

CIRCUIT BREAKERS





SAFRAN

SAFRAN ELECTRICAL & POWER

SMARTER ELECTRICAL SOLUTIONS FOR
A BETTER FLIGHT

At Power we innovate to provide greener, reliable and cost-effective electrical solutions. We are one division "Powering-On" to be a world class trusted supplier.

Table of Contents

- 3** Table of Contents
- 4** Descriptive Index
- 5** Fast Information Finder
- 5** Part Number to Page Index

Capabilities and Product Overview

- 6-7** Circuit Breaker Product Overview
- 8-9** Organizational Capabilities
- 10** Arc Fault Circuit Interrupt (AFCI) Technology
- 11** Notes

Single Phase, Thermal Circuit Breakers

- 12-13** Series 160 - 50 to 100A
- 14-15** Series 170 - 125 to 200A
- 16-17** Series 700 - 5 to 50A
- 18-19** Series 1500 - ½ to 10A
- 20-21** Series 4001 - 1 to 25A
- 22-23** Series 4200 - 1 to 25A
- 24-25** Series 4310 - 1 to 25A

Three Phase, Thermal Circuit Breakers

- 26-27** Series 940 - 50 to 100A
- 28-29** Series 1526 - 1 to 15A
- 30-31** Series 1536 - 5 to 50A
- 32-33** Series 4330 - 1 to 20A

Remote Controlled Circuit Breakers

- 34-37** Remote Controlled Circuit Breakers
- 38-39** Remote Power Controllers

Additional Circuit Breaker Products

- 40** Additional Products

Accessories

- 40** Rubber Boot Assembly

Reference

- 41** Glossary
- 42** Military to Safran Electrical & Power Part Number Index

Capabilities and Product Overview**Single Phase, Circuit Breakers****Three Phase, Circuit Breakers****Remote Controlled Circuit Breakers****Additional Circuit Breaker Products****Accessories****Reference**

Accessories	40	Military Approved Devices	
		160 Series	12
AFCI	10	170 Series	14
		700 Series	16
Auxiliary Terminal		4001 Series	20
4200 Series	22	4200 Series	22
RCCB	34	4310 Series	24
RPC	38	4330 Series	32
Capabilities	8	RCCB	34
		Random Vibration	
Cross Reference		700 Series	16
Part Number to Page	5	4001 Series	20
Military P/N to Safran		4200 Series	22
Electrical & Power Part Number	42	Remote Controlled	
Fast-Trip (Load Protection)		RCCB	34
1500 Series	18	RPC	38
1526 Series	28	Single Phase	
High Vibration		160 Series	12
160 Series	12	170 Series	14
700 Series	16	700 Series	16
4001 Series	20	1500 Series	18
4310 Series	24	4001 Series	20
4330 Series	32	4200 Series	22
Hot-wire		4310 Series	24
1500 Series	18	RCCB	34
1526 Series	28	Temperature Compensated	
Indicator Control Unit (ICU)		1500 Series	18
1500 Series	18	1526 Series	28
		1536 Series	30
Long Button		4310 Series	24
700 Series	16	4330 Series	32
4200 Series	22	Three Phase	
4310 Series	24	940 Series	26
4330 Series	32	1526 Series	28
		1536 Series	30
		4330 Series	32
		RCCB	34

Find Information Fast

- **Have a Safran Electrical & Power part number and need more information?**

Use the part number to page index on this page to get the exact page of the full product listing.

- **Have a Military part number and need applicable Safran Electrical & Power part number?**

Use the Military part number Index in the back of this catalog.

- **Know the type of product you want, but not a specific part number?**

Use the detailed Index on the facing page to find the section with those products or use the Product Overview for a quick side by side comparison.

- **Looking for a specific feature or attribute?** Use the Descriptive Index or Product Overview to quickly determine which products fit your application.

- **Need additional information not contained in this catalog?** For technical questions, application assistance, or the name of your local authorized distributor call 1- 800-955-7354.

Part Number to Page Index

Safran Part No.	Page No.	Safran Part No.	Page No.
60-	40	4330-	32
160-	12	4330-001-	32
160-012-	12	4330-007-	32
160-086-	12	4330-008-	32
100-	40	4330-009-	32
130-	40	4380-	40
140-	40	8500-	40
170-	14	9500-	40
170-001-	14	SM600BA -	34
180-	40	SM600BA125 (+)	38
260-	40	SM601BA -	34
270-	40		
700-	16		
700-001-	16		
700-089-	16		
700-092-	16		
780-	40		
920-	40		
930-	40		
940-	26		
940-006-	26		
960-	40		
970-	40		
1200-	40		
1500-	18		
1500-052-	18		
1526-	28		
1526-005-	28		
1536-	30		
1536-005-	30		
1538-	40		
1540-	40		
1585-	40		
2100-	40		
4001-	20		
4001-001-	20		
4001-008-	20		
4001-011-	20		
4200-	22		
4200-001-	22		
4200-003-	22		
4200-004-	22		
4200-006-	22		
4200-007-	22		
4310-	24		
4310-001-	24		
4310-005-	24		
4310-019-	24		
4310-024-	24		

CIRCUIT BREAKER PRODUCT OVERVIEW

PLEASE CONSULT DETAILED PRODUCT DESCRIPTIONS FOR MORE INFORMATION.

SINGLE PHASE



	160 Series	170 Series	700 Series	1500 Series	4001 Series
Catalog Location	pgs. 12-13	pgs. 14-15	pgs. 16-17	pgs. 18-19	pgs. 20-21
MS Qualified	MS25361	MS25017 ⁽⁴⁾	MS25244 (MS25017) ⁽⁴⁾	MS22074 ⁽⁴⁾	MS22073
Description	Heavy-Duty, High Current Ratings	Heavy-Duty, Very High Current Ratings	Miniature, High Interrupting Capacity, Rugged Performer	Miniature, Fast-trip, Ambient Temperature	Sub-miniature, Precision, Lightweight
Current Rating	50 to 100 Amperes	125 to 200 Amperes	5 to 50 Amperes	Compensated	1 to 25 Amperes
Voltage rating	120 VAC, 400 Hz;	115 VAC, 400 Hz;	120 VAC, 400 Hz;	0.5 to 10 Amperes	120 VAC, 400 Hz;
(For Interrupting Capacity)	30 VDC	28 VDC	30 VDC	120 VAC, 400 Hz;	30 VDC
Calibration @25° C	105% Hold	100% Hold	115% Hold	30 VDC	115% Hold
(percent of amperage rating)	138% within one hour	125% within one hour	138% within one hour	115% Hold 138% within one hour	150% within one hour
Trip Time (in seconds at 25° C)	All amperages	All amperages	All amperages		All amperages
200% Overload	15.0 to 65.0	15.0 to 70.0	15.0 to 55.0	0.5-3A / 4.5-10A	2.0 to 20.0
500% Overload	1.3 to 6.0 ⁽²⁾	1.5 to 6.5 ⁽²⁾	1.4 to 5.0 ⁽²⁾	0.4 to 3.0 / 0.8 to 3.6	0.16 to 2.0
1000% Overload	0.5 to 2.0 ⁽³⁾	0.5 to 2.5 ⁽³⁾	0.5 to 1.5 ⁽³⁾	0.06 to 0.4 / 0.08 to	0.046 to 0.5
Interrupting Capacity	3500A @ 120V AC	2500A @ 115V AC	3500A @ 120V AC	0.5 ⁽²⁾	500 to 3500A @ 120V AC
(Rating Dependent)	6,000A @ 30V DC	3,000A @ 28V DC	6,000A @ 30V DC	0.02 to 0.18 / 0.02 to 0.2 ⁽³⁾	2,000 to 6,000A @ 30V DC
Weight g (lb.)	113g (.250lb)	130g (.286lb)	43g (.095lb)	600 to 1000A @ 120V AC	33g (.073 lb)
Major Dimensions	2.250 x 1.812 x 0.750	2.250 x 1.812 x 1.00	1.860 x 1.094 x 0.750	6,000A @ 30V DC	1.852 x 0.703 x 0.593
LxWxH (inches)				45g (.099 lb)	
Notes	MIL spec approved high vibration model.	Mounting dimensions compatible with Military Standard Drawing requirements of MS25017 of MIL-C5809.	Available with auxiliary switch. P-bracket allows variation of mounting. 40 & 50 ampere ratings not MIL spec approved.	1.843 x 1.137 x 0.750 Meets requirements for use as an RCCB ICU. I ² t function is per specification.	Available in MIL spec approved high vibration and random vibration models and variations in termination and mounting. 25 ampere rating not MIL spec approved.

(1) Balanced, Unbalanced load 145%

(2) 400% Overload information available in detailed product listing

(3) 600% Overload information available in detailed product listing

(4) Designed to requirements of applicable specification. Contact Business Unit for details.

FOR CONFIGURATIONS NOT NOTED, CONTACT BUSINESS UNIT

THREE PHASE



	4200 Series	4310 Series	940 Series	1526 Series	1536 Series	4330 Series
Catalog Location	pgs. 22-23	pgs. 24-25	pgs. 26-27	pgs. 28-29	pgs. 30-31	pgs. 32-33
MS Qualified	MS26574	MS3320 (AS33201)	NA	NA	NA	MS14154
Description	Sub-miniature, High-Performance, Lightweight	Sub-miniature, Lightweight, Ambient Temperature Compensated	Heavy Duty, High Capacity Protection	Fast-trip, Hot-wire, Ambient Temperature Compensated	Miniature, Lightweight, Ambient Temperature Compensated	Sub-miniature, Lightweight, Ambient Temperature Compensated
Current Rating	0.5 to 25 Amperes	1 to 25 Amperes	50 to 200 Amperes	1 to 15 Amperes	5 to 50 Amperes	1 to 25 Amperes
Voltage rating	120 VAC, 400 Hz;	120 VAC, 400 Hz;	120 VAC, 400 Hz	120 VAC, 400 Hz	120 VAC, 400 Hz	120 VAC, 400 Hz
(For Interrupting Capacity)	28 VDC	28 VDC				
Calibration @25 C	115% Hold	115% Hold	105% Hold	115% Hold	105% Hold	110% Hold
(percent of amperage rating)	150% within one hour	138% within one hour	138% ⁽¹⁾ within one hour	138% within one hour	138% ⁽¹⁾ within one hour	145% within one hour
Trip Time (in seconds at 25 C)	All amperages	All amperages	All amperages	1-75A / 10-15A	All amperages	All amperages
200% Overload	2.0 to 20.0	5.0 to 20.0	15.0 to 70.0	0.35 to 4.0/3.0 to 10.0	10.0 to 70.0	4.0 to 20.0
500% Overload	0.16 to 1.2	0.5 to 2.0	1.2 to 6.0 ⁽²⁾	0.06 to 0.45/0.4 to	1.4 to 6.0 ⁽²⁾	0.40 to 2.00
1000% Overload	0.046 to 0.8	0.12 to 0.53	0.4 to 2.0 ⁽³⁾	0.95 ⁽²⁾	0.35 to 1.4 ⁽³⁾	0.10 to 0.53
Interrupting Capacity	500A to Unlimited @ 120V AC	2000 to 3500A @ 120V AC	1200A @ 120V AC	0.02 to 0.15/0.15 to 0.5 ⁽³⁾	1000A @ 120V AC	2000A @ 120V AC
(Rating Dependent)	2000A to Unlimited @ 28V DC	6,000A @ 28V DC		300A @ 120V AC		
Weight g (lb.)	22g (.048 lb)	25g (.055lb)	388g (.854 lb)		130g (.290 lb)	68g (.150 lb)
Major Dimensions	1.525 x 0.780 x 0.593	1.343 x 0.781 x 0.593	2.437 x 2.187 x		2.170 x 2.160 x	1.381 x 1.840 x
LxWxH (inches)			2.631	154g (.340lb)	1.312	0.781
Notes	MIL spec approved random vibration and long button models. Available with auxiliary switch and variations in termination and mounting. 0.5 and 25 ampere rating not MIL spec approved.	MIL spec approved long button and high vibration models. Available with auxiliary switch and variations in termination and mounting. 1.5 & 25 ampere ratings not MIL spec approved.	All data listed is applicable to the 940 Series. Consult Safran Electrical & Power for details on the 180, 920, 930, 960, and 970 Series devices.	1.875 x 2.063 x 1.300 For additional amperage ratings consult business unit.	Single hole mount and small size facilitate easy installation.	MIL spec approved high vibration and long button models. 25 ampere rating is not MIL spec approved. Single Hole mount. Variation in termination and mounting available.

Market Trends

Aircraft Original Equipment Manufacturers (OEM) are continuously pursuing efficiencies associated with the design and manufacture of aircraft platforms. Additionally, the OEM's are working on increasing the functionality of components while reducing operating and life cycle costs. These activities are leading to the migration of engineering and system design activities to Tier 1 system integrators and their supply partners such as Safran Electrical & Power. By optimizing relays, circuit breakers, and power distribution panel performance to satisfy application requirements; cost, size, weight can be minimized while enhancing performance.

What Problem Does Safran Electrical & Power Solve?

Aircraft OEM's have already discovered outsourcing power distribution management requirements to Tier 1-system integrators and their vendor base is an effective alternative that mitigates risk and leverages the subsystem and component manufacturer expertise. The success of such outsourcing efforts benefits the OEM and leads to more reliance on qualified Tier 1-system integrators for electrical systems. Safran Electrical & Power's objective is to be the logical candidate for the supply of aerospace components as well as subsystems that address power distribution and circuit protection.

Safran Electrical & Power offers Integrated Circuit Breaker Panels as a Line Replaceable Unit that reduce the OEM production installation time and eliminates component compatibility / interface issues. This can shorten design to market cycle time and reduce costs by outsourcing subsystems to qualified suppliers with the requisite engineering skill and manufacturing capabilities.

The Safran Electrical & Power Solution

Safran Electrical & Power is an attractive partner in the design and development of integrated circuit breaker components and subsystem panels. Our development process employs sound methodology to identify, assess, and manage program risk. The components of this approach include [Phase-Gate Reviews](#), [Project Management](#), and [Six Sigma for Design and Development](#). This process in conjunction with Safran Electrical & Power's extensive [Product Portfolio](#) and [Capabilities](#) enable Safran Electrical & Power to be a single source supplier for power protection, distribution, and switching components. The Systems Integrators have the option of sourcing pedigree circuit breakers for their panel designs or subcontracting the entire Integrated Circuit Breaker Panel to Safran Electrical & Power.

