SHOWN WITH LASER ETCHED ACTUATOR



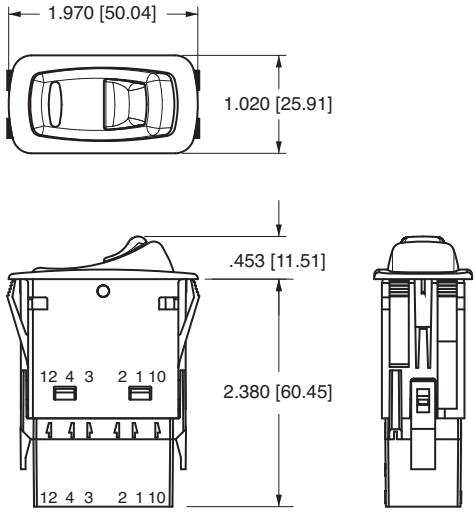
L-SERIES
SHOWN WITH ROCKER GUARD



L-SERIES
SHOWN WITH LARGE LENS AND PADDLE ACTUATOR

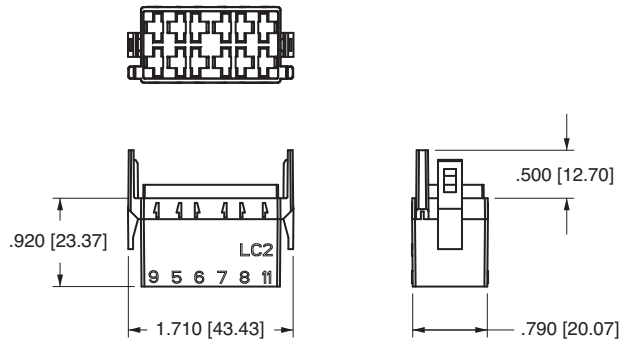


L-SERIES
SHOWN WITH BAR LENS, LOCK AND CONNECTOR



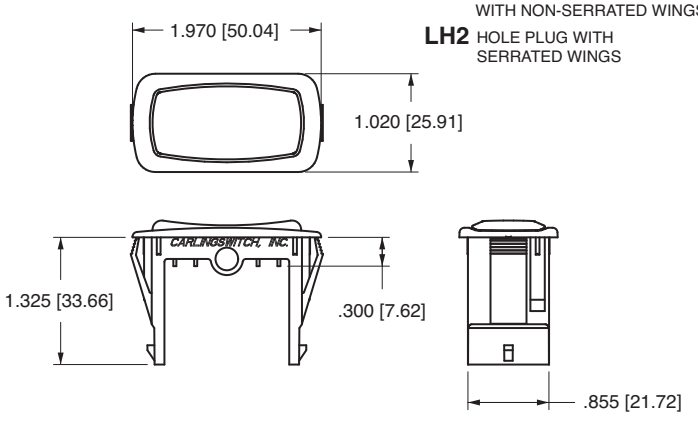
L-SERIES
CONNECTOR

LC1-01 BLACK .250 TAB CONNECTOR (PACKARD 630 SERIES)
LC2-01 BLACK .187 TAB CONNECTOR (PACKARD 480 SERIES)
LC3-01 BLACK .250 TAB CONNECTOR (AMP ONLY)



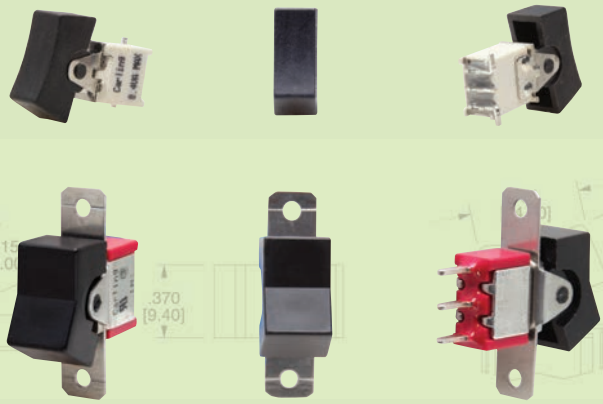
L-SERIES
HOLE PLUG

LH1 REMOVABLE HOLE PLUG WITH NON-SERRATED WINGS
LH2 HOLE PLUG WITH SERRATED WINGS



1-Series Miniature/ Sub-Miniature Switches

Typical Equipment Applications: Communication, GPS Tracking, Radar, Mobile Medical, and Audio/Visual Equipment



