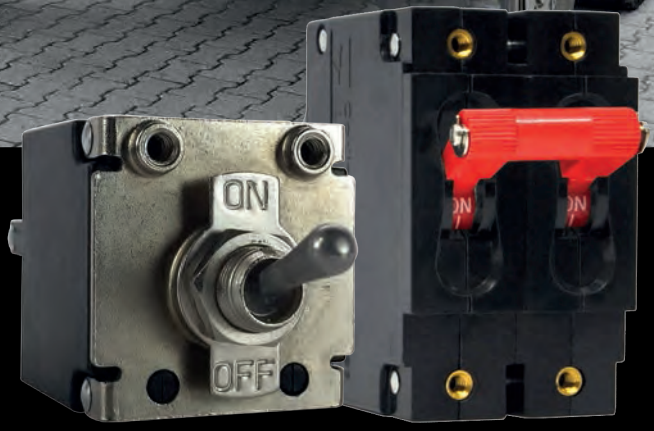
Carling Circuit Breakers

Standard Inventory Products Guide

July 2016 Edition



Carling Technologies®

Innovative Designs. Powerful Solutions.

Amelec Australia Pty Ltd is pleased to introduce our new Carling Technologies' 'Standard Inventory Products Guide' for circuit breakers July 2016 Edition.

This guide showcases a selection of the most popular circuit breaker offerings available off-the-shelf at Amelec Australia. It includes a range of Carling's superior hydraulic-magnetic protectors as well as their conventional bi-metal thermal products. Their Hy-Mag range is considered the industry standard where outstanding performance and high reliability in demanding applications is required.

Although a generous cross section is presented in this guide, it is only a small portion of the huge range of circuit breakers available from Carling Technologies. There are literally thousands of different circuit breakers available, including combinations of auxiliary and alarm outputs, series, relay or shunt trip circuits, current or voltage sensing versions, termination and illumination options, styles, colours and finishes and many, many more options.

Whatever the requirement, Carling Technologies' extensive range of switches can meet almost any application.

Contents

OPERATION

Magnetic circuit breakers provide accurate, reliable and cost effective solutions to most circuit protection applications. Carling Technologies' magnetic circuit breakers utilise a time-proven current sensing coil design connected in series with a set of contacts. Inside the coil is a special tube which contains the magnetic core. This core is suspended in a viscous fluid. When the contacts of the circuit breaker are closed, current flows through the coil inducing a magnetic field. As current increases the field strength increases accordingly and draws the magnetic core through the fluid toward the pole end. When the core reaches the pole end, maximum electro-magnetic force is achieved. An armature linked to a trip mechanism is positioned above the pole end. In an overload condition the magnetic field achieves maximum strength and subsequently attracts the armature to the pole end. This results in the activation of the tripping mechanism, which opens the contacts thus breaking the circuit.

APPLICATION

They have many advantages over thermal breakers but none of their disadvantages. The magnetic circuit breaker is considered to be temperature stable and thus is not appreciably affected by changes in ambient temperature. Its hydraulic/magnetic sensing mechanism reacts only to changes of current in the circuit being protected. It has no "warm-up" period to slow down its response to overload. It has no "cool-down" period after overload before it can be reset. The characteristics of a magnetic circuit breaker can be tailored in four separate areas: the desired circuit; the trip point (in amperes); the time delay (in seconds); and the inrush handling capacity of the breaker. These factors can be varied with relatively little impact on the short circuit capability of the breaker. These options allow excellent flexibility in choosing the proper magnetic circuit breaker for each application. All Carling Technologies' magnetic circuit breakers are designed to provide manufacturers of electrical and electronic equipment with reliable automatic circuit protection and control in a highly precise, versatile, compact, attractive and cost-effective package.

FEATURES

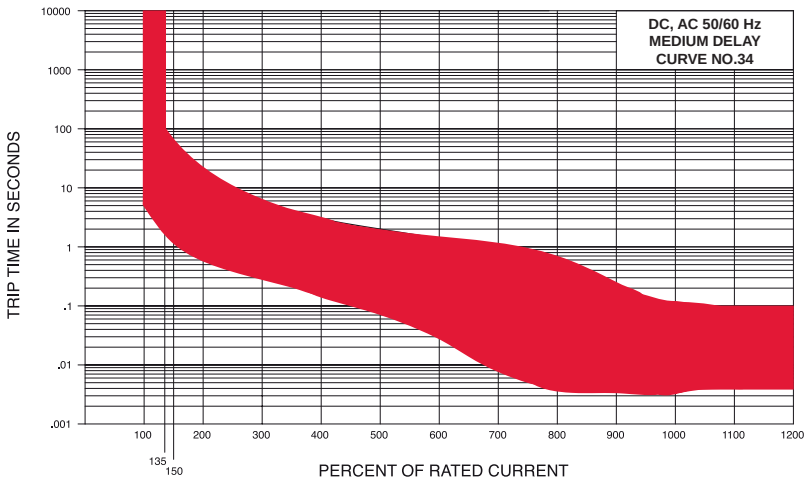
Carling Technologies' magnetic circuit breakers incorporate a host of key features making them the popular choice of marine industry professionals for many years. Following is a condensed list of the most sought after features of this range:

- A special trip-free mechanism makes it impossible to manually hold the contacts closed during overload or fault conditions. This is a highly desirable safety feature of this particular design.
- World-wide safety agency approvals are available for a multitude of applications.
- A vast range of popular current and voltage ratings available off-the-shelf with a multitude of options up to 700 Amps and 600 Volts subject to special order.
- A common trip linkage between all poles ensures that, in an overload situation, one pole will automatically trip all adjacent poles. Also a very desirable safety feature.
- Special variations, including series trip, mid-trip and switch only (with or without auxiliary switch), remote shutdown, shunt trip, relay trip and dual coil circuit options are available upon request.
- Industry standard dimensions, mounting and current ratings provide maximum application versatility and interchangeability with other brands.
- In addition to the standard, solid colour and dual colour Visi-Rocker actuators, there are a vast array of other colours available including illuminated options upon request. This provides great flexibility in design and styling for panel and switchboard builders.

Carling Technologies has long been an industry leader in the manufacture of hydraulic/magnetic circuit breakers. Our catalogue depicts the most popular versions utilised in the transport and associated industries. Details and specifications can be found on the following pages of the A, C, E, F and M-Series, which are readily available. The tables and graphs on the adjacent page represent the time delay values (trip curves) of the code numbers depicted throughout this catalogue. There are many more delay curve configurations available for specific applications, including instantaneous, ultra-short, short medium and long, in both AC and/or DC Voltage ratings. Further information is available upon request.

A, C & H Series

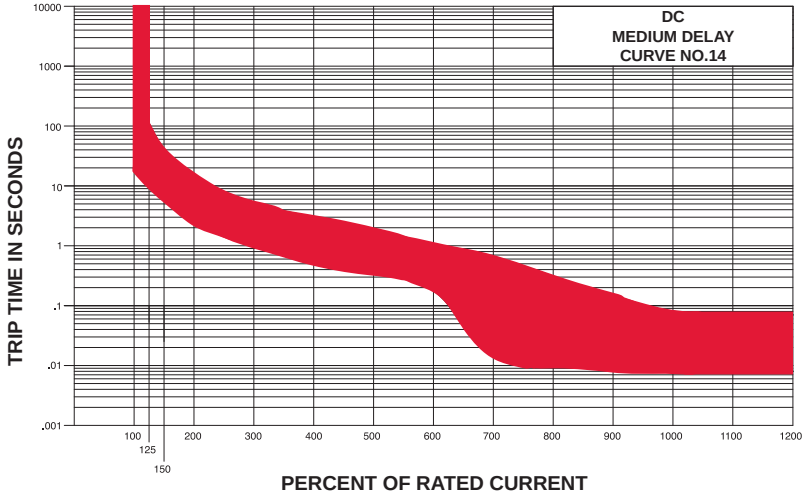
Rated Current	Trip Time (sec)
100%	NO TRIP
125%	May Trip
135%	1.80-100
150%	1.20-60.0
200%	0.60-20.0
400%	0.15-3.00
600%	.030-1.30
800%	.004-.600
1000%	.004-.110
1200%	.004-.100



Breakers to hold 100% and must trip at 135% of rated current and greater within the time limit shown in this curve.
Curve data shown represents breaker response at ambient temperature of 25°C with no preloading. Breakers are mounted in standard wall-mount position.
On 50 amp and less current ratings, the minimum inrush pulse tolerance handling capability is 12 times the rated current on standard delays and 25 times the rated current on high inrush delays. These values are based on a 60 Hz 1/2 cycle, 8 ms pulse.
High inrush delays should be specified for applications with high initial surge currents of short duration such as switching power supplies, highly capacitive and transformer loads.