Phase-Gate Reviews

This process organizes product development activities from the idea through product launch into a series of phases. The activities within each

phase are multifunctional, and are designed to provide information that progressively reduces risk. Consistent application of the process promotes successful on-time product development efforts.

Project Management

Product development projects involve the iterative planning, execution and control of project team activities in order to meet the competing demands of scope, timing, cost, risk and quality. Project management methodology affords the application of knowledge, skills, tools and techniques to meet these requirements.

Six Sigma for Design and Development

Six Sigma for Design and Development is a methodology using normal Six Sigma tools, but applies them early in the design process. This methodology instills the product development process with the same Six Sigma process rigor found in Safran manufacturing to create successful products in a competitive marketplace.

Product Portfolio

SafranElectrical&Power's complete product portfolio allows flexibility to partner with customers having a variety of circuit breaker subsystem and component needs. SafranElectrical&Power's engineers design additional value into traditional thermal circuit breaker components and subsystems through electronics, while balancing customer concerns for size, weight, cost, and complexity. Arc Fault Interrupt Technology is an example

of value add engineering. A proven design package (i.e. thermal circuit breaker) is modified so its functionality addresses emerging airline carrier and Federal Aviation Administration needs to protect the aging aircraft fleet and satisfy SFAR 88 requirements.

The Safran Electrical & Power product portfolio is recognized in the aerospace industry as MIL qualified for performance rated switching products. These components support the design and manufacture of primary power distribution panels and circuit breaker panels as well. The Safran Electrical & Power product portfolio includes:

- Electro-mechanical thermal circuit breakers (0.5 to 300 amperes) - single phase or three phase thermally actuated devices offered in conventional design or with integrated Arc Fault Circuit Interrupt technology.
- Remote Control Circuit Breakers (5 to 125 amperes) - single phase or three-phase devices sold separately or as a subsystem when combined with a necessary indicator control unit (0.5 ampere circuit breaker).
- Electro-mechanical Remote Power Controllers (125 to 200 amperes) – single-phase devices sold separately or as a subsystem when combined with a necessary indicator control unit (0.5 ampere circuit breaker).
- Smart Contactors with current sensing protection or Arc Fault Circuit Interrupt technology

- 28 VDC Contactors (50 to 1000 amperes)
- 270 VDC Contactors (25 to 350 amperes)
- 115/230 VAC 400 Hz Contactors (30 to 430 amperes)
- 750 VDC Contactors (100 to 600 amperes)
- A variety of aerospace switches (rocker, toggle, pushbutton and limit).

Safran Electrical & Power Capabilities

- Proven excellence in component and subsystem design, development, testing, qualification, and production for both military and commercial aerospace applications.
- A manufacturing organization that emphasizes customer satisfaction by focusing on cost, quality, and delivery of the product portfolio.
- Altitude / temperature testing chambers simulating altitudes to 80,000 feet and temperatures from -85°F to 257°F (-65°C to 125°C).
- Test capabilities of 115/200 VAC 400Hz to 3600 amps, 28 VDC to 10,000 amps, 270/350/475 VDC to 1,500 amps.
- Environmental tests for Sand and Dust, Shock, and Vibration.
- Latest CAD/CAM finite element analysis, stereolithographic techniques, and PRO E design.
- Model Shop flexibility to respond to design changes and the rapid turn around of prototypes.

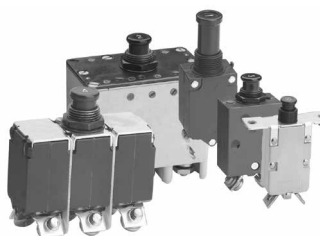
The Safran Electrical & Power Difference

There are a number of circuit breaker suppliers in the aerospace market. However, none of them possess the vertical integration needed to engineer and manufacture both circuit breaker components and subsystems that include both primary power distribution panels and circuit breaker panels.

Safran Electrical & Power affords its customers the following difference:

- Strong brand recognition, customer loyalty, and demonstrated market presence for over 80 years.
- Ability to leverage the company's size, financial strength, and scope to drive superior results. Safran Electrical & Power has the ability to leverage the engineering resources of a multi-billion dollar company.
- An extensive product portfolio that compliments integrated sub-system design competency.
- A flat organizational structure that allows for the optimal blend of best value technical approach and test support within budget and schedule constraints.
- Dedicated program managers that understand and communicate "voice of the customer".
- Design software that promotes concurrent engineering and the exchange of customer data.
- Co-located engineering, manufacturing, and development resources promote robust product development and product support.

Safran Electrical & Power's unique product portfolio, its ability to design and manufacture components and subsystems, and customer centric strategy, mitigates the risk associated with new aircraft circuit protection systems. Safran Electrical & Power is an ideal candidate to consider for engineering and manufacturing collaboration on all future commercial, General Aviation, and military programs.



The Aging Aircraft Dilemma

Today, in the United States there are more than 22,000 civil and military aircraft in operation. Many are over 20 years old. To maintain airworthiness, many have been retrofitted with new engines, new avionics, improved hydraulic systems and even new interiors. However, one element in older aircraft that will not change is the miles and miles of electrical wiring buried within the aging airframe. Over time these wire bundles and their protective insulation can deteriorate, providing the perfect environment for an electrical short and a potential fire hazard.

Until recently, aircraft circuit breakers were considered the first line of defense against electrical hazards. However, research has shown that arc faults, with temperatures as high as 6000°C, can go completely undetected by circuit breakers developed over 30 years ago. The unfortunate roll call of recent aircraft accidents blamed on explosions or fires suspected to have been triggered by electrical wire arcing is familiar. And the potential for additional incidents may be even more sobering. Safety reports show numerous, non-fatal incidents of smoke in the cockpit and electrical faults attributed to wire arcing.

Navy Statistics show 64 in-flight electrical fires between July 1995 and December 1997. On the civil side, Federal Aviation Administration (FAA) data from 1989 through July 1998 show 622 reports of smoke in the cockpit or cabin.

"No-Fault Design" By Rick DeMeis, Design News Sept 4, 2000.

Why Don't Aircraft Circuit Breakers Provide Protection from Arcing Faults?

Aerospace circuit breakers are designed to protect wiring from thermal damage that occurs during an over-current situation. They are able to do this by deploying a bi-metallic element that mimics that thermal effect of current on a wire's insulation. The reason circuit breakers do not provide protection from arcing events is that they are not designed to. The characteristics of an arcing event include fault currents that are sporadic or sputtering, have values several times the breakers rating, and the arc event is of such a short duration that the circuit breaker has little time to react.

Safran Electrical & Power's Arc-Fault Circuit Interrupt (AFCI) Technology - The Next Generation of Circuit Protection

"Present commercial airplane circuit breakers do not detect and react to arcing faults associated with the chafing and subsequent intermittent arcing when bare wires contact metal airplane structure or other bare conductors..."

FAA Aging Transport Non-Structural Systems Plan, July 1998, page 17 Incorporating AFCI Into Thermal Protection Devices

Safran Electrical & Power's AFCI protective device recognizes the unique signatures of arcing faults and acts to interrupt the circuit. Safran Electrical & Power's Arc-Fault Circuit

Interrupt technology utilizes microelectronics to monitor and analyze a circuit's current waveform. This logic circuit utilizes algorithms developed over the last 10 years. These algorithms "look" directly for the randomness in the 400Hz current signal to determine if an arcing event has occurred. If the logic circuit determines an arc fault exists, a signal is sent to the circuit protection device, which will safely shut down the circuit in question.

Recognizing An "Acceptable Arc" From An "Unacceptable Arc" - Elimination of the "Nuisance" Trip

Safran Electrical & Power's unique AFCI technology monitors the reaction of the current waveform to an arcing incident to ensure that the AFCI circuitry can discriminate between an unacceptable arc and an acceptable arc. An unacceptable arc would be any situation such as two wires or a wire to ground electrical arc due to exposed conductors. An acceptable arc could be the power surge in the starting of a hydraulic pump or another electrically driven, primary or auxiliary support component.

In order to distinguish an acceptable arc from an unacceptable arc, sophisticated arc fault algorithms employ various statistical methods that are capable of identifying the degree of chaos or randomness in the current signal. This prevents the chance of nuisance tripping even in situations where the switching of devices involves in-rush transients resulting from motor or pump start-ups.

Integrating the AFCI circuitry into the standard aerospace circuit breaker required the miniaturization of the present mechanism to make room for the necessary electronics and to provide a way to power the logic circuit. As a result of this effort, Safran Electrical & Power's AFCI circuit breaker has many added benefits:

- Offer same size as current circuit breakers listed in MS24571 and MS14105.
- Provides separate visible indication of an arc fault vs. over-current fault.
- Include independent operation of the electro-mechanical portion of circuit breaker so that the circuit breaker remains operational even with an AFCI electronics failure.

The AFCI technology can be packaged into a form / fit line replaceable unit (LRU) such as a thermal circuit breaker. Safran Electrical & Power's AFCI solution builds added safety into the LRU without the need to modify the existing electrical architecture of the aircraft.

AFCI technology is easily tailored to an application or device. Safran Electrical & Power's product portfolio of thermal circuit breakers, relays, and Remote Control Circuit Breakers can provide the required arc fault protection to address every platform electrical protection





Standard

Single-Pole High Performance

Qualified

To MIL-C-5809 and MS25361.

Protection For Heavy-Duty Systems

Protects circuits from 50 to 100 amperes.

Heavy-Duty Construction

Breaker features large contacts and wide terminals.

Not Sensitive To Frequency

May be used on either AC or DC circuits.

Performance Rated Circuit Breaker

The 160 series has the recognition of being the most specified heavy-duty aircraft type circuit breaker in the 50 to 100 ampere rating range.

Designed to protect heavy-duty aircraft and non-aircraft electrical systems, this trip-free breaker features separate, durable, overload and mechanical latches. In addition, the overload latch is designed for precise operation. Extra heavy contacts are spring-loaded to maintain high-contact pressure and assure long life. Contact material has high resistance to arcing and the corrosive action of moisture —thus assuring low voltage drop throughout the life of the breaker.

PERFORMANCE DATA

Interrupting Capacity	6,000A at 30V, DC; 3,500A at 120V, 400 Hz., AC
Endurance	At 120VAC, 400 Hz.: inductive load — 5,000 cycles; resistive load — 5,000 cycles; at 30V, DC: inductive load — 2,500 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,000 cycles
Overload Cycling	100 operations at 200% rated current and rated voltage
Dielectric Strength	At sea level, 25°C 1,500V, AC. At 70,000 ft., 71°C 500V, AC
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	0.15V, maximum
Vibration	Meets specification MIL-STD-202, Method 204, Condition A–10G, 10–500 Hz.
Shock	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	113 grams (0.25 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -40°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	105	—	70	—	125	—	% For 1 Hour
Must Trip	—	138	—	125	—	165	% Within 1 Hour
200% Overload	15	65	—	—	—	—	Seconds
400% Overload	2	10	—	—	—	—	Seconds
600% Overload	1	4	—	—	—	—	Seconds

Trip curve available

ORDERING INFORMATION

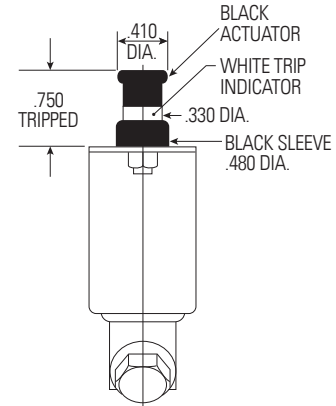
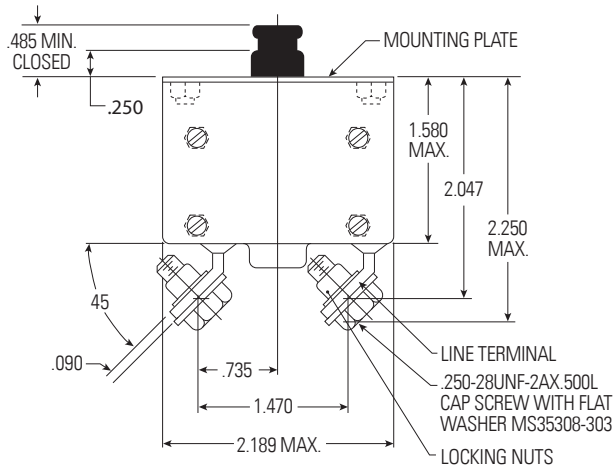
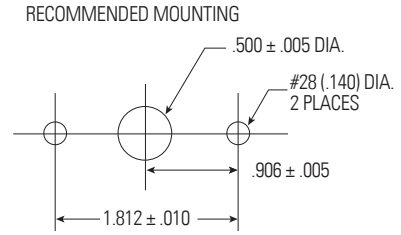
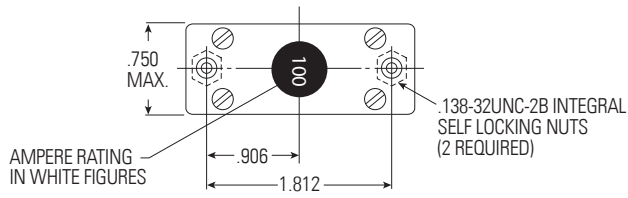
MS APPROVAL STATUS	AMPERE RATING	VOLTAGE DROP MAX. *	STANDARD		HIGH VIBRATION	
			MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N
MS Approved	50	0.15	MS25361-50	160-012-50	MS25361-50V	160-086-50
MS Approved	60	0.15	MS25361-60	160-012-60	MS25361-60V	160-086-60
MS Approved	70	0.15	MS25361-70	160-012-70	MS25361-70V	160-086-70
MS Approved	75	0.15	MS25361-75	160-012-75	MS25361-75V	160-086-75
MS Approved	80	0.15	MS25361-80	160-012-80	MS25361-80V	160-086-80
MS Approved	90	0.15	MS25361-90	160-012-90	MS25361-90V	160-086-90
MS Approved	100	0.15	MS25361-100	160-012-100	MS25361-100V	160-086-100