Specifications

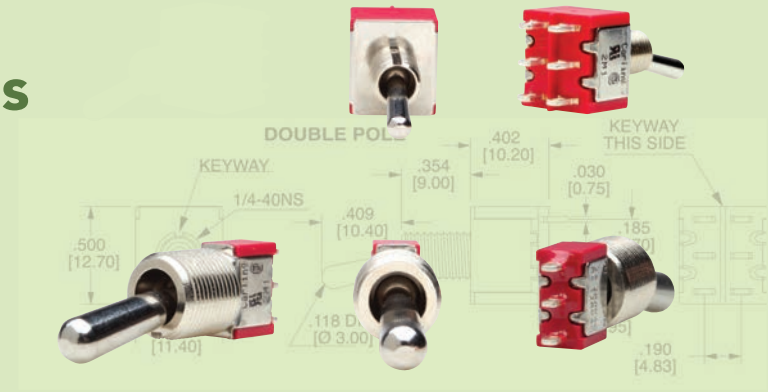
Electrical Life	**1S1-Series:** 30,000 make & break cycles @ full load **1SS & 1SM-Series:** 50,000 make & break cycles @ full load **1M1-Series:** 50,000 make & break cycles @ full load **1MS-Series:** 30,000 make & break cycles @ full load
Contact Resistance	**1S-Series:** 20 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts **1M-Series:** 10 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts
Insulation Resistance	1000 MΩ min.
Dielectric Strength	1500 Volts RMS @ sea level
Operating Temperature	-30°C to +85°C
Index of Protection	**1SS & 1SM-Series:** IP67 **1MS-Series:** IP67
Solder Heat Resistance	MIL-STD-202, Method 210
Actuator Travel	25°

Materials

Case	all UL 94V-0 **1S1-Series:** Dially phthalate (DAP) **1SS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized **1SM-Series:** Glass filled nylon 4/6, flame retardant, heat stabilized **1M1-Series:** Dially phthalate (DAP) (UL 94V-0) **1MS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL 94V-0)
Rocker	**1S1-Series:** Nylon (UL 94V-0) **1SS & 1SM-Series:** Nylon, black standard, internal o-ring sealed
Rocker/Paddle	**1M1-Series:** Nylon (UL 94V-0) 1MS-Series: Nylon, black standard, internal o-ring sealed
Bushing	**1S1-Series:** Brass, nickel plated **1SS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL 94V-0) **1SM-Series:** Glass filled nylon 4/6, flame retardant, heat stabilized **1M1-Series:** Brass, nickel plated **1MS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL94V-0)
Housing	**1S1-Series:** Stainless Steel **1M1-Series:** Stainless Steel **1MS-Series:** Spring Steel
Bracket	**1M1-Series:** Stainless Steel **1MS-Series:** Nylon (UL 94V-0)
Actuator Pivot Retainer	**1MS-Series:** Stainless Steel
Switch Support	Brass, tin plated
Terminal Seal	Epoxy

2-Series Miniature/ Sub-Miniature Switches

Typical Equipment Applications: Communication, GPS Tracking, Radar, Mobile Medical, and Audio/Visual Equipment



Specifications

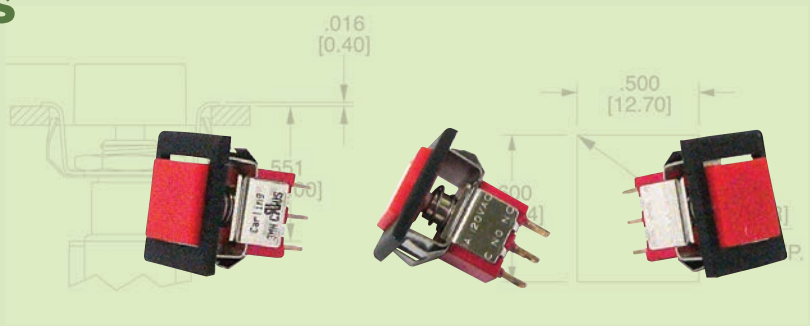
Electrical Life	**2S-Series:** 30,000 make & break cycles @ full load **2M-Series:** 50,000 make & break cycles @ full load
Contact Resistance	**2S-Series:** 20 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts **2M-Series:** 10 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts
Insulation Resistance	1000MΩ min.
Dielectric Strength	1500 Volts RMS @ sea level
Operating Temperature	-30°C to +85°C
Index of Protection	**2SS & 2SM-Series:** IP67 **2MS-Series:** IP67
Solder Heat Resistance	MIL-STD-202, Method 210
Actuator Travel	25°