F Series

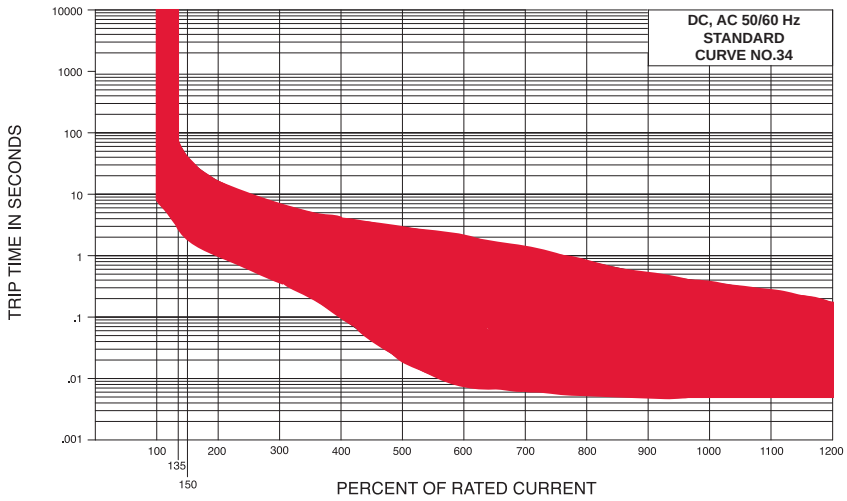
Rated Current	Trip Time (sec)
100%	NO TRIP
125%	11.0 - 110
150%	6.00 - 45.0
200%	3.00 - 18.0
400%	0.28 - 3.50
600%	.13 - 1.50
800%	.10 - .130
1000%	.009 - .090
1200%	.009 - .080



Breakers to hold 100% and must trip at 125% of rated current and greater within the time limit shown in these curves.
Curve data shown represents breaker response at ambient temperature of 25°C with no preloading. Breakers are mounted in standard wall-mount position.
The minimum inrush pulse tolerance handling capability on the above standard delays is 16 times rated current on a 60 Hz 1/2 cycle, 8 ms pulse.

M & MS Series

Rated Current	Trip Time (sec)
100%	NO TRIP
135%	3.00 - 70.0
150%	2.00 - 40.0
200%	1.00 - 15.0
400%	.100 - 4.00
600%	.008 - 2.00
800%	.006 - .800
1000%	.005 - .350
1200%	.005 - .160



Breakers to hold 100% and must trip at 135% of rated current and greater within the time limits shown in this curve.
Curve data shown represents breaker response at ambient temperature of 25°C with no preloading. Breakers are mounted in standard wall mount position.
The minimum inrush pulse tolerance handling capacity on the above standard delays is 12 times rated current based on a 60Hz, 1/2 cycle 8 ms pulse.

Fig.1

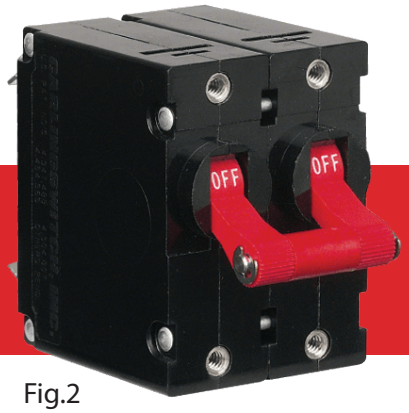


Fig.2

A-Series
Lever Actuator

Features Hy-Mag topology in small form factor
Double screw fixing prevents rotation in panel
Lever actuator provides easy, tactile operation
Fundamental design is simplistic but practical

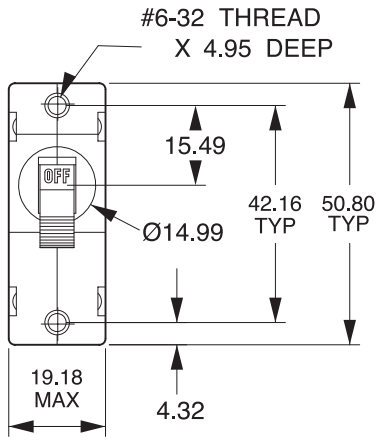
Carling Technologies' A-Series circuit breakers have long been recognised as the industry standard in marine circles. Used extensively in switchboards and panels by boat and ship builders worldwide, the A-Series is also utilised in a variety of other markets where performance is paramount, particularly in high ambient temperature environments. The standard range includes both single and double pole versions, with red handle actuators, angled screw terminals and flush rear mount fitment. A popular range of current ratings are readily available.

Code No.	Rating	Poles	Voltage	Curve	Figure
A-SERIES - LEVER ACTUATOR					
AA1B0344509G1C	5 Amps	1	80VDC / 277VAC	34	1
AA1B0346109G1C	10 Amps	1	80VDC / 277VAC	34	1
AA1B0346159G1C	15 Amps	1	80VDC / 277VAC	34	1
AA1B0346209G1C	20 Amps	1	80VDC / 277VAC	34	1
AA1B0346259G1C	25 Amps	1	80VDC / 277VAC	34	1
AA1B0346309G1C	30 Amps	1	80VDC / 277VAC	34	1
AA1B0346409G1C	40 Amps	1	65VDC / 125VAC	34	1
AA1B0346509G1C	50 Amps	1	65VDC / 125VAC	34	1
A-SERIES - LEVER ACTUATOR					
AA2B0344509G1C	5 Amps	2	80VDC / 277VAC	34	2
AA2B0346109G1C	10 Amps	2	80VDC / 277VAC	34	2
AA2B0346159G1C	15 Amps	2	80VDC / 277VAC	34	2
AA2B0346209G1C	20 Amps	2	80VDC / 277VAC	34	2
AA2B0346259G1C	25 Amps	2	80VDC / 277VAC	34	2
AA2B0346309G1C	30 Amps	2	80VDC / 277VAC	34	2
AA2B0346409G1C	40 Amps	2	65VDC / 250VAC	34	2
AA2B0346509G1C	50 Amps	2	65VDC / 250VAC	34	2

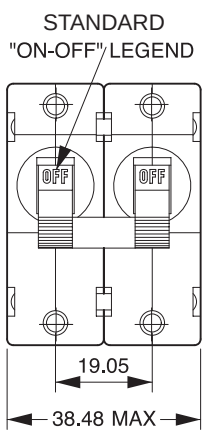
Electrical	
Number of Poles	1 – 2 Poles up to and including 50 Amps. 3 pole units available upon request. All 2 pole units supplied with actuator link (axle, spacer and circlips) as standard.
Current Ratings	Standard current coils: 5, 10, 15, 20, 25, 30, 40, 50 Amps. Other ratings available upon request.
Voltage Ratings	All poles: 0-30 Amps 80VDC, 277VAC 50/60 Hz max. 1 pole: 40/50 Amps 65VDC, 125VAC 50/60 Hz max. 2 pole: 40/50 Amps 65VDC, 250VAC 50/60 Hz max.
Trip delay	The standard trip delay curve is code 34. Refer to page 3 for relevant curve data.
Interrupting Capacity	Maximum 3,000 Amps @ 250VAC, 65VDC.