* AT RATED NOMINAL CURRENT

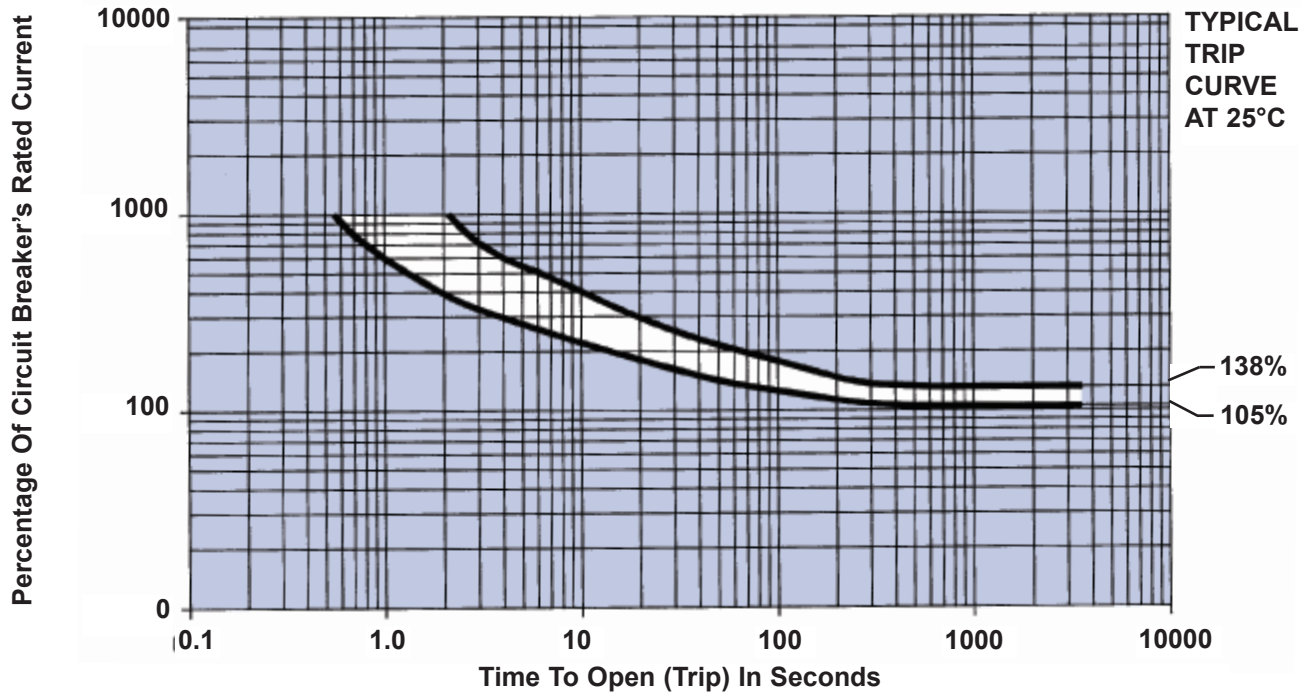
3 Phase variants are available as a 940 Series.

For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS



TRIP CURVE





Single-Pole High Performance

Protection For Very High Current Rated Circuits

Protects circuits from 125 to 200 amperes.

Meets MS Mounting Dimensions

Has mounting dimensions compatible with Military Standard Drawing requirements of MS25017 of MIL-C-5809.

Heavy-Duty Components

Extra heavy contacts and wide sturdy terminals.

Trouble-Free Contact Life

Contacts mounted on spring-loaded pivots to maintain high-contact pressure and to improve arc quenching capability.

Performance Rated Circuit Breaker

The 170 series is the only compact, reliable, heavy-duty aircraft-type circuit breaker available in the 125 to 200 ampere range. It is the only device in this range that has mounting dimensions compatible with Military Standard Drawing MS25017. Designed to protect heavy-duty aircraft electrical systems, the breaker features separate overload and mechanical latches. The unit's trip-free design prevents it from being held closed manually against any overload that would ordinarily cause it to open. The breaker may be used on either AC or DC circuits.

PERFORMANCE DATA

Interrupting Capacity	3,000A at 28V, DC; 2,500A at 115V, AC
Endurance	At 120V, 400 Hz.: inductive load — 2,500 cycles; resistive load — 5,000 cycles; at 30V, DC: inductive load — 1,000 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,000 cycles
Overload Cycling	100 operations at 200% rated current and rated voltage
Dielectric Strength	1,500V, minimum
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	0.1 volt maximum at rated current
Vibration	Exceeds MIL-STD-202, Method 204, Condition A
Shock	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	130 grams (0.286 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -40°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	100	—	70	—	110	—	% For 1 Hour
Must Trip	—	125	—	125	—	160	% Within 1 Hour
200% Overload	15	70	—	—	—	—	Seconds
400% Overload	2	12	—	—	—	—	Seconds
600% Overload	1	5	—	—	—	—	Seconds

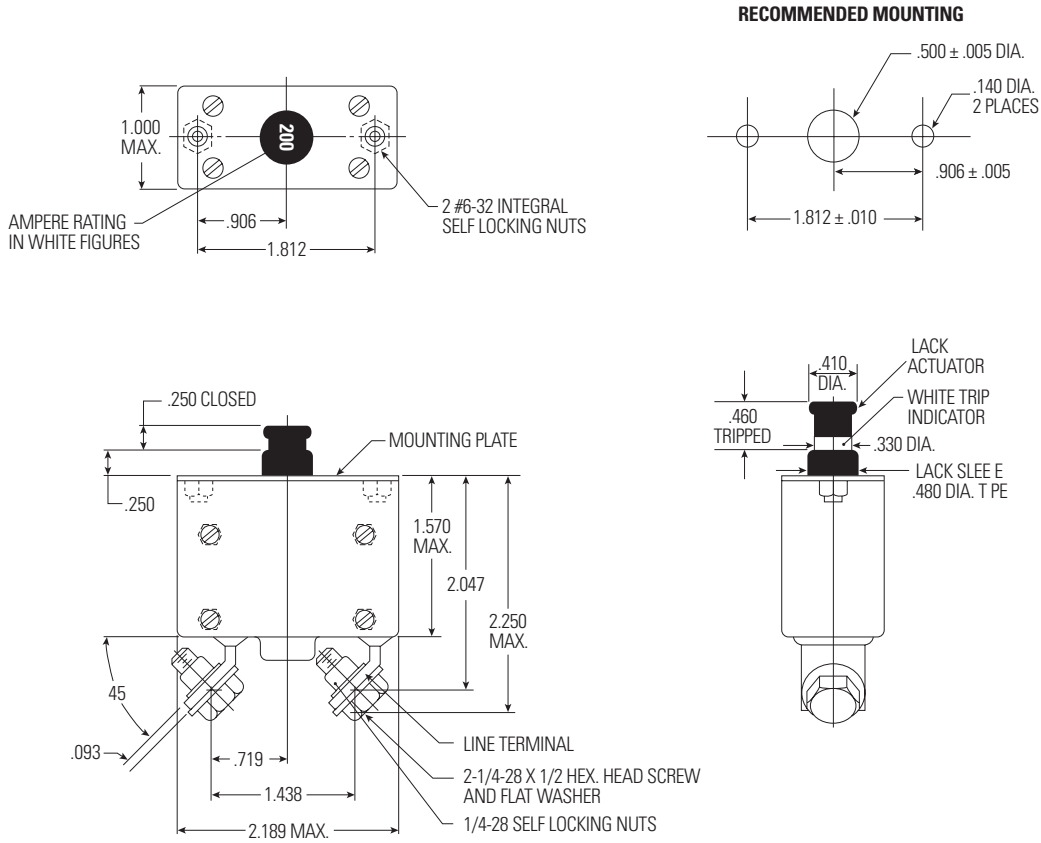
ORDERING INFORMATION

Ampere Rating	Voltage Drop Max.*	Part Number
125	.100	170-001-125
140	.100	170-001-140
150	.100	170-001-150
160	.100	170-001-160
180	.100	170-001-180
200	.100	170-001-200

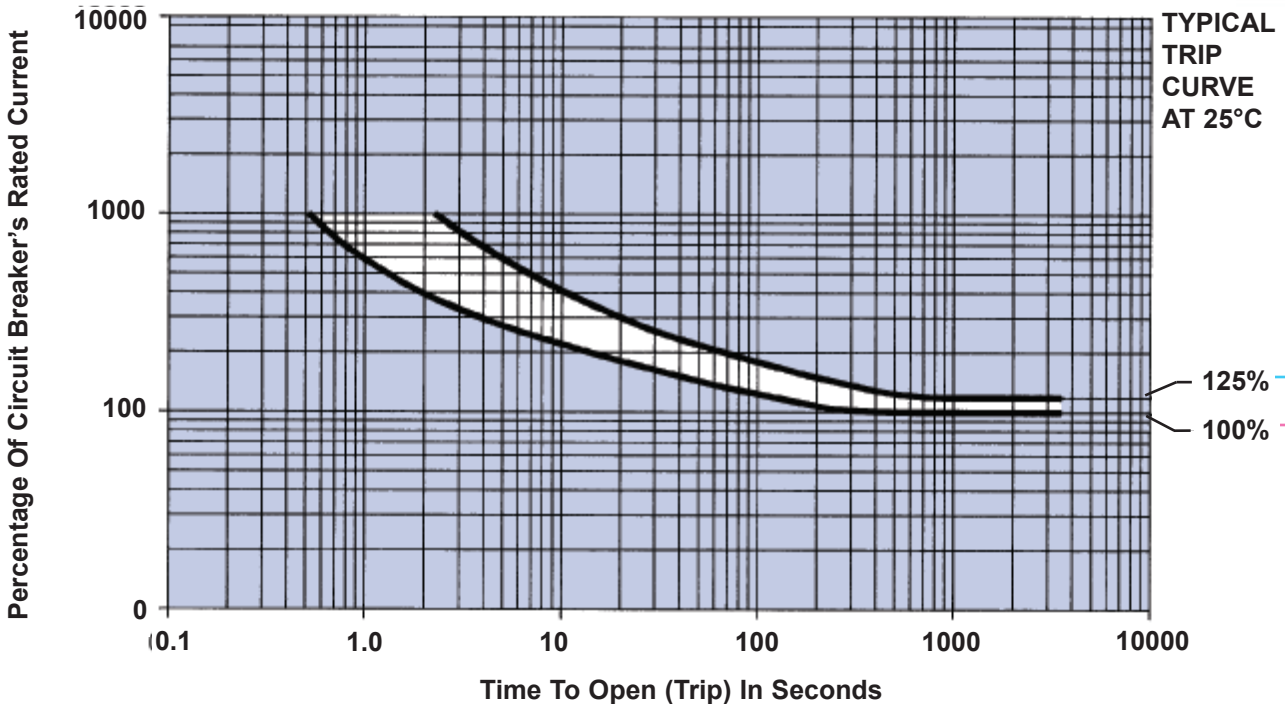
* At rated nominal current.

Three phase variants are available as a 970 Series. Also available as a 180 Series device for ratings up to 300 amperes. For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS



TRIP CURVE





**Standard
(Bushing
Mounting)**



**High/Random
Vibration (Flush
Mounting)**

Single-Pole High Performance

Qualified

To MS25244, MS25244-P and MS25244-PT of MIL-C-5809 (MS25244PT is a substitute for MS25017) .

Lightweight

Circuit breaker weighs only 43 grams.

High Interrupting Capacity

Interrupts a 6,000A circuit at 30V, DC; 3,500A circuit at 120V, 400 Hz. AC.

Performance Rated Circuit Breaker

Exceeds military specification requirements for durability, vibration, mechanical shock, and acceleration. The 700 is a miniature push-pull breaker offering fast trip and high interrupting capacity. Its trip-free design prevents the breaker from being held closed manually on overloads.

A feature of the breaker is separate overload and mechanical latches. Separated in this way, the mechanical latch assures maximum endurance for the thousands of cycles of manual on-off operation, while the thermal latch combines both precise operation and durability.

Bushing and Flush Mounting Options

PERFORMANCE DATA

Interrupting Capacity	6,000A at 30V, DC; 3,500A at 120V, 400 Hz., AC
Endurance	At 120V, 400 Hz., AC or 30V, DC: inductive load — 2,500 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,000 cycles
Overload Cycling	100 operations at 200% rated current and rated voltage
Dielectric Strength	At sea level, 25°C 1,500V, AC. At 65,000 ft., 70°C 500V, AC. 1,500V, minimum
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration	Exceeds MIL-STD-202, Method 204, Condition A (Random Optional)
Shock	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	700-001: 43 grams (.1 lbs.). 700-089: 48 grams (.11 lbs.)
Altitude Maximum	65,000 ft.

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -40°C		@ -40°C		@ -40°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	60	—	70	—	156	—	148	—	% For 1 Hour
Must Trip	—	138	—	108	—	114	—	178	—	178	% Within 1 Hour
200% Overload	15	55.0	—	—	—	—	—	—	—	—	Seconds
400% Overload	2	7.0	—	—	—	—	—	—	—	—	Seconds
600% Overload	1	3.5	—	—	—	—	—	—	—	—	Seconds

Trip curve available.

ORDERING INFORMATION

ADAPTER FLUSH MOUNTING PLATE								
STANDARD			BASE & TERMINAL CONFIGURATION STYLE "P"			ALTERNATE BASE & TERMINAL CONFIGURATION STYLE "PT"		
MS APPROVAL STATUS	AMPERE RATING	VOLTAGE DROP MAX. *	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N
MS Approved	5	0.25	MS25244-5	700-001-5	MS25244-P5	700-089-5	MS25244-PT5	700-092-5
MS Approved	7 1/2	0.25	MS25244-7 1/2	700-001-705	MS25244-P7 1/2	700-089-705	MS25244-PT7 1/2	700-092-705
MS Approved	10	0.25	MS25244-10	700-001-10	MS25244-P10	700-089-10	MS25244-PT10	700-092-10
MS Approved	15	0.25	MS25244-15	700-001-15	MS25244-P15	700-089-15	MS25244-PT15	700-092-15
MS Approved	20	0.25	MS25244-20	700-001-20	MS25244-P20	700-089-20	MS25244-PT20	700-092-20
MS Approved	25	0.25	MS25244-25	700-001-25	MS25244-P25	700-089-25	MS25244-PT25	700-092-25
MS Approved	30	0.25	MS25244-30	700-001-30	MS25244-P30	700-089-30	MS25244-PT30	700-092-30
MS Approved	35	0.25	MS25244-35	700-001-35	MS25244-P35	700-089-35	MS25244-PT35	700-092-35
Non MS Approved	40	0.25		700-001-40		700-089-40		700-092-40
Non MS Approved	50	0.25		700-001-50		700-089-50		700-092-50

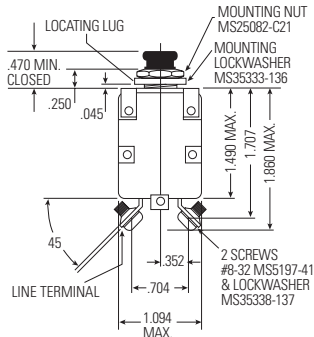
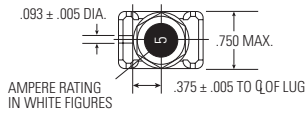
* AT RATED NOMINAL CURRENT

Three phase variants are available as a 930 Series.