Materials

Case	all UL 94V-0 **2S1-Series:** Dially phthalate (DAP) **2SS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized **2SM-Series:** Glass filled nylon 4/6,flame retardant, heat stabilized **2M1-Series:** Dially phthalate (DAP) **2MS & 2M2-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized
Toggle	**2S1-Series:** Brass, chrome plated **2SS & 1SM-Series:** Brass, chrome plated or nylon, internal o-ring sealed **2M1-Series:** Brass, chrome plated **2MS & 2M2-Series:** Brass, chrome plated or nylon, internal o-ring sealed
Bushing	**2S1-Series:** Brass, nickel plated **2SS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL 94V-0) **2SM-Series:** Glass filled nylon 4/6, flame retardant, heat stabilized (UL 94V-0) **2M1-Series:** Brass, nickel plated **2MS & 2M2-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL 94V-0)
Housing	Stainless Steel
Switch Support	Brass, tin plated
Terminal Seal	Epoxy

3-Series Miniature/Sub-Miniature Pushbutton Switches

Typical Equipment Applications: Communication, GPS Tracking, Radar, Mobile Medical, and Audio/Visual Equipment



Specifications

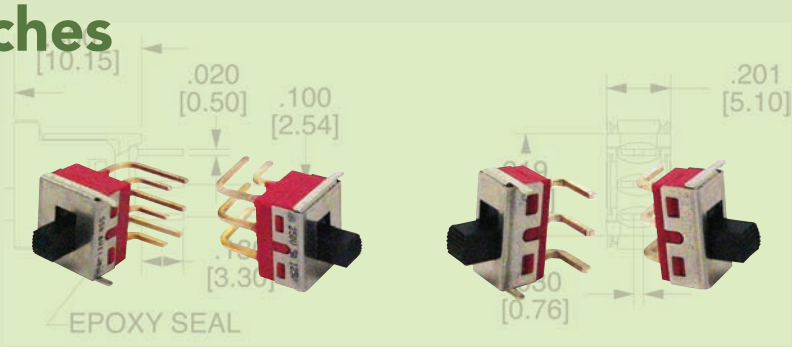
Electrical Life	50,000 make & break cycles @ full load
Contact Resistance	**3SM & 3SS Series:** 20 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts **3MN & 3MA-Series:** 10 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts **3MS-Series:** 50 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts
Insulation Resistance	1000 MΩ min.
Dielectric Strength	1500 Volts RMS @ sea level
Operating Temperature	-30°C to +85°C
Index of Protection	**3SS & 3SM-Series:** IP67 **3MS-Series:** IP68
Cap Installation Support	**3MS-Series:** 10 lbs. max.
Solder Heat Resistance	MIL-STD-202, Method 210
Actuator Travel	25°

Materials

Case	UL 94V-0 **3S1-Series:** Dially phthalate (DAP) **3SS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized **3SM-Series:** Glass filled nylon 4/6, flame retardant, heat stabilized **3MN & 3MA-Series:** Dially phthalate (DAP) (UL 94V-0) **3MS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL 94V-0)
Plunger	**3S1-Series:** Thermoplastic polyester, black **3SS-Series:** Thermoplastic polyester (UL 94V-0), with internal o-ring seal **3SM-Series:** Glass filled nylon 4/6, flame retardant, heat stabilized **3MN-Series:** Thermoplastic polyester, black **3MS & 3MA-Series:** Glass filled nylon or glass filled polyester (UL 94V-0)
Bushing	**3S1-Series:** Brass, nickel plated **3SS-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL 94V-0) **3SM-Series:** Glass filled nylon 6/6, flame retardant, heat stabilized (UL 94V-0) **3MN-Series:** Brass, nickel plated **3MA-Series:** Zinc, nickel plated
Housing	**3SM & 3SS-Series:** Stainless Steel **3MN & 3MA-Series:** Stainless Steel
Switch Support	**3SM & 3SS-Series:** Brass, tin plated **3MS-Series:** Stainless Steel
Terminal Seal	Epoxy