Insulation Resistance	Minimum of 100 Megohms at 500 VDC.
Dielectric Strength	UL, CSA – 1500V 60 Hz for one minute between all electrically isolated terminals.
Internal Circuit Configurations	Series trip standard. Optional configurations include series trip with auxiliary switch, shunt or relay trip with current or voltage coils, dual coil, switch only with or without auxiliary switch.
Mechanical	
Endurance	10,000 ON-OFF operations @ 6 per minute; with rated Current and 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.
Environmental	
Environmental	Designed and tested in accordance with requirements of specification MIL-C-55629 and MILSTD – 202.
Shock	Withstands 100 Gs, 6ms, saw tooth 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
Physical	
Termination	The screw terminal is a flat bus type angled at 30° to allow screwdriver access. Other termination options available upon request.
Fixing	#6-32 (x2) threaded insert. Other thread sizes available upon request.
Actuator colour	Standard lever is red and imprinted with white 'on' and 'off' legend on the lever barrel. Other lever colours available upon request.
Weight	Approximately 65 grams/pole.

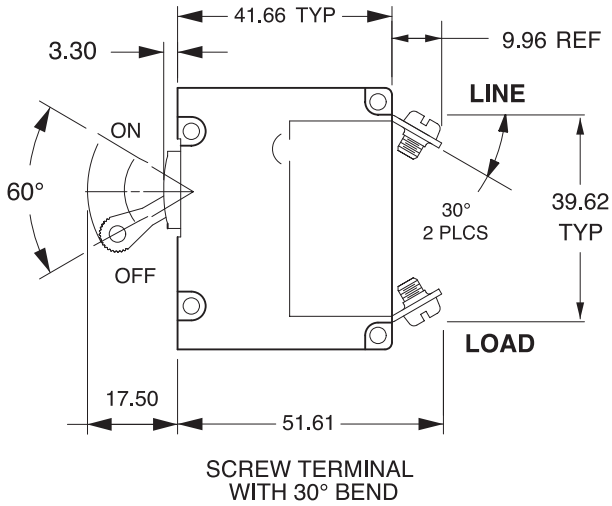
1-POLE



2-POLE



SIDE VIEW



All dimensions are shown in millimetres. Consult Amelec for tolerances.

Fig.3

Fig.4

C-Series
Lever Actuator

Features Hy-Mag topology for high performance
Double screw fixing for flush-fit panel mounting
Lever actuator provides easy, tactile operation
Fundamental design is simplistic but practical

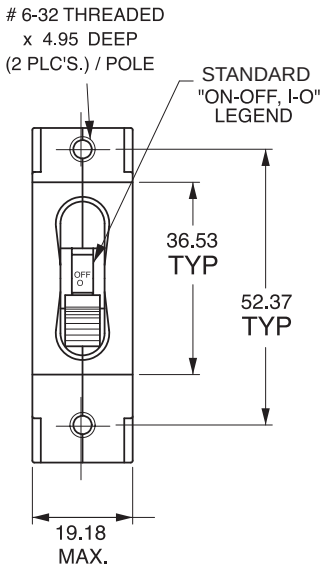
Carling Technologies' C-Series circuit breakers are a heavy duty version of the renown A-Series. Ideal for both switchboard applications and individual branch protection the C-Series is used extensively in marine and transport applications as well as affiliated markets where performance is paramount, particularly in high ambient temperature environments. The standard range includes both single and double pole versions, with red handle actuators, threaded stud terminals and rear panel mount fitment. A popular range of current ratings are readily available.

Code No.	Rating	Poles	Voltage	Curve	Figure
C-SERIES – LEVER ACTUATOR					
CA1B034660331C	60 Amps	1	80VDC / 250VAC	34	3
CA1B034680331C	80 Amps	1	65VDC / 240VAC	34	3
CA1B034810331C	100 Amps	1	65VDC / 240VAC	34	3
C-SERIES – LEVER ACTUATOR					
CA2B034660331C	60 Amps	2	80VDC / 250VAC	34	4
CA2B034680331C	80 Amps	2	65VDC / 240VAC	34	4
CA2B034810331C	100 Amps	2	65VDC / 240VAC	34	4

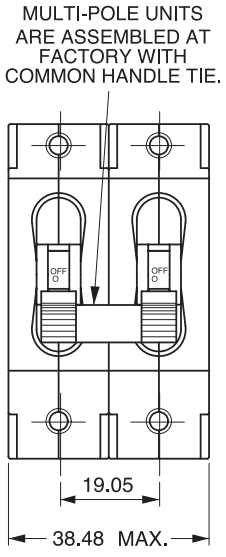
Electrical	
Number of Poles	1 – 2 Poles up to and including 100 Amps. 3 pole units available upon request. All 2 pole units supplied with actuator link (axle, spacer and circlips) as standard.
Current Ratings	Standard current coils: 60, 80, 100 Amps. Other ratings available upon request.
Voltage Ratings	All poles: 60 Amps 80VDC, 250VAC 50/60 Hz max. All poles: 80/100 Amps 65VDC, 240VAC 50/60 Hz max.
Trip delay	The standard trip delay curve is code 34. Refer to page 3 for relevant curve data.
Interrupting Capacity	Maximum: 7,500 Amps @ 80VDC, 3,000 Amps @ 250VAC.
Insulation Resistance	Minimum of 100 Megohms at 500 VDC.
Dielectric Strength	UL, CSA: 1960 V 50/60 Hz for one minute between all electrically isolated terminals.
Internal Circuit Configurations	Series trip standard. Optional configurations include series trip with auxiliary switch, shunt or relay trip with current or voltage coils, dual coil, switch only with or without auxiliary switch.

Mechanical	
Endurance	10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.
Trip Free	All C-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.
Environmental	
Environmental	Designed and tested in accordance with requirements of specification MIL-C-55629 and MILSTD– 202.
Shock	Withstands 100 Gs, 6ms, saw tooth 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
Physical	
Termination	The stud terminal is threaded ¼"-20 UNC and fitted with a jam nut and washers. Other termination options available upon request.
Fixing	#6-32 (x2) threaded insert. Other thread sizes available upon request.
Actuator colour	Standard lever is red and imprinted with white 'on' and 'off' legend on the lever barrel. Other lever colours available upon request.
Weight	Approximately 100 grams/pole.

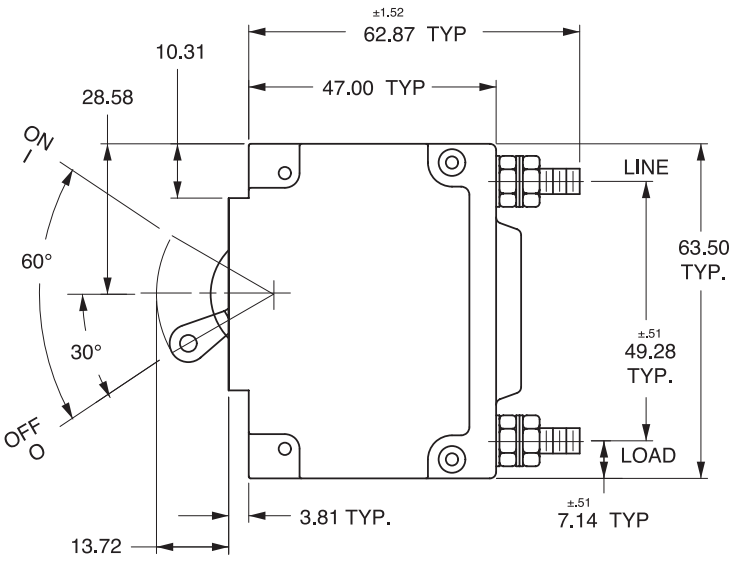
1-POLE



2-POLE



SIDE VIEW



All dimensions are shown in millimetres. Consult Amelec for tolerances.