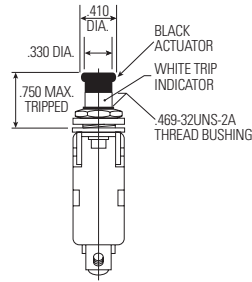
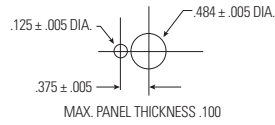
For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS

700-001 (MS25244)



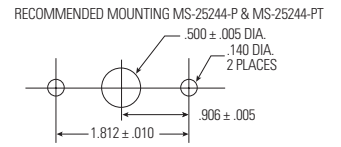
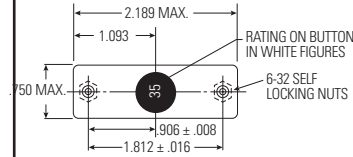
RECOMMENDED MOUNTING MS-25244



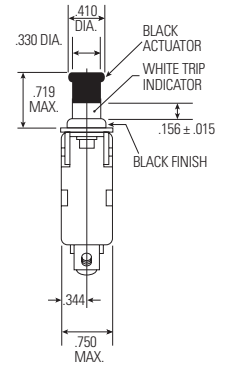
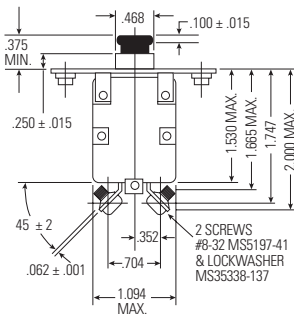
700-089 (MS25244-P)

700-092 (MS25244-PT)

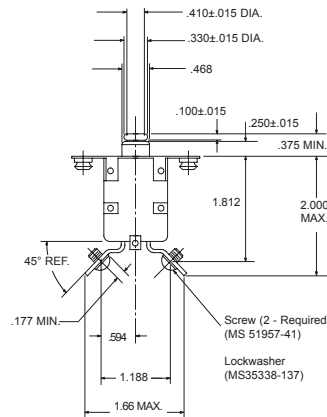
Dimensions Different Base & Terminal



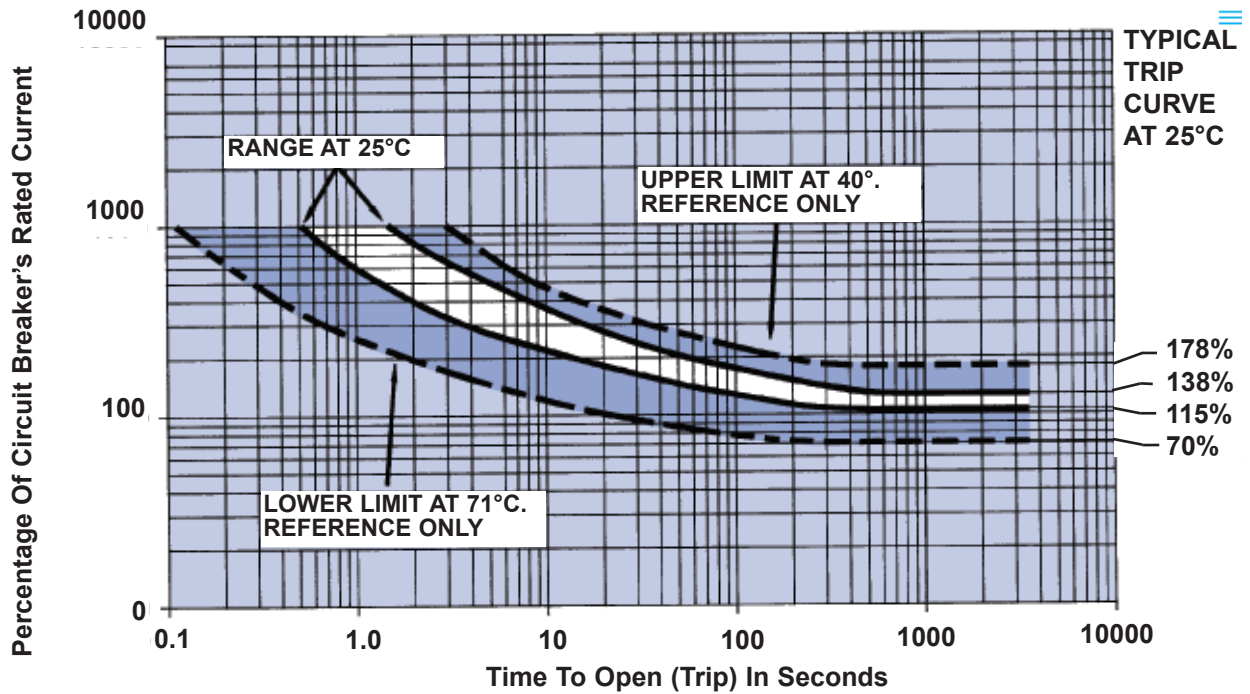
MS25244-P Base & Terminal



MS25244-PT Base & Terminal



TRIP CURVE





Single-Pole High Performance

Qualified

Designed to MS22074 for MIL-C-5809.

Fast Trip

Operates on a hot-wire principle, much faster than bimetal breakers.

Fail-Safe Operation

Fault cannot cause breaker to fuse closed.

Ambient-Compensated

No appreciable change in trip time from -40°C to +71°C.

Low Resistance

Silver alloy contacts maintain low resistance for life of circuit breaker.

Load Protection

The fast tripping circuit breaker is ideal for protecting sensitive loads such as avionics and fuel pumps where rapid detection and fault clearing are desired.

Performance Rated Circuit Breaker

It is the only thermal hot wire type available in ratings from one-half ampere.

The 1500 is a circuit breaker that features fast trip for quick response. Designed for the protection of both wiring and equipment, the unit provides trip indication, trip-free protection, and the convenience of manual on-off operation. Excellent temperature stability is assured by the hot-wire design. The breaker has a high resistance to shock and vibration. Its "Fail Safe" design eliminates the danger of the breaker fusing closed on overload.

ICU Application

This circuit breaker meets the requirements of MIL-C-83383 for use as a RCCB ICU (Indicator Control Unit). Its I2t function is per specification.

PERFORMANCE DATA

Interrupting Capacity	1/2 to 1A: 600A at 120V AC, 400 Hz.; 6,000A at 30V DC 1 1/2 to 4A: 1,000A at 120V AC 400 Hz.; 6,000A at 30V DC 5 to 10A: 600A at 120V AC 400 Hz.; 6,000A at 30V DC
Endurance	At 120VAC, 400 Hz., or at 30V DC; inductive load — 2,500 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,000 cycles
Overload Cycling	100 operations at 200% rated current and rated voltage
Dielectric Strength	1,500V, minimum
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration	Exceeds MIL-STD-202, Method 204, Condition A
Shock	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	45 grams (.099 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C				@ +71°C		@ -40°C		Test Time Parameters
	0.5 – 3A		4.5 – 10A						
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	115	—	115	—	115	—	% For 1 Hour
Must Trip	—	138	—	138	—	138	—	138	% Within 1 Hour
200% Overload	.400	3.0	.800	3.60	—	—	—	—	Seconds
400% Overload	.090	0.6	.140	0.75	—	—	—	—	Seconds
600% Overload	.042	0.3	.055	0.35	—	—	—	—	Seconds

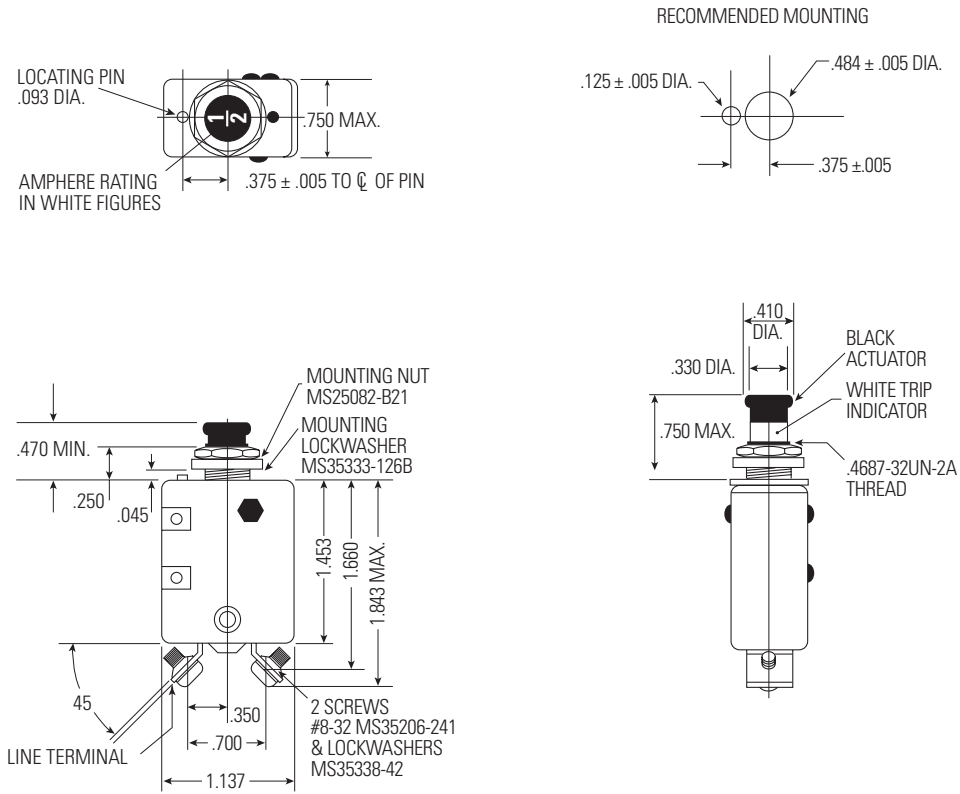
Trip curve available

ORDERING INFORMATION

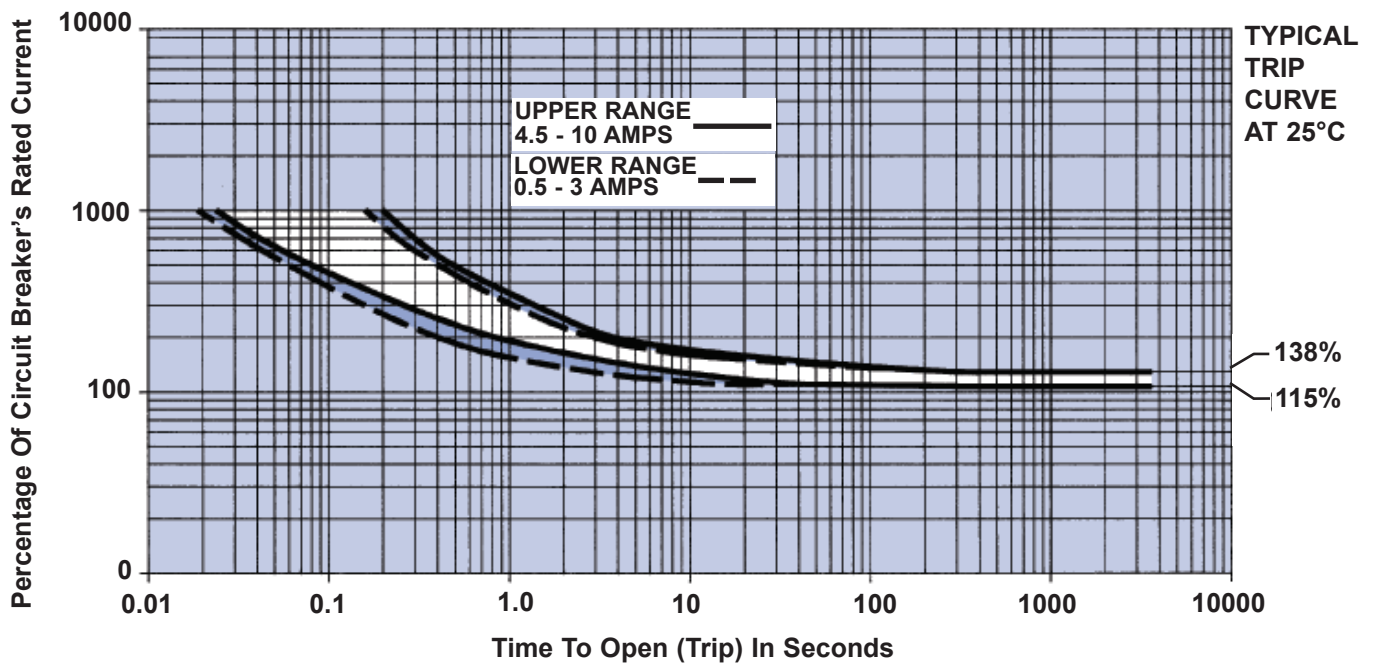
Ampere Rating	Voltage Drop Max.*	Part Number
1/2	1.21	1500-052-05
3/4	1.21	1500-052-075
1	1.20	1500-052-1
1 1/2	1.10	1500-052-105
2	0.95	1500-052-2
2 1/2	0.85	1500-052-205
3	0.81	1500-052-3
4	0.72	1500-052-4
5	0.65	1500-052-5
10	0.55	1500-052-10

* At rated nominal current.
For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS



TRIP CURVE





Single-Pole High Performance

Qualified

To MS22073 of MIL-C-5809

Lightweight

Under 33 grams (.073 lbs)

High Interrupting Capacity

Interrupts up to 6,000A circuit at 30V, DC; and up to 3,500A circuit at 120V, 400 Hz. AC.