4-Series Sub-Miniature & Miniature Slide Switches

Typical Equipment Applications: Communication, GPS Tracking, Radar, Mobile Medical, and Audio/Visual Equipment



Specifications

Electrical Life.....30,000 make & break cycles @ full load
Contact Resistance .....10 mΩ max. initial @ 2-4 VDC 100mA for both silver & gold plated contacts
Insulation Resistance .....1000 MΩ min.
Dielectric Strength.....1500 Volts RMS @ sea level
Operating Temperature.....-30°C to +85°C
Solder Heat Resistance.....MIL-STD-202, Method 210
Actuator Travel.....25°

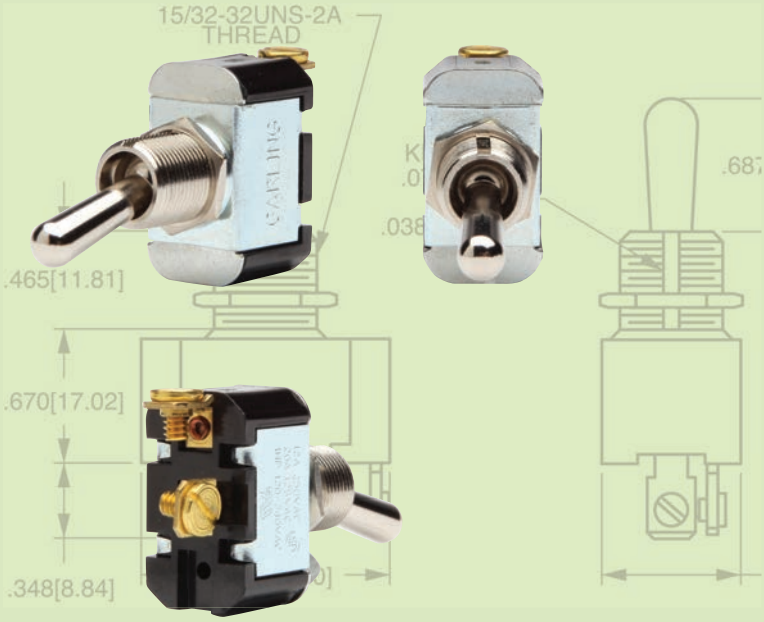
Materials

Case.....Dially phthalate (DAP) (UL 94V-0)
Slide Handle .....Nylon
Housing .....Stainless Steel
Terminal Seal .....Epoxy

F-Series Single Pole Toggle Switches

General purpose workhorses with options tailored to meet most any need. Ratings to 20A 277VAC, various actuator, bushing, termination, and circuit choices allow this versatile switch to easily integrate into a variety of different applications. The F-Series has a storied history in the Marine, Food Service, Generator, Industrial Control, and Office Automation markets and is appropriate for usage in low voltage DC applications as well.

Typical Applications: Military/Special Forces Vehicle Controls, Auxiliary Lighting Compressors, General Purpose Control Needs.