Fig.5

Fig.6

F-Series
Lever Actuator

Heavy duty design featuring Hy-Mag topology
Double screw fixing for flush-fit panel mounting
Lever actuator provides easy, tactile operation
Fundamental design is simplistic but practical

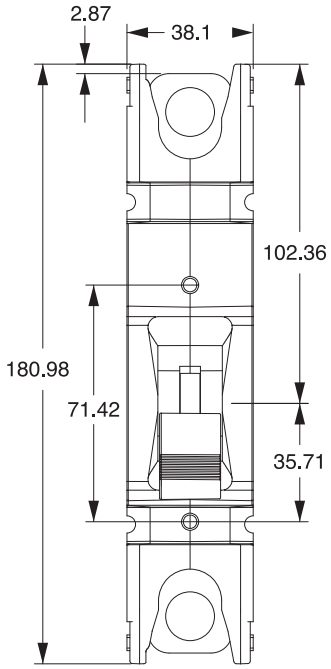
Carling Technologies' F-Series circuit breakers were developed to meet the demand for protection in high current DC installations. The heavy duty construction of the F-Series is designed for critical applications in marine, transport and alternate energy industries. The F-Series are often used for the protection of main DC supplies and large loads such as bow thrusters in vessels, for example. The standard range includes both single and double pole versions, with white handle actuators, threaded stud terminals and rear panel mount fitment.

Code No.	Rating	Poles	Voltage	Curve	Figure
F-SERIES – LEVER ACTUATOR					
FA1B01481511ABA	150 Amps	1	125VDC	14	5
FA1B01482011ABA	200 Amps	1	125VDC	14	5
FA1B01482511ABA	250 Amps	1	125VDC	14	5
F-SERIES – LEVER ACTUATOR					
FA2B01481511ABA	150 Amps	2	125VDC	14	6
FA2B01482011ABA	200 Amps	2	125VDC	14	6
FA2B01482511ABA	250 Amps	2	125VDC	14	6

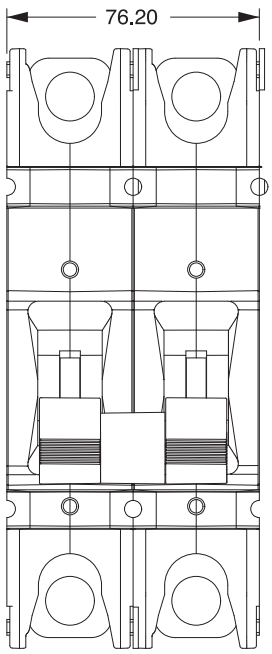
Electrical	
Number of Poles	1 – 2 Poles up to and including 250 Amps. 3 pole units available upon request. All 2 pole units supplied with actuator link (axle, spacer and circlips) as standard.
Current Ratings	Standard current coils: 150, 200, 250 Amps. Other ratings available upon request.
Voltage Ratings	Maximum: 150-250 Amps 1 & 2 pole - 125VDC. Other ratings available upon request.
Trip delay	The standard trip delay curve is code 14. Refer to page 3 for relevant curve data.
Interrupting Capacity	Maximum: 50,000 Amps @ 125VDC.
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.
Internal Circuit Configurations	Series trip standard. Optional configurations include series trip with auxiliary switch.

Mechanical	
Endurance	10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.
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.
Environmental	
Environmental	Designed and tested in accordance with requirements of specification MIL-C-55629 and MILSTD – 202.
Shock	Withstands 100 Gs, 6ms, saw tooth 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
Physical	
Termination	The stud terminal is threaded 3/8"-18 UNF and fitted with a jam nut and washers. Other termination options available upon request.
Fixing	#10-32 (x2) threaded insert. Other thread sizes available upon request.
Actuator colour	Standard lever is white and imprinted with white 'on' and 'off' legend on the housing. Other lever colours available upon request.
Weight	Approximately 875 grams/pole.

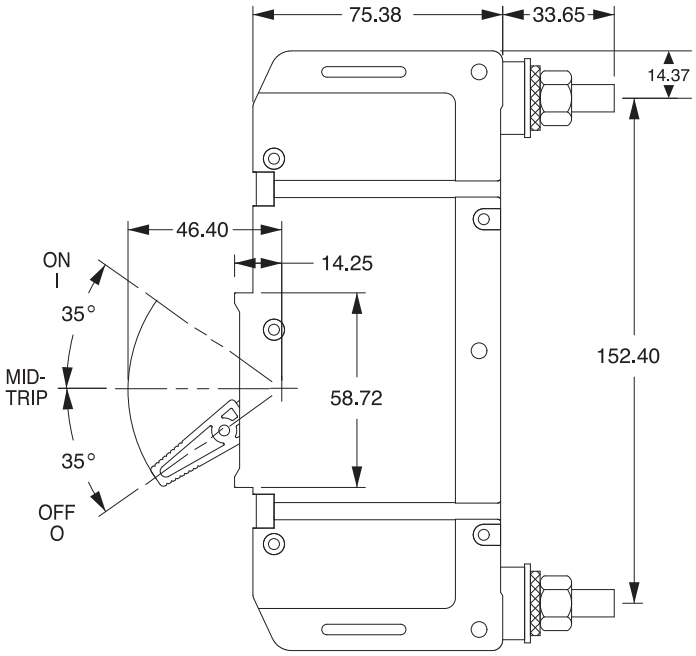
1-POLE



2-POLE



SIDE VIEW



All dimensions are shown in millimetres. Consult Amelec for tolerances.

Fig.7

Fig.8

H-Series
Lever Actuator

NEW

Compact package featuring Hy-Mag topology
Double screw fixing prevents rotation in panel
Lever actuator provides easy, tactile operation
Fundamental design is simplistic but practical

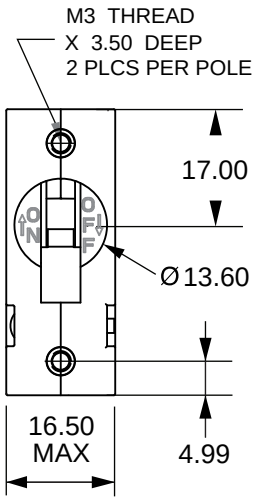
The H-Series is the latest development in the Hy-Mag product range from Carling Technologies and is a more compact version of the popular A-Series. Ideal for switchboard panels where space is at a premium, the H-Series provides dependable circuit protection in a low cost, yet high specification package, for a variety of applications. The H-Series is the ideal choice for international market applications. The standard range includes both single and double pole versions, with red handle actuators, screw terminals and rear panel mount fitment.

Code No.	Rating	Poles	Voltage	Curve	Figure
H-SERIES – LEVER ACTUATOR					
HA1B034450BG245	5 Amps	1	80VDC / 250VAC	34	7
HA1B034610BG245	10 Amps	1	80VDC / 250VAC	34	7
HA1B034615BG245	15 Amps	1	80VDC / 250VAC	34	7
HA1B034620BG245	20 Amps	1	80VDC / 250VAC	34	7
HA1B034625BG245	25 Amps	1	80VDC / 250VAC	34	7
HA1B034630BG2M5	30 Amps	1	80VDC	34	7
H-SERIES – LEVER ACTUATOR					
HA2B034450BG245	5 Amps	2	80VDC / 250VAC	34	8
HA2B034610BG245	10 Amps	2	80VDC / 250VAC	34	8
HA2B034615BG245	15 Amps	2	80VDC / 250VAC	34	8
HA2B034620BG245	20 Amps	2	80VDC / 250VAC	34	8
HA2B034625BG245	25 Amps	2	80VDC / 250VAC	34	8
HA2B034630BG2D5	30 Amps	2	250VAC	34	8

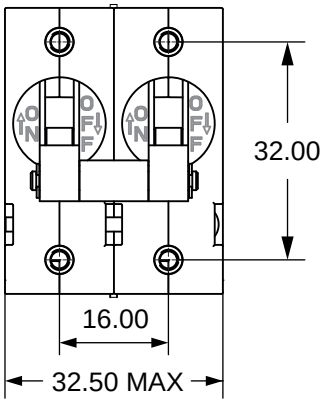
Electrical	
Number of Poles	1 – 2 Poles up to and including 30 Amps. 3 pole units available upon request. All 2 pole units supplied with actuator link (axle, spacer and circlips) as standard.
Current Ratings	Standard current coils: 5, 10, 15, 20, 25, 30 Amps.
Voltage Ratings	All poles: 0-25 Amps 80 VDC, 250VAC 50/60Hz max. 1 pole: 30 Amps 80 VDC max. 2 pole: 30 Amps 250VAC 50/60Hz max.