Not Sensitive To Frequency Or Voltage

Breaker may be used on either AC or DC circuits.

Performance Rated Circuit Breaker

Meets or exceeds military specification requirements for durability, vibration, mechanical shock, and acceleration. Precision internal design provides a time-temperature characteristic capable of protecting either wire or equipment. With a case 1 1/2 inches long, the breaker weighs less than 33 grams, and is ideal for today's demanding design requirements.

PERFORMANCE DATA

Interrupting Capacity	1 to 5A: 6,000A at 30V, DC. 7 1/2 to 25A: 2,000A at 30V, DC 1A: 3,500A at 120V, 400 Hz., AC. 2 to 5A: 800A at 120V, 400 Hz., AC 7 1/2 to 25A: 500A at 120V, 400 Hz., AC
Endurance*	At 120V, 400 Hz., AC, or 28V, DC: inductive load — 2,500 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,500 cycles
Overload Cycling	100 operations at 200% rated current and rated voltage
Dielectric Strength	1,500V, minimum
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration*	Meets specification MIL-STD-202, Method 204, Condition A, 10G, 10-500 Hz. MS "V" type (4001-008) meets Condition B, 15G, 10-2,000 Hz. and Condition C, 10G, 10-2,000 Hz. MS "D" type (4001-011) meets Random Vibration levels
Shock*	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	33 grams (0.073 lbs.)

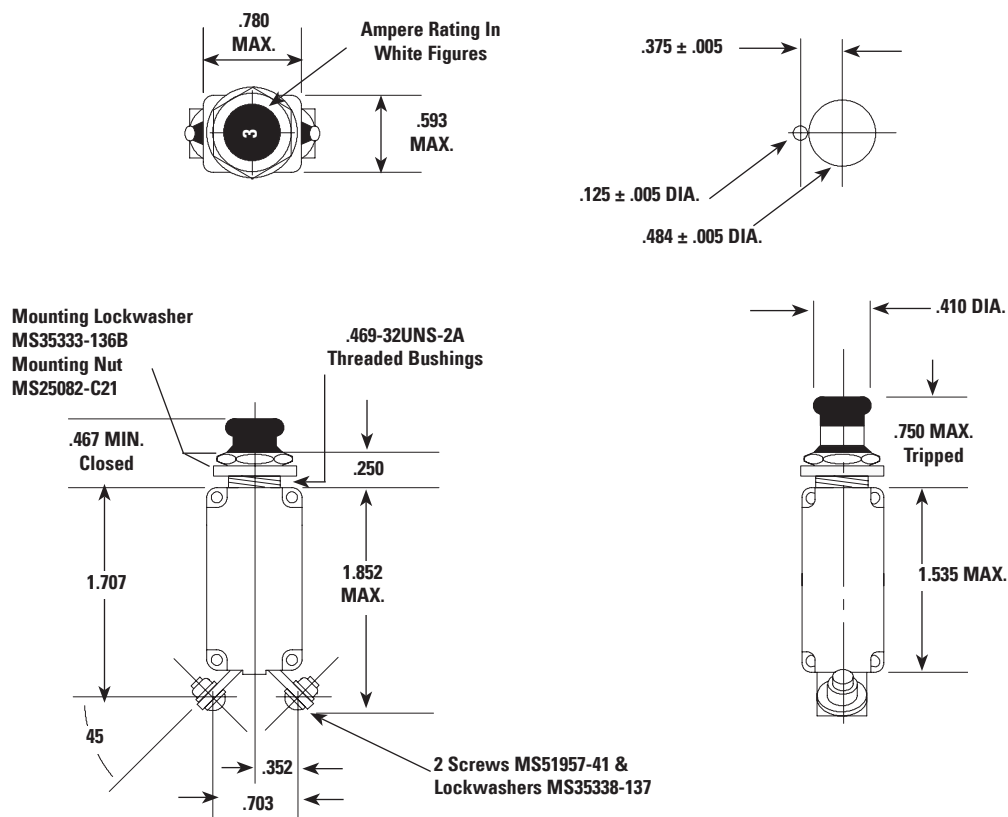
* Variations of these circuit breakers are capable of exceeding the standard Mil specification for endurance, vibration, and shock. Consult the business unit for more information.

OVERLOAD CALIBRATION DATA

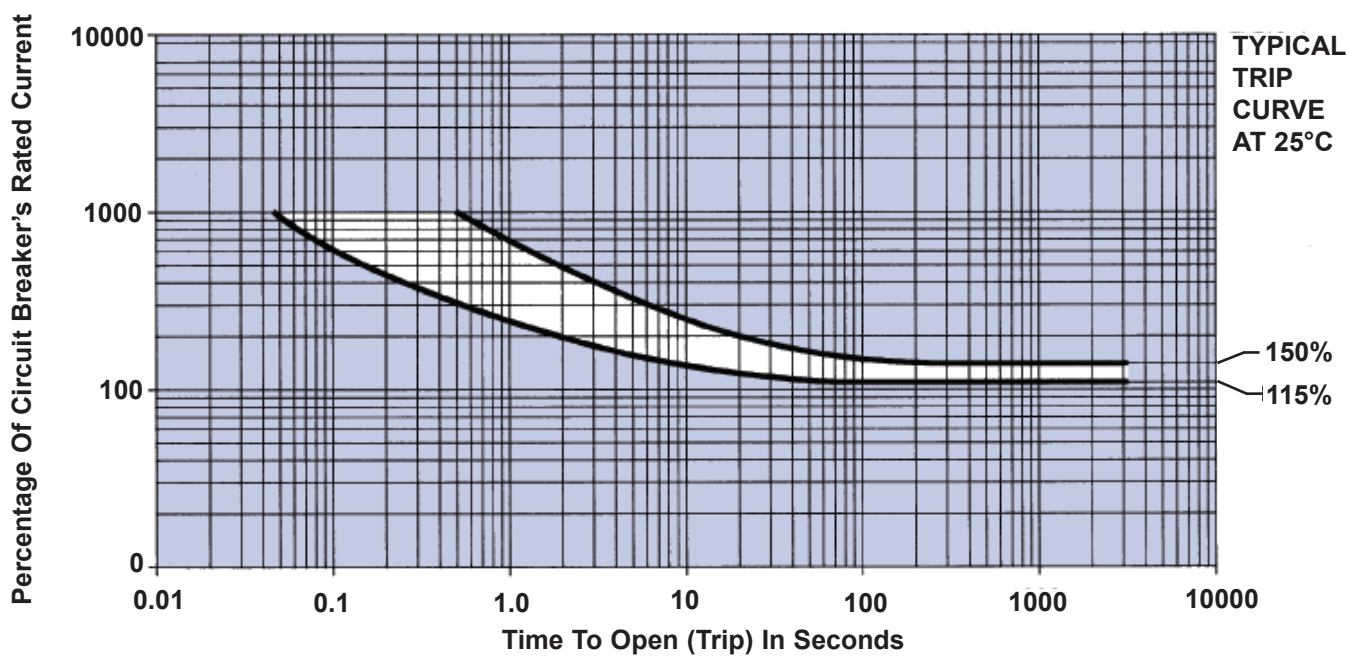
Specification Table	@ 25°C		@ +71°C		@ -55°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	90	—	135	—	% For 1 Hour
Must Trip	—	150	—	130	—	180	% Within 1 Hour
200% Overload	2.000	20.0	—	—	—	—	Seconds
500% Overload	0.160	2.0	—	—	—	—	Seconds
1000% Overload	0.046	0.5	—	—	—	—	Seconds

Trip curve available

DIMENSIONS



TRIP CURVE





Standard



Longbutton



Auxiliary Terminal

Single-Pole High Performance

Qualified

To MS26574 of MIL-C-5809

Lightweight

22 grams (.048 lbs)

High Interrupting Capacity

High Vibration and Shock Resistance

Sub-Miniature Size

Performance Rated Circuit Breaker

The 4200 is a sub-miniature, lightweight, trip free, single phase circuit breaker, which combines its compact size with a proven technological track record. A modification of the popular 4310 series, its reliability has been long established. Options such as long button, high vibration resistance, and hardware variations will enhance its versatility. The 4200 reacts consistently in extreme fluctuations of temperature, high shock, vibration, or humidity.

Auxiliary Switch And Terminals

The 4200 Series is also available in an Auxiliary Switch version (4200-004) to provide a remote indication of a trip condition. In a trip condition, the contacts in the auxiliary switch are in a closed position.

PERFORMANCE DATA

Interrupting Capacity	1 to 5A: unlimited at 28V DC; 7 1/2 to 25A: 2,000A at 28V DC 1 to 1 1/2A: unlimited at 120V 400 Hz., AC 2 to 5A: 800A at 120V, 400 Hz., AC 7 1/2 to 25A: 500 amps at 120V, 400 Hz., AC
Endurance*	At 120V, 400 Hz., AC or at 28V, DC: inductive load — 2,500 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,000 cycles
Overload Cycling	Minimum of 100 cycles at 200% rated current
Dielectric Strength	At sea level, 25°C 1,500V, AC. At 80,000 ft. 71°C 500V, AC
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration*	Meets specification MIL-STD-202, Method 204, Condition A 10-57 Hz. 06 in. Displacement Double Amplitude, and 57-500 Hz. at 10G's (Random vibration level also available)
Shock*	Exceeds 50G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213A Test A
Acceleration	Exceeds 10G's
Weight	22 grams (0.048 lbs.)

* Variations of these circuit breakers are capable of exceeding the standard Mil specification for endurance, vibration, and shock. Consult the business unit for more information.

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -55°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	90	—	135	—	% For 1 Hour
Must Trip	—	150	—	130	—	180	% Within 1 Hour
200% Overload	2.000	20.0	—	—	—	—	Seconds
500% Overload	0.160	1.2	—	—	—	—	Seconds
1000% Overload	0.046	0.8	—	—	—	—	Seconds

Trip curve available.

ORDERING INFORMATION

			STANDARD		LONG BUTTON		RANDOM VIBRATION		AUXILIARY TERMINAL		LONG BUTTON	
MS APPROVAL STATUS	AMPERE RATING	DROP MAX *	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MPP/N	MS P/N	SAFRAN MPP/N
MS Approved	3/4	1.45	MS26574-3/4	4200-001-075	MS26574-3/4L	4200-003-075	MS26574-D3/4	4200-006-075	MS26574-3/4A	4200-004-075	MS26574-D3/4L	4200-007-075
MS Approved	1	1.10	MS26574-1	4200-001-1	MS26574-1L	4200-003-1	MS26574-D1	4200-006-1	MS26574-1A	4200-004-1	MS26574-D1L	4200-007-1
MS Approved	1 1/2	0.75	MS26574-1 1/2	4200-001-105	MS26574-1 1/2L	4200-003-105	MS26574-D1 1/2	4200-006-105	MS26574-1 1/2A	4200-004-105	MS26574-D1 1/2L	4200-007-105
MS Approved	2	0.75	MS26574-2	4200-001-2	MS26574-2L	4200-003-2	MS26574-D2	4200-006-2	MS26574-2A	4200-004-2	MS26574-D2L	4200-007-2
MS Approved	2 1/2	0.70	MS26574-2 1/2	4200-001-205	MS26574-2 1/2L	4200-003-205	MS26574-D2 1/2	4200-006-205	MS26574-2 1/2A	4200-004-205	MS26574-D2 1/2L	4200-007-205
MS Approved	3	0.55	MS26574-3	4200-001-3	MS26574-3L	4200-003-3	MS26574-D3	4200-006-3	MS26574-3A	4200-004-3	MS26574-D3L	4200-007-3
MS Approved	4	0.45	MS26574-4	4200-001-4	MS26574-4L	4200-003-4	MS26574-D4	4200-006-4	MS26574-4A	4200-004-4	MS26574-D4L	4200-007-4
MS Approved	5	0.35	MS26574-5	4200-001-5	MS26574-5L	4200-003-5	MS26574-D5	4200-006-5	MS26574-5A	4200-004-5	MS26574-D5L	4200-007-5
MS Approved	7 1/2	0.30	MS26574-7 1/2	4200-001-705	MS26574-7 1/2L	4200-003-705	MS26574-D7 1/2	4200-006-705	MS26574-7 1/2A	4200-004-705	MS26574-D7 1/2L	4200-007-705
MS Approved	10	0.28	MS26574-10	4200-001-10	MS26574-10L	4200-003-10	MS26574-D10	4200-006-10	MS26574-10A	4200-004-10	MS26574-D10L	4200-007-10
MS Approved	15	0.25	MS26574-15	4200-001-15	MS26574-15L	4200-003-15	MS26574-D15	4200-006-15	MS26574-15A	4200-004-15	MS26574-D15L	4200-007-15
MS Approved	20	0.25	MS26574-20	4200-001-20	MS26574-20L	4200-003-20	MS26574-D20	4200-006-20	MS26574-20A	4200-004-20	MS26574-D20L	4200-007-20
Non MS Approved	25	0.20		4200-001-25		4200-003-25		4200-006-25		4200-004-25		4200-007-25

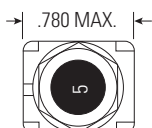
* AT RATED NOMINAL CURRENT

For other amperage ratings and configurations, consult the Business Unit.