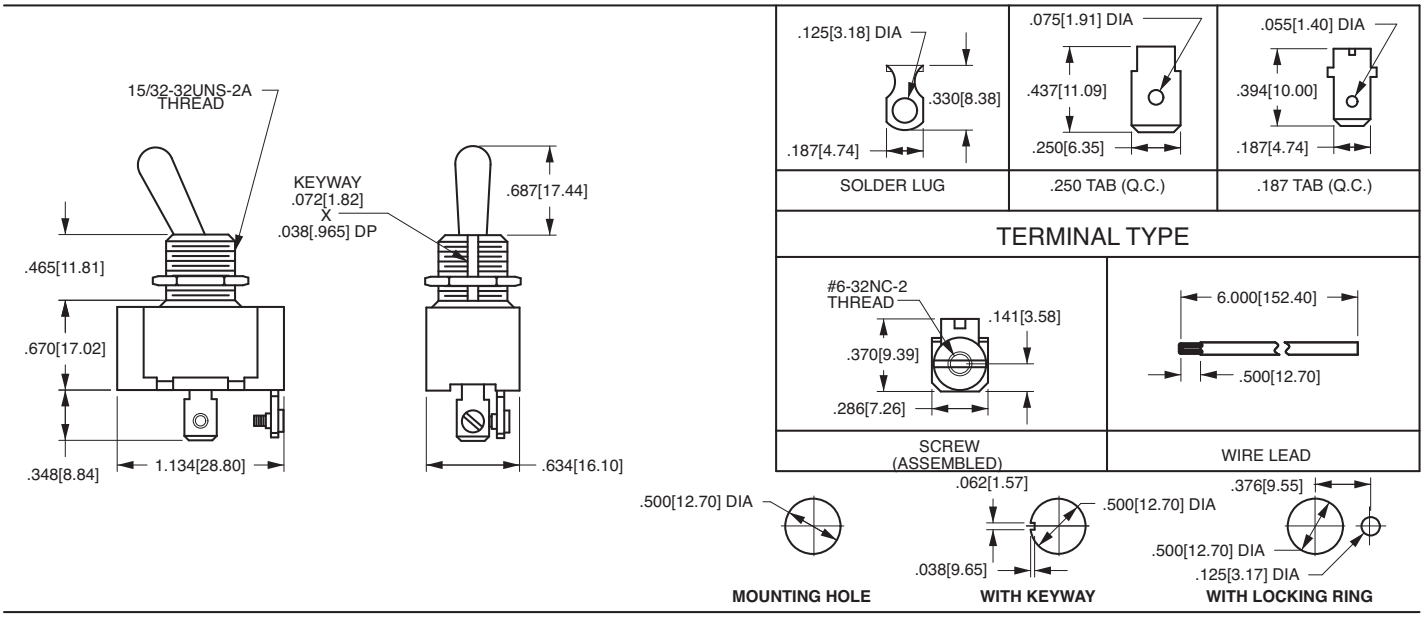


Dielectric Strength
UL/CSA:
1000V - live to dead metal parts

Electrical Life
50,000 cycles- maintained
25,000 cycles- momentary

Mechanical Life
100,000 cycles

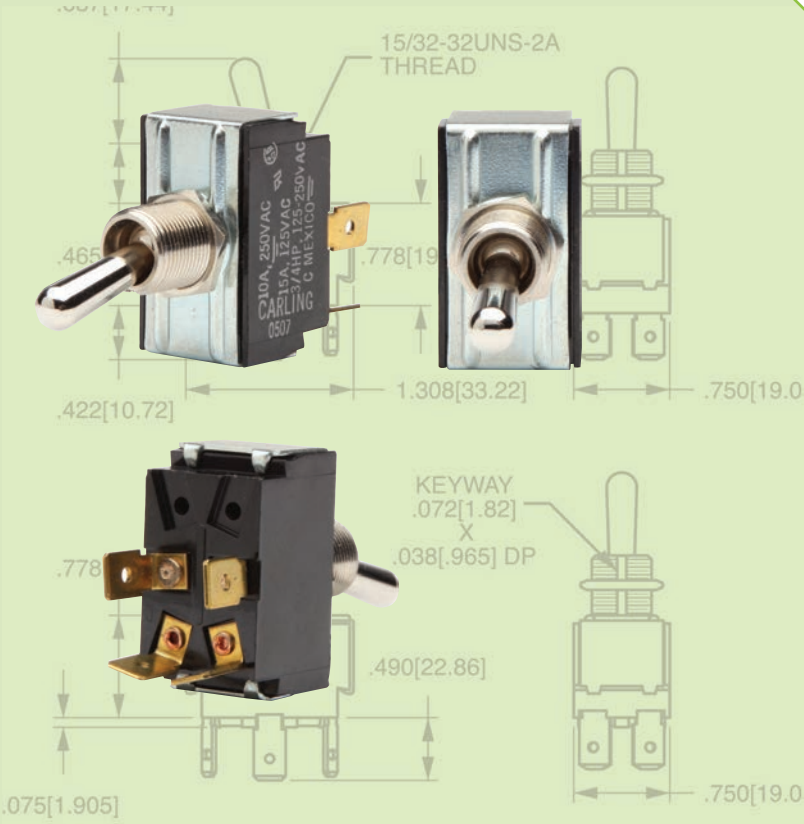
Operating Temperature
0°F to 150°F (-17.8°C to +65.6°C)



G-Series Toggle Switches

General purpose toggle switches with options tailored to meet almost any need. Features such as ratings to 20A 277VAC, international approvals, various actuators, bushing, termination, and circuit choices allow this toggle switch to be easily integrated into a variety of different applications.