Trip delay	The standard trip delay curve is code 34. Refer to page 3 for relevant curve data.
Interrupting Capacity	Maximum 3,000 Amps @ 250VAC, 65VDC.
Insulation Resistance	Minimum of 100 Megohms at 500 VDC.
Dielectric Strength	UL, CSA – 1500V 60 Hz for one minute between all electrically isolated terminals.
Internal Circuit Configurations	Series trip standard. Optional configurations include series trip with auxiliary switch, shunt or relay trip with current or voltage coils, dual coil, switch only with or without auxiliary switch.
Mechanical	
Endurance	10,000 ON-OFF operations @ 6 per minute; with rated current & voltage.
Trip Free	All H-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.
Environmental	
Environmental	Designed and tested in accordance with requirements of specification MIL-C-55629 and MILSTD – 202.
Shock	Withstands 100 Gs, 6ms, saw tooth 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
Physical	
Termination	The screw terminal is an M4 straight bus type to allow for fitment of a common bus. Other termination options available upon request.
Fixing	M3 (x2) threaded insert. Other thread sizes available upon request.
Actuator colour	Standard lever is red and imprinted with white 'on' and 'off' legend on the lever barrel. Other lever colours available upon request.
Weight	Approximately 48 grams per pole.

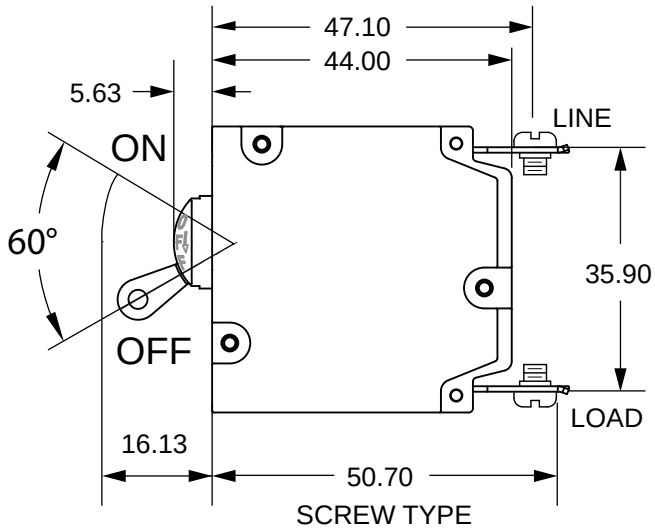
1-POLE



2-POLE



SIDE VIEW



All dimensions are shown in millimetres. Consult Amelec for tolerances.

M-Series
Rocker Actuator

Fig.9

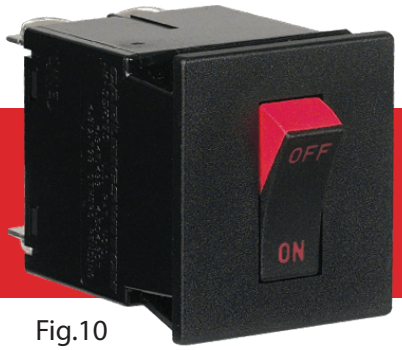


Fig.10

Features high visibility rocker for 'ON' indication
Most compact form factor in the Hy-Mag range
Snap-in panel mounting requires no fasteners
Contemporary design is aesthetically pleasing

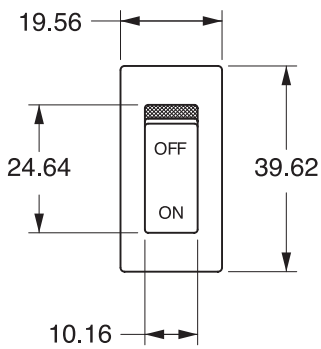
The most versatile addition to the Carling Technologies' magnetic circuit breaker range in recent years is the M-Series. Widely used throughout the marine and transport industry because of their compact architecture, the M-Series is available in switchable rocker and paddle lever versions. The standard rocker on offer features a unique dual colour scheme to provide quick recognition when the circuit is 'ON'. The standard range includes both single and double pole versions, with red Visi-Rocker, screw terminals and front panel mount fitment.

Code No.	Rating	Poles	Voltage	Curve	Figure
M-SERIES – ROCKER ACTUATOR					
MD1B344503A32BC	5 Amps	1	32VDC / 250VAC	34	9
MD1B346103A32BC	10 Amps	1	32VDC / 250VAC	34	9
MD1B346153A32BC	15 Amps	1	32VDC / 125VAC	34	9
MD1B346203A32BC	20 Amps	1	32VDC / 125VAC	34	9
MD1B346253A32BC	25 Amps	1	32VDC / 125VAC	34	9
MD1B346303A32BC	30 Amps	1	32VDC / 125VAC	34	9
M-SERIES – ROCKER ACTUATOR					
MD2B344503A32BC	5 Amps	2	65VDC / 250VAC	34	10
MD2B346103A32BC	10 Amps	2	65VDC / 250VAC	34	10
MD2B346153A32BC	15 Amps	2	65VDC / 250VAC	34	10
MD2B346203A32BC	20 Amps	2	65VDC / 250VAC	34	10
MD2B346253A32BC	25 Amps	2	65VDC / 250VAC	34	10
MD2B3463053A32BC	30 Amps	2	65VDC / 250VAC	34	10

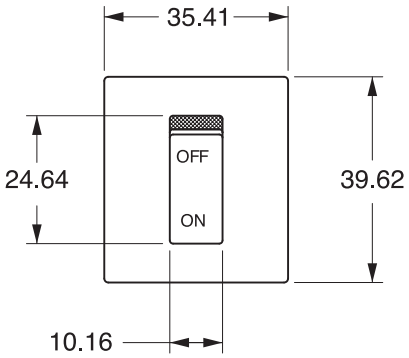
Electrical	
Number of Poles	1 – 2 Poles up to and including 30 Amps.
Current Ratings	Standard current coils: 5, 10, 15, 20, 25, 30 Amps. Other ratings available upon request.
Voltage Ratings	1 pole: 5-10 Amps 32 VDC, 250 VAC 50/60 Hz max. 1 pole: 15-30 Amps 32 VDC, 125 VAC 50/60 Hz max. 2 pole: 5-30 Amps 65 VDC, 250 VAC 50/60 Hz max.
Trip delay	The standard trip delay curve is code 34. Refer to page 3 for relevant curve data.
Interrupting Capacity	Maximum 1 pole: 1,000 Amps @ 125 VAC, 32 VDC. 2 pole: 1,000 Amps @ 250 VAC, 65 VDC.

Insulation Resistance	Minimum of 100 Megohms at 500 VDC.
Dielectric Strength	UL, CSA 1500V, 50/60 Hz for one minute between all electrically isolated terminals.
Internal Circuit Configurations	Series trip standard. Optional configurations include series trip with auxiliary switch or switch only with or without auxiliary switch.
Mechanical	
Endurance	10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.
Trip Free	All M-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.
Environmental	
Environmental	Designed and tested in accordance with requirements of specification MIL-C-55629 and MILSTD – 202.
Shock	Withstands 100 Gs, 6ms, saw tooth 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
Physical	
Termination	The screw terminal is a #6-32 flat bus type to allow for fitment of a common bus. Other termination options available upon request.
Fixing	Snap-fit panel mounting.
Actuator Colour	Red/Black Visi-Rocker with ON OFF indication standard. Other colours upon request.
Weight	Approximately 30 grams/pole.