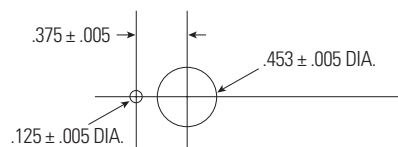
DIMENSIONS

Part No.	A*Max.	B*Min.
4200-001	0.759	0.407
4200-003	1.134	0.782
4200-004	0.759	0.407
4200-006	0.759	0.407
4200-007	1.0134	0.782

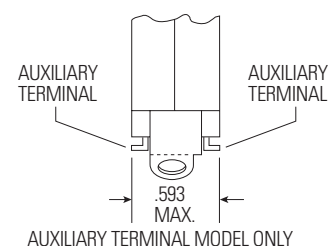
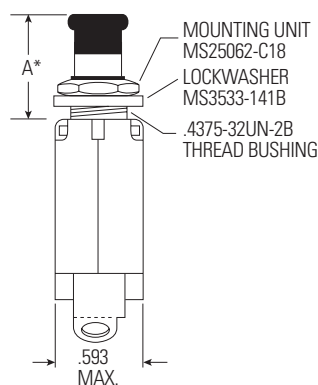
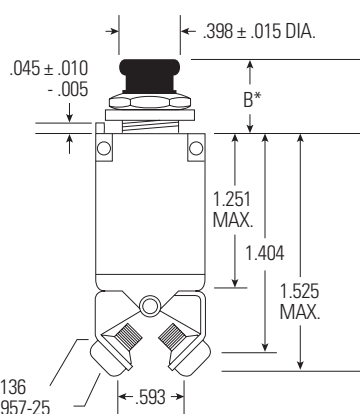
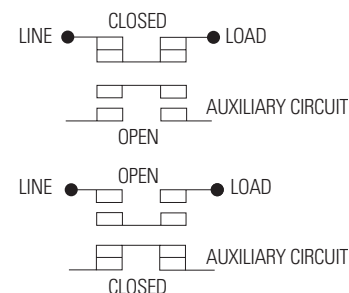
Min. Panel Thickness .025
Max. Panel Thickness .100



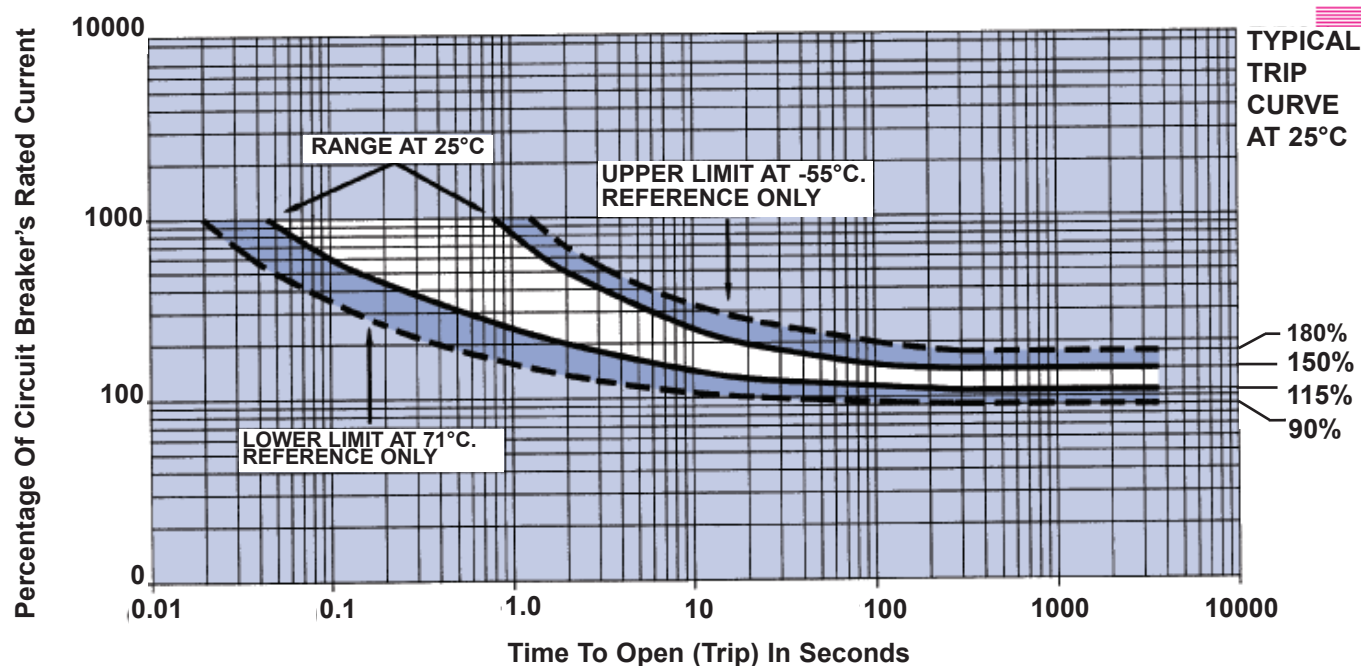
RECOMMENDED MOUNTING



AUXILIARY SWITCH OPERATION



TRIP CURVE





Standard

Sub-Miniature Size — High Performance

Qualified

To MS3320 of Mil-C-5809. Meets performance specification of MS14105 of MIL-C-5809

High Interrupting Capacity

Interrupts 6,000A fault at 28V, DC; up to 3,500A fault at 120V, 400 Hz., AC (ampere rating dependent).

Vibration Resistance

Vibration resistance and mechanical life exceed MIL Specs — including random vibration.

Temperature-Compensated

Ambient-temperature-compensated from -55°C to +121°C.

Performance Rated Circuit Breaker

The lightweight, single-phase circuit breaker, Series 4310, allows high density packaging for all aircraft and aerospace needs.

The 4310 series reflects the latest advancements in circuit breaker design — plus other proven features (e.g., self-wiping contacts).

Tight tolerances in design and stringent manufacturing standards are key factors in the reliable operation of the 4310 under severe environmental conditions of high temperature, high humidity, extreme vibration, and shock. It is also fungus- and corrosion-proof.

Calibration integrity is maintained through wide variations in ambient temperature and altitude, making this circuit breaker ideal for applications where temperature is not controlled.

Multiple Options

This series is available in many optional configurations.

It is presently being manufactured with 7/16, 15/32 and metric mounting sleeves. Many versions of different terminals, barriers, and hardware are current production items. Several different actuator options provide our customers with additional flexibility.

PERFORMANCE DATA

Interrupting Capacity*	1 to 25A: 6,000A at 28V, DC. 1A: 3,500A at 120V, 400 Hz., AC 1 1/2 to 2 1/2A: 2,800A at 120V, 400 Hz., AC; 3 TO 15: 2,500A AT 120V, 400 Hz., AC; 20 to 25A: 2,000A at 120V, 400 Hz., AC
Endurance*	At 120V, 400 Hz., AC or at 28V, DC: inductive load — 2,500 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 10,000 cycles
Overload Cycling	Minimum of 100 cycles at 200% rated current
Dielectric Strength	At sea level, 25°C 1,500V, AC. At 70,000 ft. 121°C 500V, AC
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration*	Meets specification MIL-STD-202, Method 204, Condition A-10G, 10-500 Hz. MS "V" type, (4310-019) meets Condition B, 15G, 10-2,000 Hz. and Condition C 10G, 10-2,000 Hz.
Shock*	Exceeds 50G's, 11 Milli-sec (half-sine pulse) MIL-STD-202, Method 213 Test A
Acceleration	Exceeds 10G's
Weight	25 grams (.055 lbs.)

* Variations of these circuit breakers are capable of exceeding the standard Mil specification for endurance vibration, shock, and Interrupting capacity. Consult the Business Unit for more information.

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +121°C		@ -55°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	100	—	115	—	% For 1 Hour
Must Trip	—	138	—	138	—	160	% Within 1 Hour
200% Overload	5.00	20.00	1.500	13.00	7.00	40.00	Seconds
500% Overload	0.50	2.00	0.150	1.10	0.50	3.00	Seconds
1000% Overload	0.12	0.53	0.035	0.30	0.16	0.80	Seconds

Trip curves available.

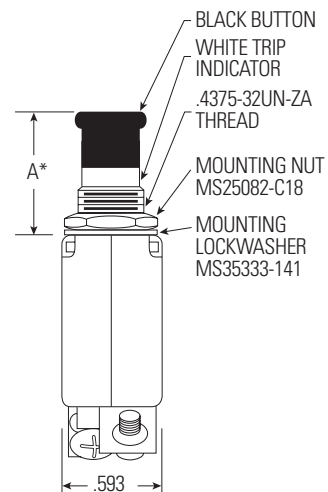
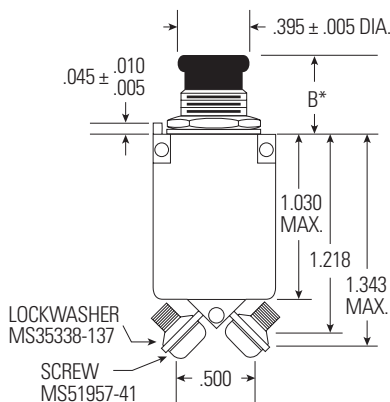
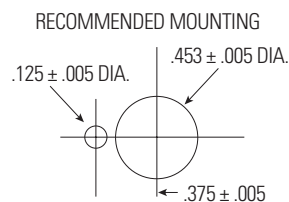
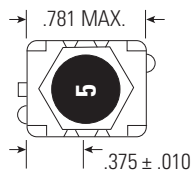
ORDERING INFORMATION

MS Approval Status	AMPERE RATING	VOLTAGE DROP MAX. *	STANDARD		LONG BUTTON		HIGH VIBRATION		LONG BUTTON VIBRATION	
			MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N
MS Approved	1	1.10	MS3320-1	4310-001-1	MS3320-1L	4310-005-1	MS3320-1V	4310-019-1	MS3320-1VL	4310-024-1
Non MS Approved	1 1/2	0.80		4310-001-105		4310-005-105		4310-019-105		4310-024-105
MS Approved	2	0.75	MS3320-2	4310-001-2	MS3320-2L	4310-005-2	MS3320-2V	4310-019-2	MS3320-2VL	4310-024-2
MS Approved	2 1/2	0.70	MS3320-2-1/2	4310-001-205	MS3320-2 1/2L	4310-005-205	MS3320-2 1/2V	4310-019-205	MS3320-2 1/2VL	4310-024-205
MS Approved	3	0.55	MS3320-3	4310-001-3	MS3320-3L	4310-005-3	MS3320-3V	4310-019-3	MS3320-3VL	4310-024-3
MS Approved	4	0.45	MS3320-4	4310-001-4	MS3320-4L	4310-005-4	MS3320-4V	4310-019-4	MS3320-4VL	4310-024-4
MS Approved	5	0.35	MS3320-5	4310-001-5	MS3320-5L	4310-005-5	MS3320-5V	4310-019-5	MS3320-5VL	4310-024-5
MS Approved	7 1/2	0.30	MS3320-7-1/2	4310-001-705	MS3320-7 1/2L	4310-005-705	MS3320-7 1/2V	4310-019-705	MS3320-7 1/2VL	4310-024-705
MS Approved	10	0.28	MS3320-10	4310-001-10	MS3320-10L	4310-005-10	MS3320-10V	4310-019-10	MS3320-10VL	4310-024-10
MS Approved	15	0.25	MS3320-15	4310-001-15	MS3320-15L	4310-005-15	MS3320-15V	4310-019-15	MS3320-15VL	4310-024-15
MS Approved	20	0.25	MS3320-20	4310-001-20	MS3320-20L	4310-005-20	MS3320-20V	4310-019-20	MS3320-20VL	4310-024-20
Non MS Approved	25	0.20		4310-001-25		4310-005-25		4310-019-25		4310-024-25

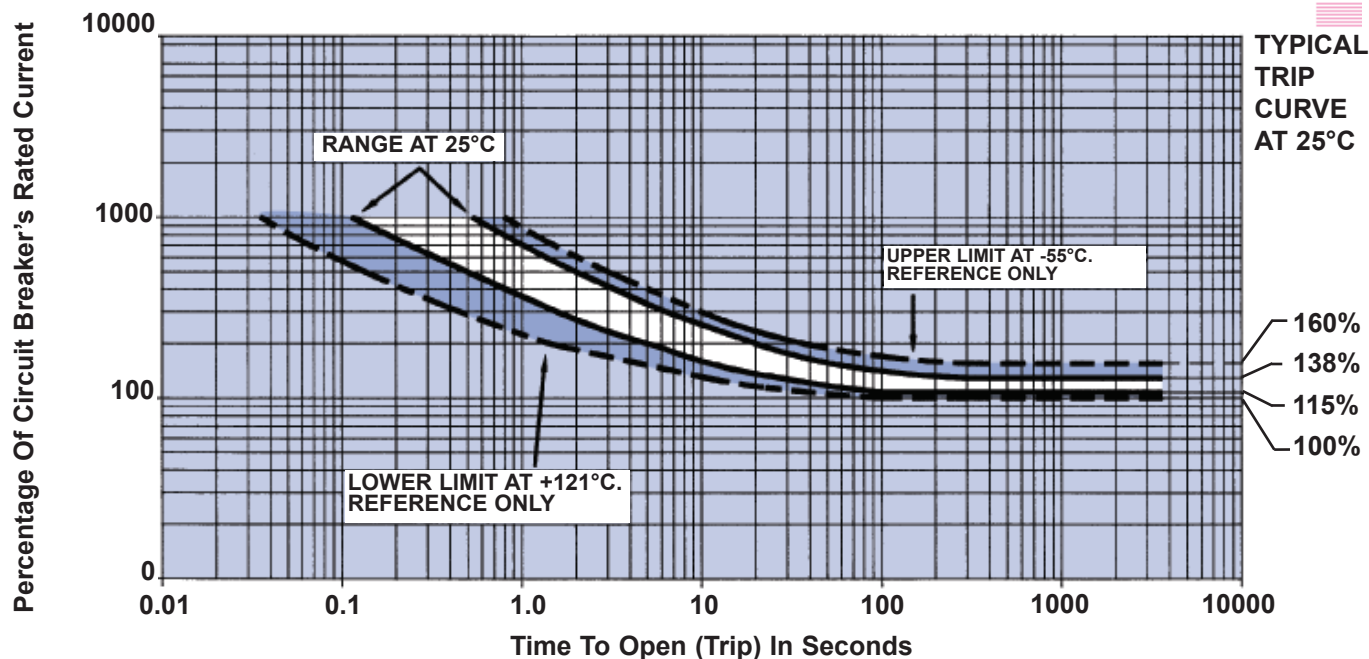
DIMENSIONS

MIL Spec	Part No.	A*Max.	B*Min.
MS3320	4310-001	0.750	0.470
MS3320L	4310-005	1.125	0.845
MS3320V	4310-019	0.750	0.470
MS3320VL	4310-024	1.125	0.845

Min. Panel Thickness .025
Max. Panel Thickness .100



TRIP CURVE





Heavy-Duty Three-Pole High Performance

Three-phase protection of circuits from 50 to 100 amperes.

Interphase Insulation

Insulating interphase barriers separate adjacent terminals.

Common Trip Bar

One bar connects the three operating mechanisms for simultaneous trip action. Trip bar is removable for installation.