Typical Applications: Military/Special Forces Vehicle Controls, Auxiliary Lighting Compressors, General Purpose Control Needs.

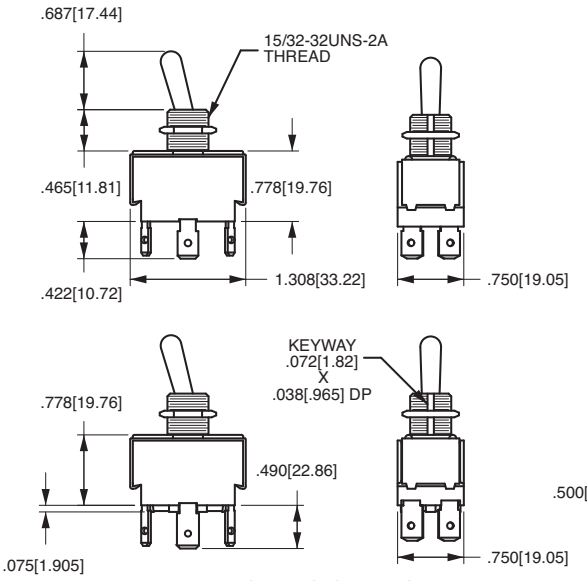


Dielectric Strength
UL/CSA: 1000V - live to dead metal parts & opposite polarity VDE: 4000V - live to dead metal parts; 1250V - opposite polarity & across open contacts

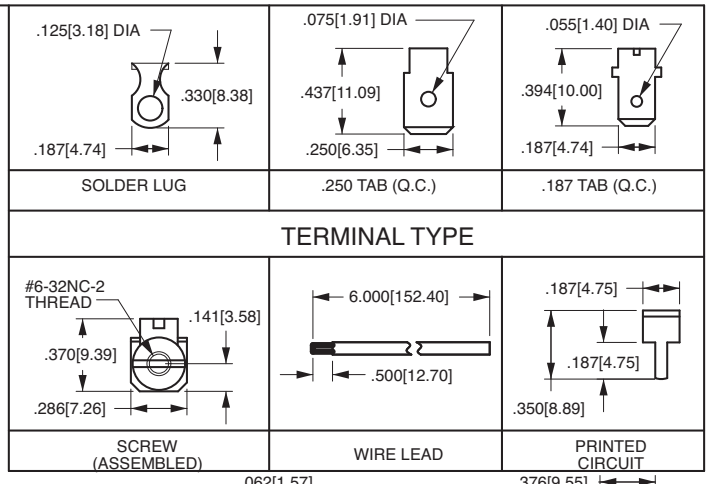
Electrical Life
50,000 cycles- maintained
25,000 cycles- momentary

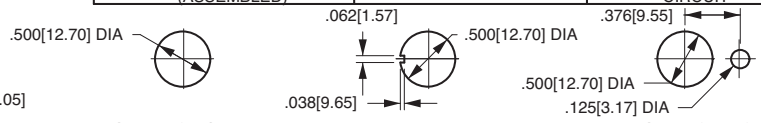
Mechanical Life
100,000 cycles

Operating Temperature
32°F to 185°F (0° to 85°C)