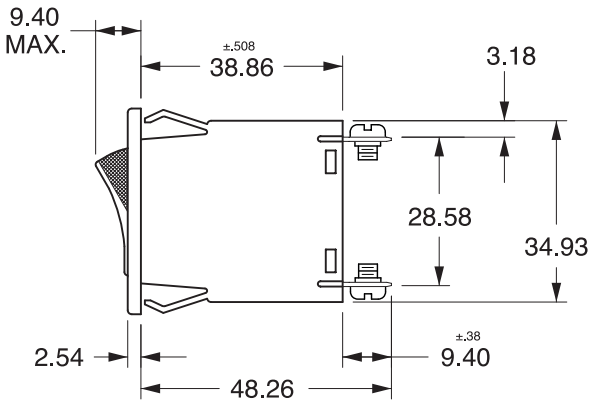
SINGLE POLE



DOUBLE POLE



SIDE VIEW



All dimensions are shown in millimetres. Consult Amelec for tolerances.

M-Series
Paddle Actuator

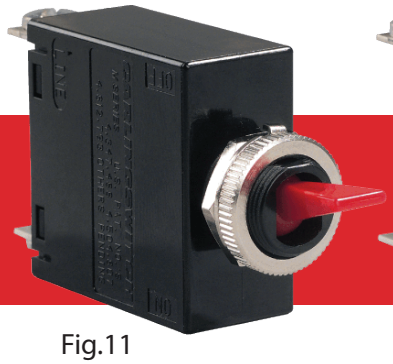


Fig.11

Fig.12

- Features simple 'duck bill' style paddle actuator
- Very compact form factor in Hy-Mag topology
- Single hole panel mounting for quick assembly
- Fundamental design is simplistic but practical

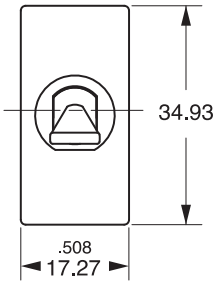
The most versatile addition to the Carling Technologies' magnetic circuit breaker range in recent years is the M-Series. Widely used throughout the marine and transport industry because of their compact architecture, the M-Series is available in switchable rocker and paddle lever versions. The standard paddle lever on offer is the traditional 'duck bill' design which is both easy to grasp and quick to operate. The standard range includes both single and double pole versions, with red paddle, screw terminals and rear panel mount fitment.

Code No.	Rating	Poles	Voltage	Curve	Figure
M-SERIES – PADDLE ACTUATOR					
MM1B3445033CBBC	5 Amps	1	32VDC / 250VAC	34	11
MM1B3461033CBBC	10 Amps	1	32VDC / 250VAC	34	11
MM1B3461533CBBC	15 Amps	1	32VDC / 125VAC	34	11
MM1B3462033CBBC	20 Amps	1	32VDC / 125VAC	34	11
MM1B3462533CBBC	25 Amps	1	32VDC / 125VAC	34	11
MM1B3463033CBBC	30 Amps	1	32VDC / 125VAC	34	11
M-SERIES – PADDLE ACTUATOR					
MM2B3445033CBBC	5 Amps	2	65VDC / 250VAC	34	12
MM2B3461033CBBC	10 Amps	2	65VDC / 250VAC	34	12
MM2B3461533CBBC	15 Amps	2	65VDC / 250VAC	34	12
MM2B3462033CBBC	20 Amps	2	65VDC / 250VAC	34	12
MM2B3462533CBBC	25 Amps	2	65VDC / 250VAC	34	12
MM2B3463033CBBC	30 Amps	2	65VDC / 250VAC	34	12

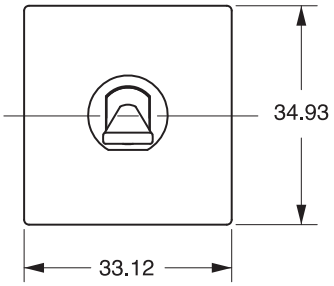
Electrical	
Number of Poles	1 – 2 Poles up to and including 30 Amps.
Current Ratings	Standard current coils: 5, 10, 15, 20, 25, 30 Amps. Other ratings available upon request.
Voltage Ratings	1 pole: 5-10 Amps 32 VDC, 250 VAC 50/60 Hz max. 1 pole: 15-30 Amps 32 VDC, 125 VAC 50/60 Hz max. 2 pole: 5-30 Amps 65 VDC, 250 VAC 50/60 Hz max.
Trip delay	The standard trip delay curve is code 34. Refer to page 3 for relevant curve data.
Interrupting Capacity	Maximum 1 pole: 1,000 Amps @ 125 VAC, 32 VDC. 2 pole: 1,000 Amps @ 250 VAC, 65 VDC.

Insulation Resistance	Minimum of 100 Megohms at 500 VDC.
Dielectric Strength	UL, CSA 1500V, 50/60 Hz for one minute between all electrically isolated terminals.
Internal Circuit Configurations	Series trip standard. Optional configurations include series trip with auxiliary switch or switch only with or without auxiliary switch.
Mechanical	
Endurance	10,000 ON-OFF operations @ 6 per minute; with rated Current and Voltage.
Trip Free	All M-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.
Environmental	
Environmental	Designed and tested in accordance with requirements of specification MIL-C-55629 and MILSTD – 202.
Shock	Withstands 100 Gs, 6ms, saw tooth 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
Physical	
Termination	The screw terminal is a #6-32 flat bus type to allow for fitment of a common bus. Other termination options available upon request.
Fixing	Through hole panel mounting. Includes anti-rotation washer, knurled dress nut and hex jam nut. A standard ON OFF legend plate is included.
Actuator Colour	Red paddle actuator as standard. Other colours upon request.
Weight	Approximately 30 grams/pole

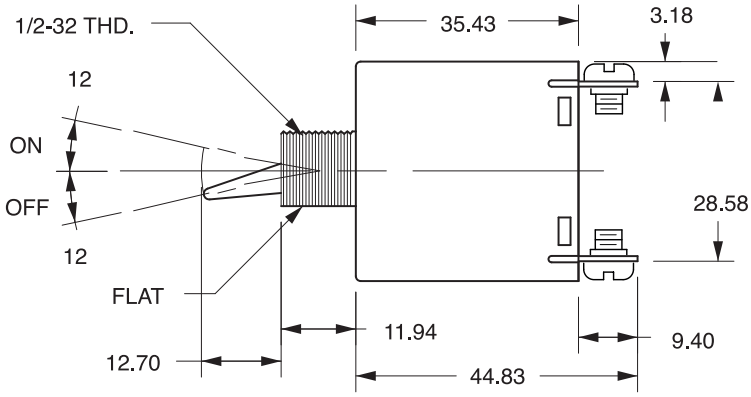
SINGLE POLE



DOUBLE POLE



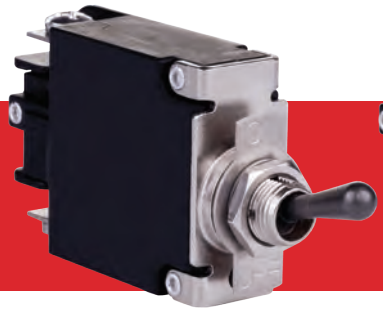
SIDE VIEW



All dimensions are shown in millimetres. Consult Amelec for tolerances.