Performance Rated Circuit Breaker

The 940 series is the only three-pole heavy-duty aircraft-type circuit breaker available in the 50 to 100 ampere range and consists of three specially built 160-012 breakers with insulating interphase barriers separating adjacent terminals. The unit has a common trip bar connecting the three operating mechanisms so that an overload tripping one pole will simultaneously trip the remaining two poles.

PERFORMANCE DATA

Interrupting Capacity	1,200A at 120V 400 Hz., AC
Endurance	At 120VAC, 400 Hz.: inductive load — 5,000 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,000 cycles
Overload Cycling	100 cycles minimum at 200% rated current and rated voltage
Dielectric Strength	1,500V, minimum
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration	Exceeds MIL-STD-202, Method 204, Condition A except, 7G peak
Shock	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	390 grams (.860 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -40°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	105	—	70	—	145	—	% For 1 Hour
Must Trip	—	138	—	115	—	170	% Within 1 Hour
200% Overload	15	70	—	—	—	—	Seconds
400% Overload	2	10	—	—	—	—	Seconds
600% Overload	1	4	—	—	—	—	Seconds

Tip curve available.

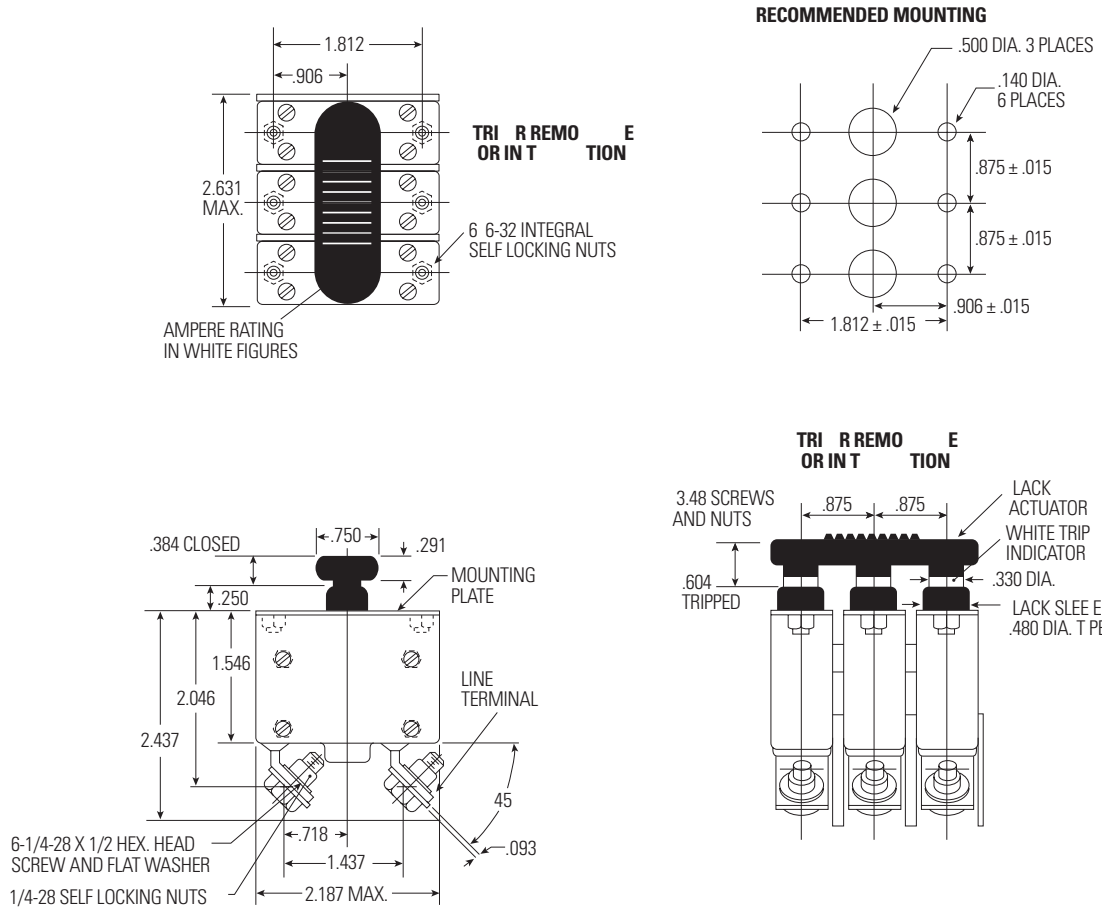
ORDERING INFORMATION

Ampere Rating	Voltage Drop Max.*	Part Number
50	0.15	940-006-50
60	0.15	940-006-60
70	0.15	940-006-70
75	0.15	940-006-75
80	0.15	940-006-80
90	0.15	940-006-90
100	0.15	940-006-100

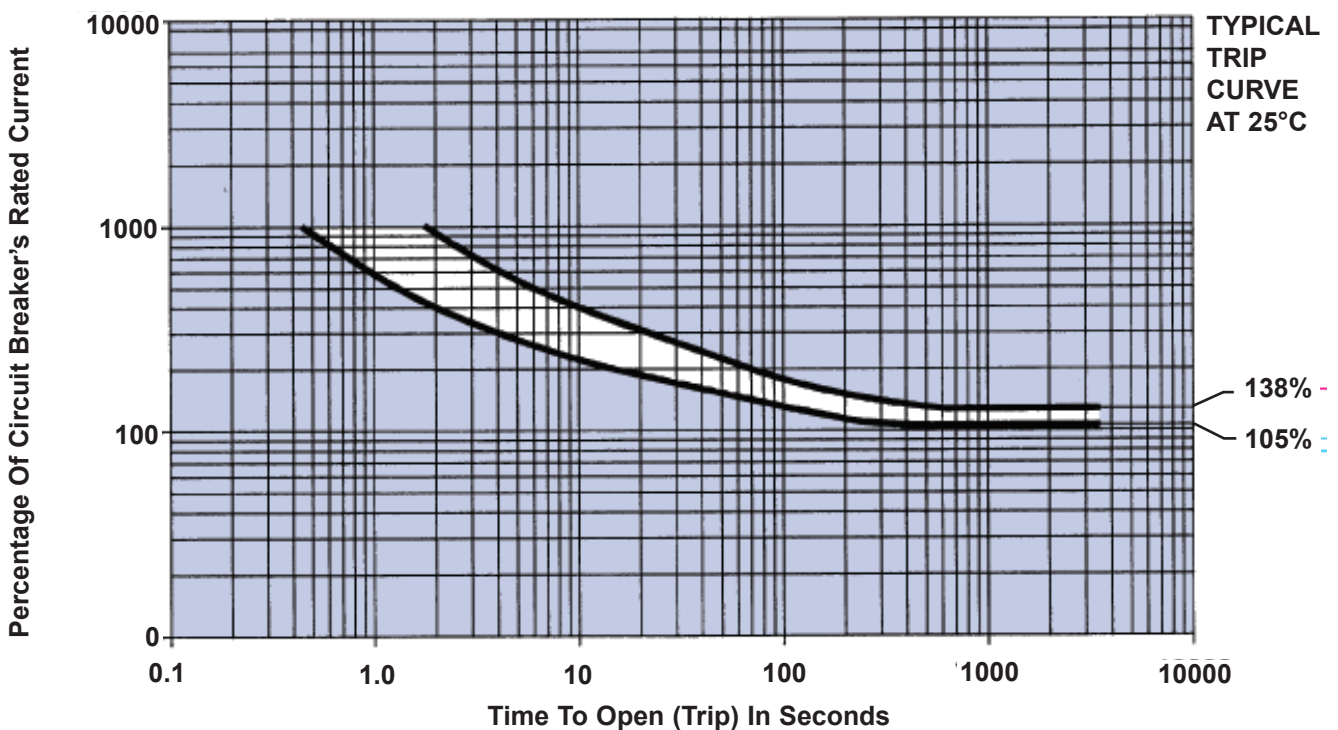
* At rated nominal current.

Data depicted is for the 940 Series. Also available to order are 920, 930, 960, and 970 Series devices. For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS



TRIP CURVE





Three-Pole High Performance

Common trip mechanism trips all three phases, regardless of which phase is overloaded.

Low-Current Protection

Protects circuits in ratings from 1 to 15 amperes.

Ambient-Compensated

Effects of temperature on trip times are minimal.

Fast Trip

Operates on a hot-wire principle, much faster than bimetal breakers.

Low Resistance

Contacts are made from a silver alloy that maintains low resistance throughout the life of the breaker.

Load Protection

The fast tripping circuit breaker is ideal for protecting sensitive loads such as avionics and fuel pumps where rapid detection and fault clearing are desired.

Performance Rated Circuit Breaker

The 1526 Series is the only hot wire, fast-trip, three-pole circuit breaker in ratings from 1 -15 amperes. A single actuator controls all three poles, so that the breaker can be easily operated manually. There is only one overload latch; thus an overload on one pole will open all three poles simultaneously, regardless of which pole is overloaded. Long contact life is assured through the use of a low-resistance silver alloy.

PERFORMANCE DATA

Interrupting Capacity	300A at 120V, 400Hz., AC, three-phase
Endurance	4,000 cycles at 100% load
Overload Cycling	100 cycles minimum at 200% load
Dielectric Strength	1,500V, minimum
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration	Exceeds MIL-STD-202, Method 204, Condition A
Shock	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	154 grams (.340 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C				@ +71°C		@ -65°C		Test Time Parameters
	1– 7.5A		10 – 15A						
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	115	—	110	—	110	—	% For 1 Hour
Must Trip	—	138	—	138	—	138	—	138	% Within 1 Hour
200% Overload	.35	4.0	3.0	10.0	—	—	—	—	Seconds
400% Overload	.10	0.7	0.6	1.4	—	—	—	—	Seconds
600% Overload	.04	0.3	0.3	0.8	—	—	—	—	Seconds

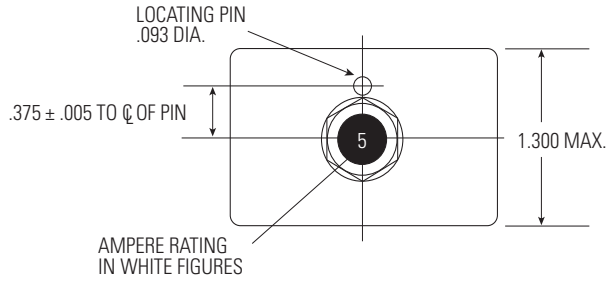
Trip curve available.

ORDERING INFORMATION

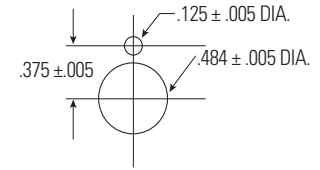
Ampere Rating	Voltage Drop Max.*	Part Number
1	1.20	1526-005-1
1 1/2	1.20	1526-005-105
2	0.95	1526-005-2
2 1/2	0.85	1526-005-205
3	0.85	1526-005-3
3 1/2	0.75	1526-005-305
4	0.72	1526-005-4
5	0.65	1526-005-5
7 1/2	0.60	1526-005-705
10	0.55	1526-005-10
15	0.50	1526-005-15

* At rated nominal current.
For other amperage ratings and configurations, consult the Business Unit.

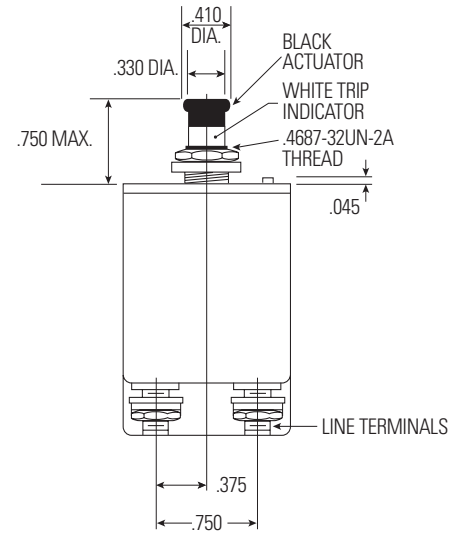
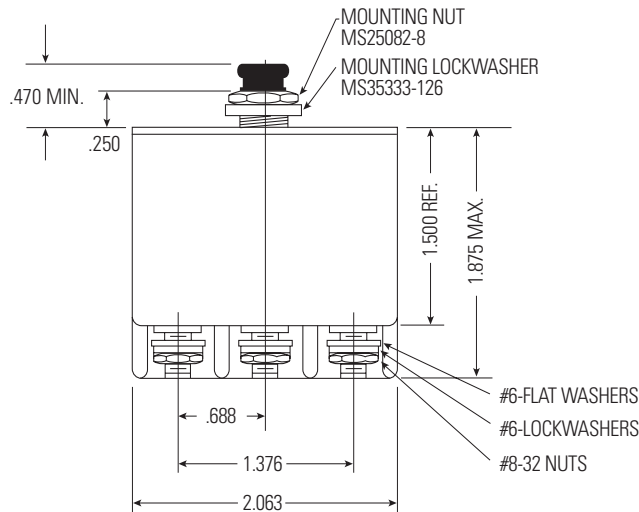
DIMENSIONS



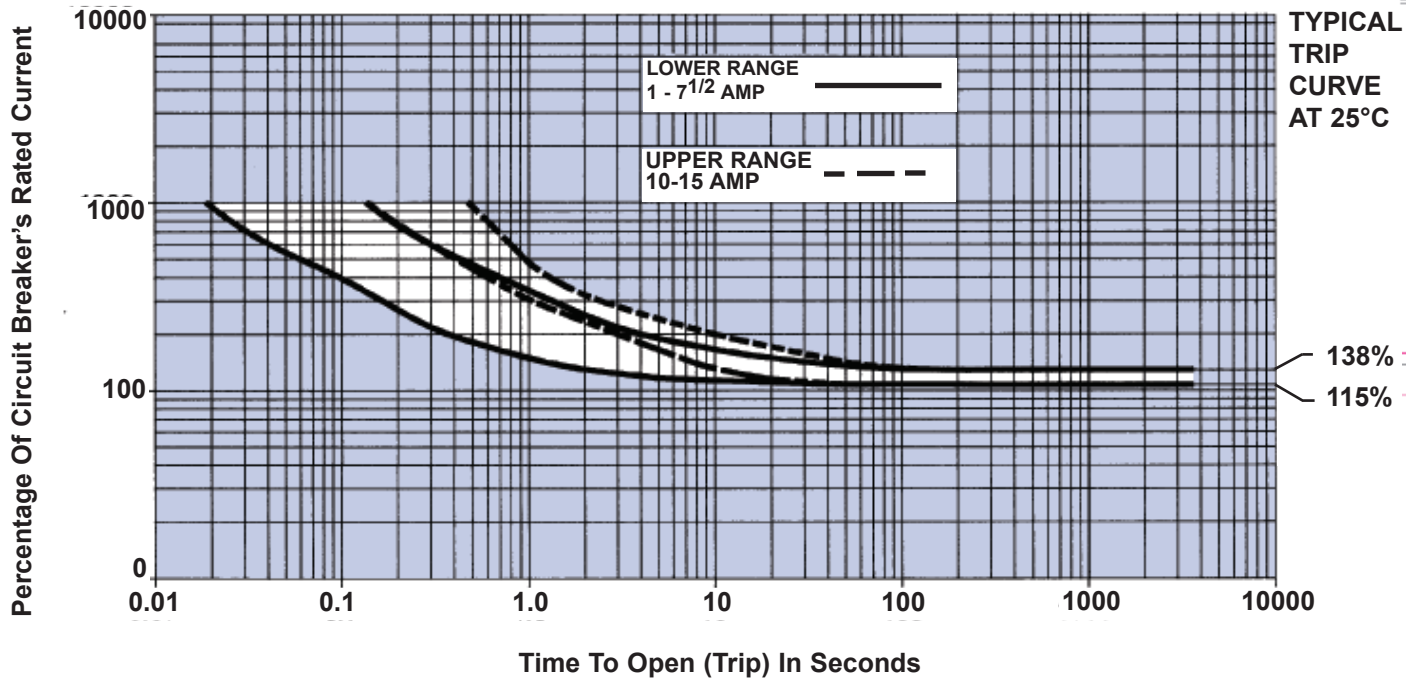
RECOMMENDED MOUNTING



MAX. PANEL THICKNESS .100



TRIP CURVE





Three-Pole High Performance

Three-Phase Protection

Common trip mechanism trips all three phases, regardless of which phase is overloaded.