IEC APPROVED CONSTRUCTION





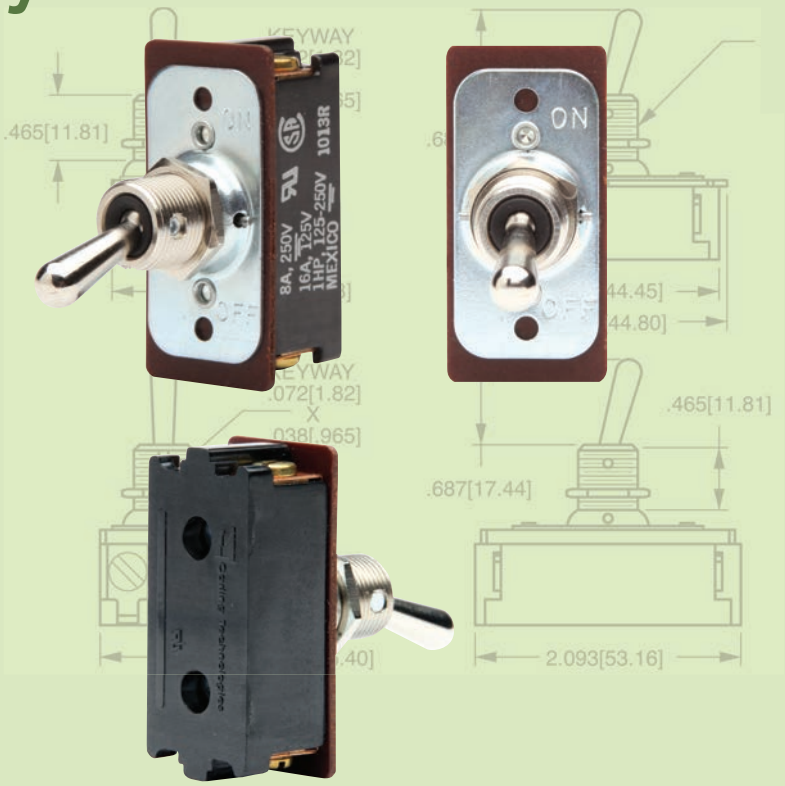
DK/EK-Series Heavy Duty Toggle Switches

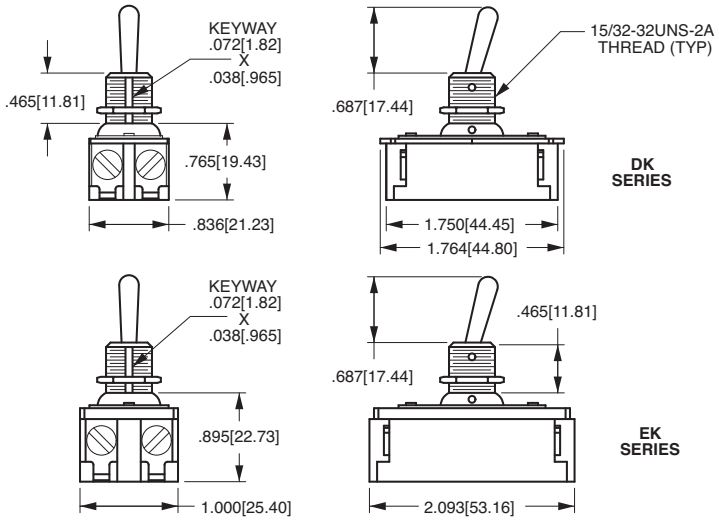
The switch that can handle your heavy duty requirements. Single or double pole with wire lead or screw terminations, and ratings to 20A 125V 10A 250V, the ac/dc DK/EK-Series is the most heavy duty toggle switch in the Carling line. Its sturdy metal construction and stiff actuation force will withstand the abuses of virtually any stringent application. The quick make/quick break contact mechanism is ideal for high voltage DC applications. The DK/EK-Series has long been a staple of the Industrial Motor control and General Purpose market segments.

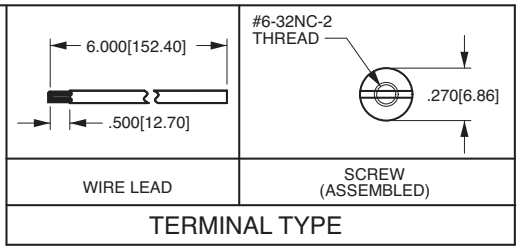
Typical Applications: General Purpose High Circuit, High Voltage AC/DC Controls, Motor Controllers

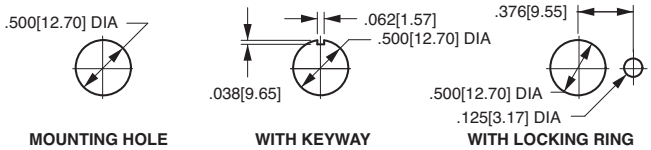
Dielectric Strength
UL/CSA: 1000V - live to dead metal parts & opposite polarity
Electrical Life
25,000 cycles