NEW

MS-Series
Sealed Toggle Actuator



Designed to meet Military Specification standards
Environmental protection to IP68 from panel front
Heavy duty construction for harshest applications
Genuine Hy-Mag topology in compact form factor

Fig.13 Fig.14

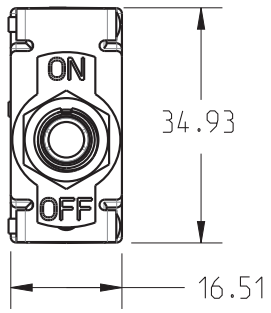
The new, class leading, MS-Series circuit breakers are designed in accordance with military specifications making them the best choice for applications where shock, vibration, moisture resistance, salt spray and thermal cycling are of the utmost consideration. The space saving envelope of the MS-Series features a durable metal frame, bushing and toggle with a sealed design that meets IP68 requirements from the front. The standard range includes both single and double pole versions, mid-length toggle, screw terminals and rear panel mount fitment.

Code No.	Rating	Poles	Voltage	Curve	Figure
MS-SERIES – TOGGLE ACTUATOR					
MS1B34450E1CBA17C	5 Amps	1	65VDC / 240VAC	34	13
MS1B34610E1CBA17C	10 Amps	1	65VDC / 240VAC	34	13
MS1B34615E1CBA17C	15 Amps	1	65VDC / 240VAC	34	13
MS1B34620E1CBA17C	20 Amps	1	65VDC / 240VAC	34	13
MS1B34625E1CBA17C	25 Amps	1	65VDC / 240VAC	34	13
MS1B34630E1CBA17C	30 Amps	1	65VDC / 240VAC	34	13
MS-SERIES – TOGGLE ACTUATOR					
MS2B34450E1CBA17C	5 Amps	2	65VDC / 240VAC	34	14
MS2B34610E1CBA17C	10 Amps	2	65VDC / 240VAC	34	14
MS2B34615E1CBA17C	15 Amps	2	65VDC / 240VAC	34	14
MS2B34620E1CBA17C	20 Amps	2	65VDC / 240VAC	34	14
MS2B34625E1CBA17C	25 Amps	2	65VDC / 240VAC	34	14
MS2B34630E1CBA17C	30 Amps	2	65VDC / 240VAC	34	14

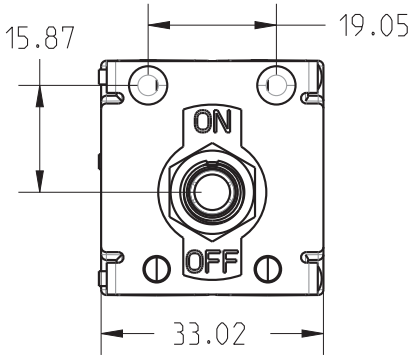
Electrical	
Number of Poles	1-3 poles.
Current Ratings	Standard current coils: 5, 10, 15, 20, 25, 30 Amps. Other ratings available upon request.
Voltage Rating	All poles: 65VDC, 240VAC, 120/240VAC max.
Trip delay	The standard trip delay curve is code 34. Refer to page 3 for relevant curve data.
Interrupting Capacity	1 pole: 3,000/300 Amps @ 240 VAC 50/60 Hz and 65 VDC for UL/cUL U1/U3. 2 poles: 2,000/300 Amps @ 240 VAC 50/60 Hz and 65 VDC for UL/cUL U1/U3.

Insulation Resistance	Minimum of 100 Megohms @ 500VDC.
Dielectric Strength	UL,CSA 1500V, 50/60 Hz for one minute between all electrically isolated terminals.
Internal Circuit Configurations	Series trip standard. Optional configurations include series trip with auxiliary switch or switch only with or without auxiliary switch.
Mechanical	
Endurance	10,000 On-Off operations @ 6 per minute with rated current and voltage.
Trip Free	Trips on short circuit and overload, even when the actuator is forcibly held in the "On" position.
Trip Indication	The operating handle moves positively to the "Off" position when a short circuit or overload causes the circuit breaker to trip.
Environmental	
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	To IP68 MIL-PRF-55629C when mounted in panel.
Other	Materials used in this product are non-nutrient to fungus growth.
Certifications	
Agency Approvals	UL Standard 1077, CUL Standard C22.2.
Physical	
Termination	The screw terminal is an M4 flat bus type to allow for fitment of a common bus. Other termination options available upon request.
Fixing	Through hole panel mounting. Includes anti-rotation washer, hex front nut, locking washer and hex jam nut. A standard ON OFF legend plate is included.
Weight	Approximately 1.8 oz (50 G) per pole.

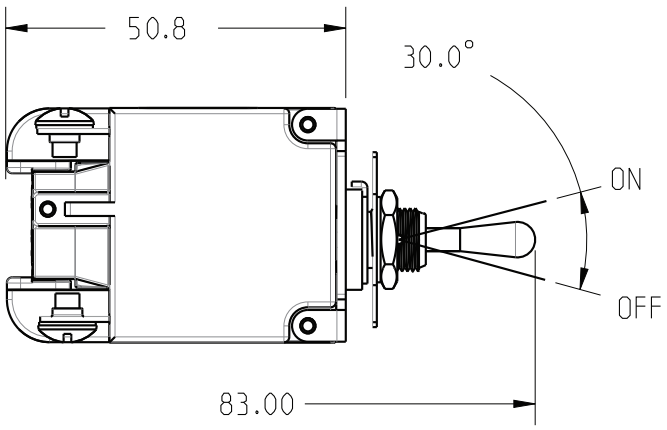
SINGLE POLE



DOUBLE POLE



SIDE VIEW



All dimensions are shown in millimetres. Consult Amelec for tolerances.

OPERATION

Thermal circuit breakers are a simple and cost effective method for protecting circuits.They utilise a bi-metallic strip, constructed of two dissimilar metals which react differently to temperature variations. The metals are bonded together to form the actuating strip, which is the essential mechanical component of the entire assembly. The strip is connected to the trip mechanism in the breaker which allows the current to pass through the line contact to the load contact under normal operating conditions. In an overload situation the increase in current causes the bi-metallic strip to overheat. As the strip heats the two metals bend or deform because they are expanding at different rates. As they have been designed to bend in a certain way the tripping mechanism is activated thus opening the contacts. The circuit is now disconnected and can only be reset once the button is depressed. If the overload situation is still present the strip will heat up again and the mechanism will subsequently trip.

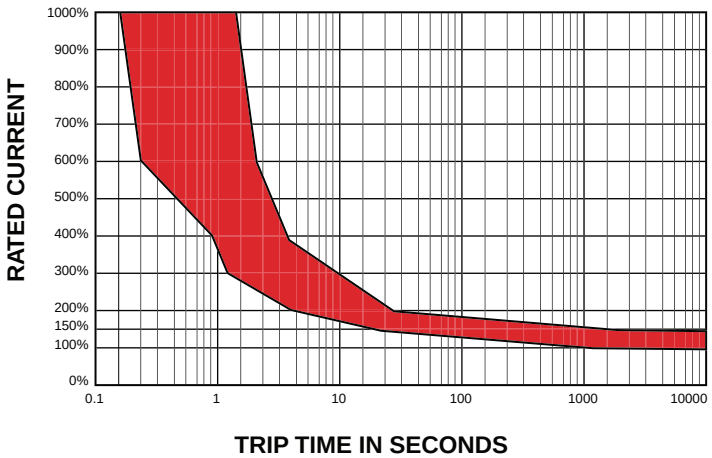
APPLICATION

As thermal circuit breakers are effectively temperature-sensing devices, they are subject to changes in ambient temperatures. When operating in a cold environment they will trip at a higher current level thus compromising circuit protection. When operating in a warm environment, they may 'nuisance trip' at a lower current level resulting in inconvenient circuit disconnection. Fortunately, in most instances, these changes can be compensated for by de-rating the circuit breaker current rating used. This compensation is known as correction factor and can be calculated when the ambient operating temperature is known for the particular application. Thermal circuit breakers have relatively slow trip times compared to magnetic circuit breakers but when applied correctly are much more convenient than fuses. The ability to be able to reset a thermal circuit breaker rather than replace a fuse is a desirable feature.