Integral Barriers

Terminals are separated by barriers molded into the case.

Single-Hole Mounting

For quick, easy installation.

Shock And Vibration Resistant Construction

Permits use in various types of portable and mobile airborne equipment.

Performance Rated Circuit Breaker

The 1536-001 is a lightweight, miniature breaker that features three bimetal sensing elements having very fast electro-dynamic response under short circuit conditions, and standard trip characteristics at lower levels of overloads.

Single hole mounting and small size facilitate easy installation. The breaker's one-piece, glass-filled case features integrally-molded barriers to separate the terminals.

PERFORMANCE DATA

Interrupting Capacity	1,000A at 205V, 400 Hz., three-phase symmetrical fault 1,000A at 120V, 400 Hz., single-phase fault
Endurance	At 120VAC, 400 Hz.: inductive load — 5,000 cycles; resistive load — 5,000 cycles; mechanical cycling, no load — 5,000 cycles
Overload Cycling	100 operations at 200% load
Dielectric Strength	1,500V, minimum
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration	Exceeds MIL-STD-202, Method 204, Condition A
Shock	Exceeds 30G's, 11 Millisec (half-sine pulse) MIL-STD-202, Method 213 Test J
Acceleration	Exceeds 10G's
Weight	181 grams (.40 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -55°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	105	—	70	—	130	—	% For 1 Hour
Must Trip	—	138 Balanced*	—	110	—	160	% Within 1 Hour
200% Overload	10.00	70.0	—	—	—	—	Seconds
400% Overload	2.00	10.0	—	—	—	—	Seconds
600% Overload	1.00	4.0	—	—	—	—	Seconds
1000% Overload	0.35	1.4	—	—	—	—	Seconds

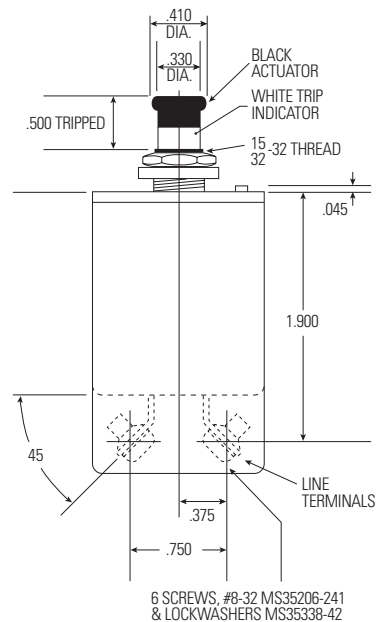
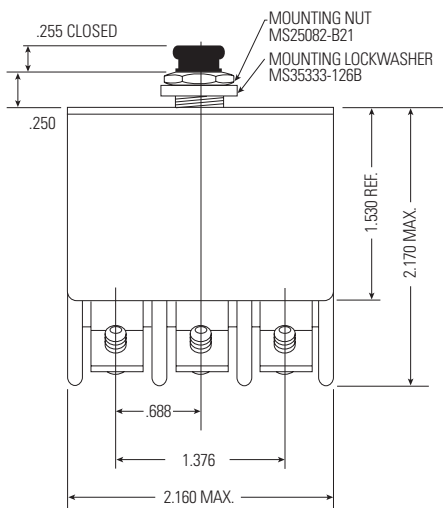
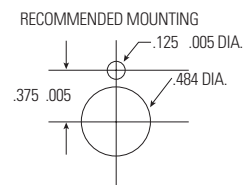
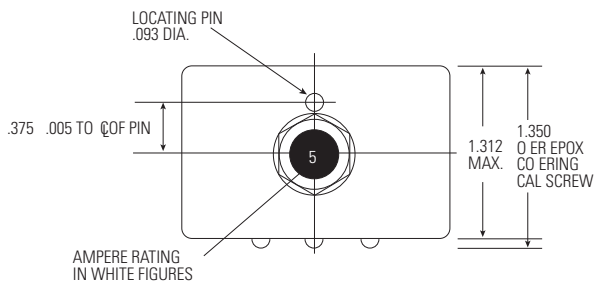
*Unbalanced load, individual phases: 145%
Trip curve available.

ORDERING INFORMATION

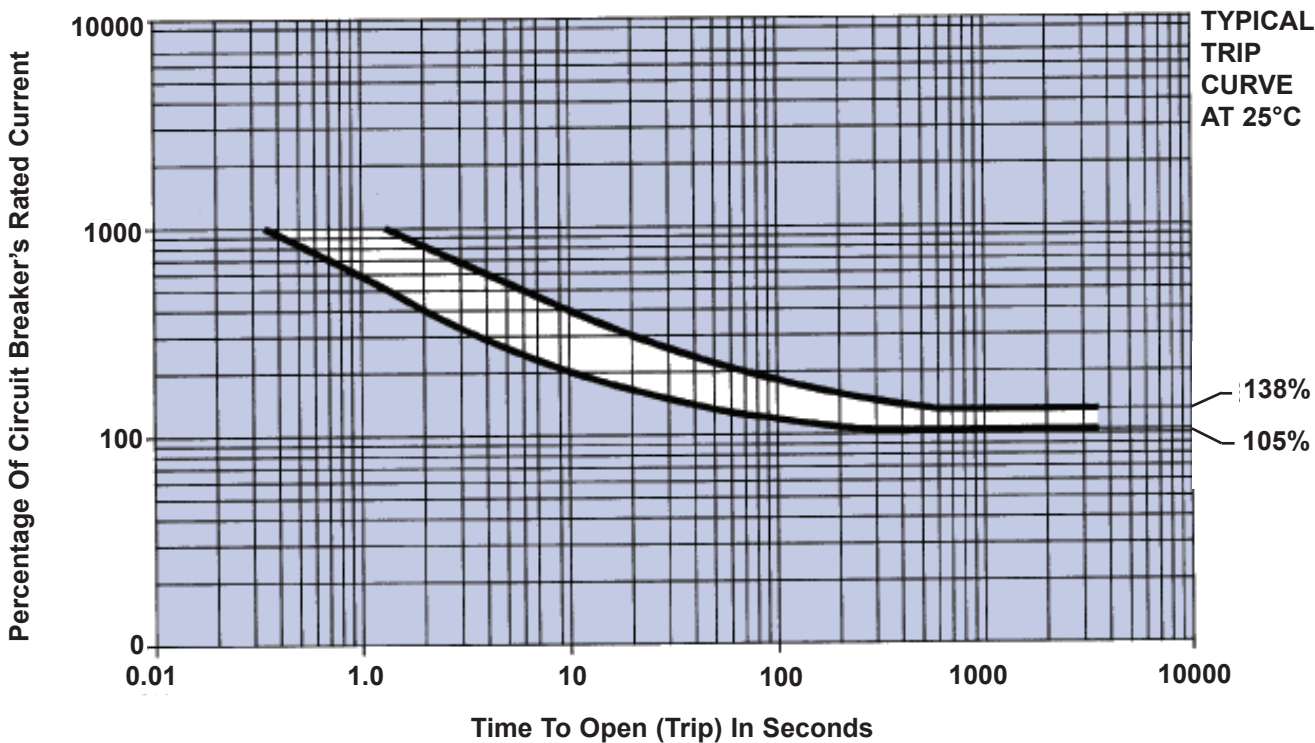
Ampere Rating	Voltage Drop Max.*	Part Number
5	0.350	1536-001-5
7 1/2	0.325	1536-001-705
10	0.300	1536-001-10
15	0.250	1536-001-15
20	0.200	1536-001-20
25	0.180	1536-001-25
30	1.180	1536-001-30
35	0.175	1536-001-35
40	0.175	1536-001-40
50	0.150	1536-001-50

* At rated nominal current.
For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS



TRIP CURVE





Standard

Three-Phase Protection

Qualified

To MS14154 of MIL-C-5809.

Lightweight

Weighs 68 grams maximum (0.15 lbs.).

Vibration Resistance

Vibration resistance and mechanical life exceed MIL Specs — including random vibration.

Miniature Size — High Performance

19.8mm, 46.7mm, 35.0mm behind panel depth.

Temperature-Compensated

Ambient-temperature-compensated from -55°C to +71°C. Note: higher operating ranges are available.

Performance Rated Circuit Breaker

This lightweight, miniature, three-phase circuit breaker, Series 4330, reflects the latest advancements in circuit breaker design, incorporating self-wiping contacts, tight tolerances in design, and stringent manufacturing standards. It is fungus-proof and highly resistant to corrosion. The trip-free thermal mechanism avoids nuisance trips (even during temporary surges of starting loads) under ambient temperatures ranging from -55°C to +71°C. Calibration integrity is maintained through wide variations in ambient temperature and altitude, making this circuit breaker ideal for applications where temperature is not controlled.

Multiple Options

This series is available in many optional configurations.

It is presently being manufactured with 7/16, 15/32 and metric mounting sleeves. Many versions of different terminals, barriers, and hardware are current production items. Several different button options provide our customers with additional flexibility.

PERFORMANCE DATA

Interrupting Capacity	1,200A balanced at 205V, 400Hz, AC and 2,000A unbalanced at 120V, 400Hz, AC, at sea level and 70,000 feet
Endurance	120V, 400 Hz., AC: inductive load — 2,500 cycles; resistive load — 5,000 cycles; mechanical cycling no load — 5,000 cycles
Overload Cycling	100 cycles at 200%
Dielectric Strength	At sea level, 25°C 1,500V, AC. At 70,000 ft. +71°C 500V, AC
Insulation Resistance	Not less than 100 megohms at 500V, DC
Voltage Drop	Varies with rating (see "Ordering Information")
Vibration	Meets specification MIL-STD-202, Method 204, Condition A-10G., 10-500 Hz. MS "V" type, meets Condition B, 15G, 10-2,000 Hz. and Condition C 10G, 10-2,000 Hz.
Shock	50G's. MIL-STD-202, Method 213 Test G
Acceleration	Exceeds 10G's
Weight	68 grams max. (0.15 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -55°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	110	—	100	—	110	—	% For 1 Hour
Must Trip	—	145	—	145	—	165	% Within 1 Hour
200% Overload	4.00	20.00	3.00	20.00	6.00	40.00	Seconds
500% Overload	0.40	2.00	0.33	1.70	0.55	3.50	Seconds
1000% Overload	0.10	0.53	0.08	0.40	0.15	0.80	Seconds

ORDERING INFORMATION

STANDARD				LONG BUTTON		HIGH VIBRATION		LONG BUTTON VIBRATION	
MS APPROVAL STATUS	AMPERE RATING	VOLTAGE DROP MAX *	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N
MS Approved	1	1.10	MS14154-1	4330-001-1	MS14154-1L	4330-007-1	MS14154-1V	4330-008-1	MS14154-1VL
MS Approved	2	0.75	MS14154-2	4330-001-2	MS14154-2L	4330-007-2	MS14154-2V	4330-008-2	MS14154-2VL
MS Approved	2 1/2	0.70	MS14154-2 1/2	4330-001-205	MS14154-2 1/2L	4330-007-205	MS14154-2 1/2V	4330-008-205	MS14154-2 1/2VL
MS Approved	3	0.55	MS14154-3	4330-001-3	MS14154-3L	4330-007-3	MS14154-3V	4330-008-3	MS14154-3VL
MS Approved	4	0.45	MS14154-4	4330-001-4	MS14154-4L	4330-007-4	MS14154-4V	4330-008-4	MS14154-4VL
MS Approved	5	0.35	MS14154-5	4330-001-5	MS14154-5L	4330-007-5	MS14154-5V	4330-008-5	MS14154-5VL
MS Approved	7 1/2	0.30	MS14154-7 1/2	4330-001-705	MS14154-7 1/2L	4330-007-705	MS14154-7 1/2V	4330-008-705	MS14154-7 1/2VL
MS Approved	10	0.28	MS14154-10	4330-001-10	MS14154-10L	4330-007-10	MS14154-10V	4330-008-10	MS14154-10VL
MS Approved	15	0.28	MS14154-15	4330-001-15	MS14154-15L	4330-007-15	MS14154-15V	4330-008-15	MS14154-15VL
MS Approved	20	0.25	MS14154-20	4330-001-20	MS14154-20L	4330-007-20	MS14154-20V	4330-008-20	MS14154-20VL

* AT RATED NOMINAL CURRENT

For other amperage ratings and configurations, consult the Business Unit.