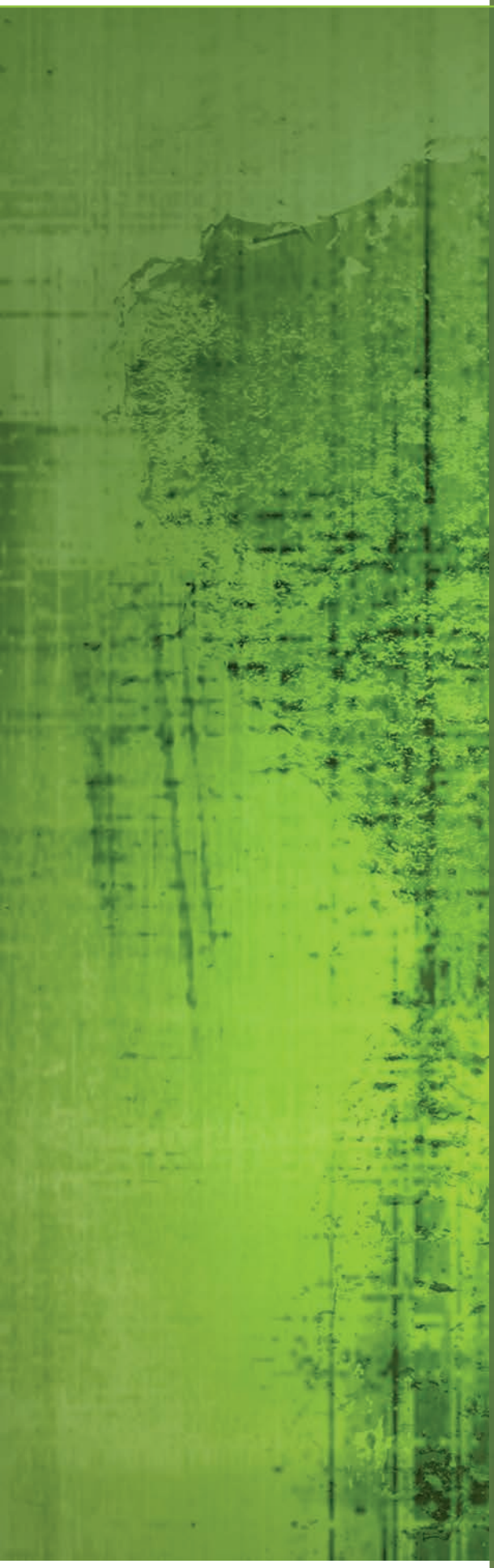
Mechanical Life
100,000 cycles
Operating Temperature
0°F to 150°F (-17.8°C to +65.6°C)











Carling Technologies™

Innovative Designs. Powerful Solutions.

World-Wide
Corporate Headquarters
60 Johnson Avenue
Plainville, CT 06062
860/793-9281
Fax: 860/793-9231
E-mail: info@carlingtech.com
www.carlingtech.com

Europe/Middle East/Africa
Carling Technologies Ltd.
Devon, England
Int + 44 (0)1392-364422
Fax: Int + 44 (0)1392-364477
E-mail: ltdsales@carlingtech.com

Asia/Pacific
Carling Technologies Asia-Pacific Ltd.
Kowloon, Hong Kong
Int + 852-2737-2277
Fax: Int + 852-2736-9332
E-mail: sales@carlingtech.com.hk

Additional Carling Technologies Offices

East Region Sales Office, CT
ersm@carlingtech.com

Midwest Region Sales Office, IL
mrsm@carlingtech.com

West Region Sales Office, CA
wrsm@carlingtech.com

GmbH, Germany
gmbh@carlingtech.com

SARL, France,
sarl@carlingtech.com

Asia-Pacific Ltd., Shanghai, China
capsh@online.sh.cn

Asia-Pacific Ltd., Japan
japan@carlingtech.com

Pune, India
india@carlingtech.com

Kaohsiung, Taiwan
taiwan@carlingtech.com

Maretron

Maretron, LLC
9014 N. 23rd Avenue
Suite 10
Phoenix AZ 85021
Phone: (602) 861-1707
Fax: (602) 861-1777
sales@maretron.com
www.maretron.com

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