FEATURES

The simple concept of thermal circuit breakers makes them economical to produce and therefore an inexpensive solution for circuit protection. They should not be used to replace magnetic circuit breakers, which have many advantages over thermal circuit breakers, but when applied correctly will give many years of reliable service and protection. Carling Technologies, has recently entered the thermal market with the introduction of two new miniature circuit breakers. Details and specifications can be found on the following pages, of the CLB-Series which are now readily available. The tables and graph below represent the time delay values (trip curves) and temperature correction factors for these two products.

TRIP CURVES



CLB SERIES

Overload	Trip Time
100%	NO TRIP
150%	TRIP IN 1 HR
200%	5 - 35 SEC.
300%	1.5 - 9 SEC.
400%	0.9 - 5.5 SEC.
500%	0.5 - 3.5 SEC.
600%	0.3 - 2.8 SEC.

TEMPERATURE

Correction Factor	
0°C	x .67
10°C	x .72
15°C	x .83
25°C	x 1.00
40°C	x 1.18
50°C	x 1.33
60°C	x 1.67

NOTES:
The circuit breaker must hold 100% of the rated current, must trip at 150% and above, within the limits shown in the curve. Trip times specified are at 25ºC ambient with no pre-loading.

To adjust the circuit breaker rating for ambient temperature multiply the breaker rating by the factor. For example, 5 Amp rating at 0ºC: 5 x 0.67 = 3.3 Amp.
Therefore select 3 Amp rating.

CLB-Series
Thermal Circuit Breaker

The CLB-Series is a compact, single pole, push-to-reset family of thermal circuit breakers designed to protect equipment.

The popular CLB-Series miniature circuit breakers from Carling Technologies offer a reliable, cost effective solution for circuit protection requirements. The CLB-Series is available in a range of current ratings up to 40 Amps and is suitable for both AC and DC extra low voltage applications.

The compact design, quick connection and simple mounting makes installation a breeze. The standard model is supplied with a M12 mounting bush fitted with a knurled nut. An indicator plate which fits over the bushing is also available and is imprinted with the words 'Circuit Breaker – Press To Reset'.

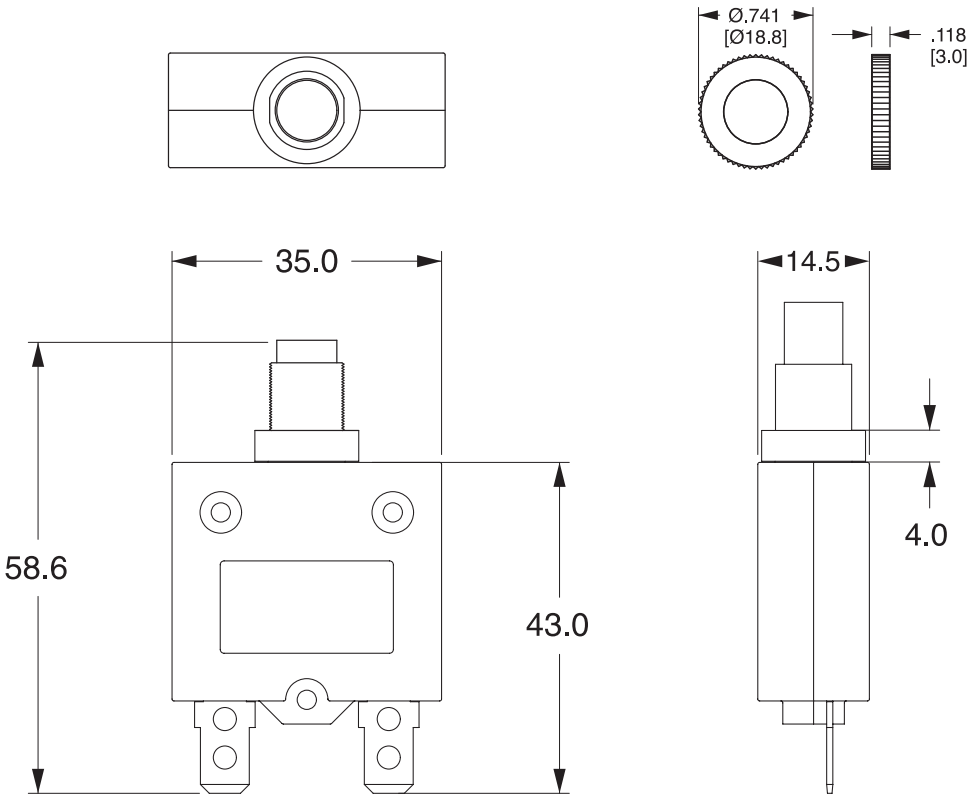
An optional clear silicon rubber waterproof boot is also readily available. Various hardware options, terminals, actuator colours and mounting styles are available upon request.

Code No.	Rating	Poles	Voltage
CLB-SERIES			
CLB03312C1NBA	3 Amps	1	48VDC / 250VAC
CLB05312C1NBA	5 Amps	1	48VDC / 250VAC
CLB10312C1NBA	10 Amps	1	48VDC / 250VAC
CLB15312C1NBA	15 Amps	1	48VDC / 250VAC
CLB20312C1NBA	20 Amps	1	48VDC / 250VAC
CLB25312C1NBA	25 Amps	1	48VDC / 250VAC
CLB30312C1NBA	30 Amps	1	48VDC / 250VAC
CLB35312C1NBA	35 Amps	1	48VDC / 250VAC
CLB40312C1NBA	40 Amps	1	48VDC / 250VAC

- All code numbers above have a black actuator. Other colours are available upon request.
- All code numbers above have a 6.35mm (0.250") push-on terminal. Other terminals are available upon request.
- Standard hardware supplied with above items is 1 piece knurled metal dress nut. Other hardware options are available to order.
- Various mounting styles and bushing sizes are available subject to minimum order requirements.
- Refer to page 1 for relevant curve data. No other curve options are currently available.
- All voltage ratings shown above are absolute maximums.

Electrical	
Current Ratings	3 to 40 Amps.
Voltage Rating	32VDC, 125-250 VAC
Dielectric Strength	1500 VAC/1 minute
Interrupting Capacity	1000 amps @ 32 VDC
Resettable overload capacity	10 x rated current
Insulation Resistance	100 Megohms
Voltage Drop	< 0.25 V
Environmental	
Operating Temperature	-10°C to +60°C
Certifications	
Agency Approvals	UL, CUL, CSA, TUV, CE, UL 1500 / ISO 8846 for ignition protection / marine
Physical	
Number of Poles	Single
Actuator Style	Pushbutton
Dimensions	See form & fit drawing

CLB Dimensional Specifications (mm)



Amelec Australia Pty Ltd warrants all Carling products against defects in factory workmanship and materials for a period of 12 months from final point of sale providing the item in question does not exceed the manufacture date by more than 2 (two) years. Specific exclusions of this warranty apply where the item in question has been misapplied or used for a purpose for which it is not designed or intended; or altered in any way that would be detrimental to the performance or life of the product; or opened or tampered with by an unauthorised party; or contaminated by oil, water, grease or other substances; or subjected to misuse, negligence, excessive vibration or mechanical abuse; or damaged as a result of incorrect connection or voltage. On any part or product found to be defective after examination by Amelec Australia Pty Ltd or their authorised agent, Amelec Australia will only repair or replace the merchandise through the original selling dealer. Amelec Australia assumes no responsibility for diagnosis, removal and/or installation labour, loss of equipment use, loss of time, inconvenience or any other subsequent expenses including freight costs. Save and except for the express warranty set out above and to the maximum extent permitted by law, all conditions and warranties which may at any time be implied by the common law, Trade Practices Act, Fair Trading Act or any other State or Federal Act are excluded. To the extent that these cannot be excluded and where the law permits, Amelec Australia liability in respect of any such condition or warranty shall be limited at the option of Amelec Australia to the repair or the replacement of the goods or the supply of equivalent goods or refunding the cost of the goods. Amelec Australia Pty Ltd A.B.N. 38 009 386 216

Carling Technologies™
Innovative Designs. Powerful Solutions.

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