

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	42		
Number		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
		4310 Series	24
Hot-wire		RCCB	34
1500 Series	18		
1526 Series	28	Temperature Compensated	
		1500 Series	18
Indicator Control Unit (ICU)		1526 Series	28
1500 Series	18	1536 Series	30
Long Button		4310 Series	24
700 Series	16	4330 Series	32
4200 Series	22		
4310 Series	24	Three Phase	
4330 Series	32	940 Series	26
		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	150% within one hour
				138% 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

Safran Electrical & Power's complete product portfolio allows flexibility to partner with customers having a variety of circuit breaker subsystem and component needs. Safran Electrical & 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

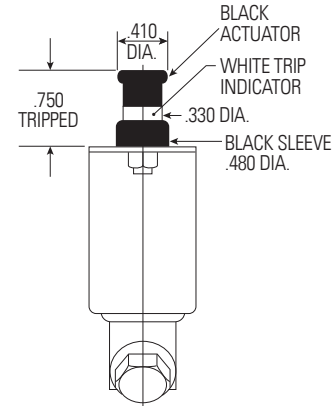
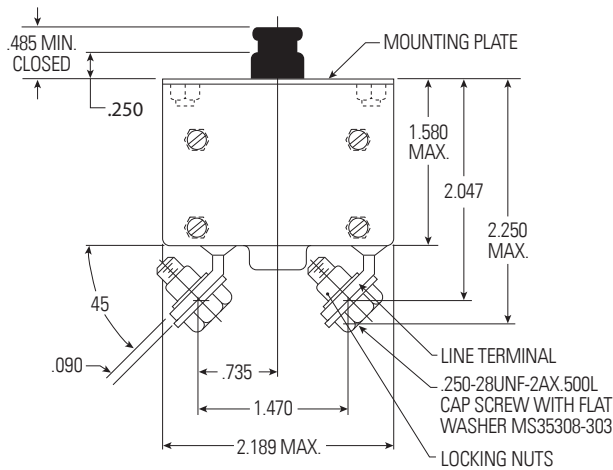
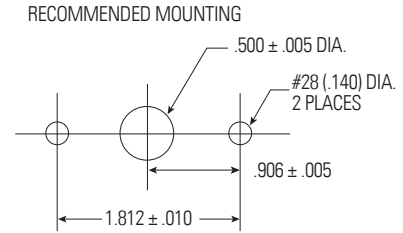
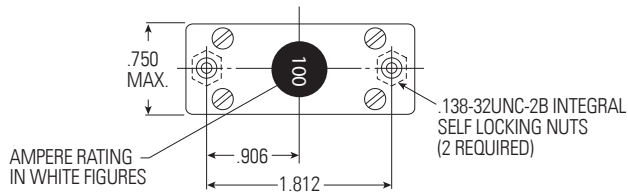
MS APPROVAL STATUS	AMPERE RATING	VOLTAGE DROP MAX. *	STANDARD		HIGH VIBRATION	
			MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N
MS Approved	50	0.15	MS25361-50	160-012-50	MS25361-50V	160-086-50
MS Approved	60	0.15	MS25361-60	160-012-60	MS25361-60V	160-086-60
MS Approved	70	0.15	MS25361-70	160-012-70	MS25361-70V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

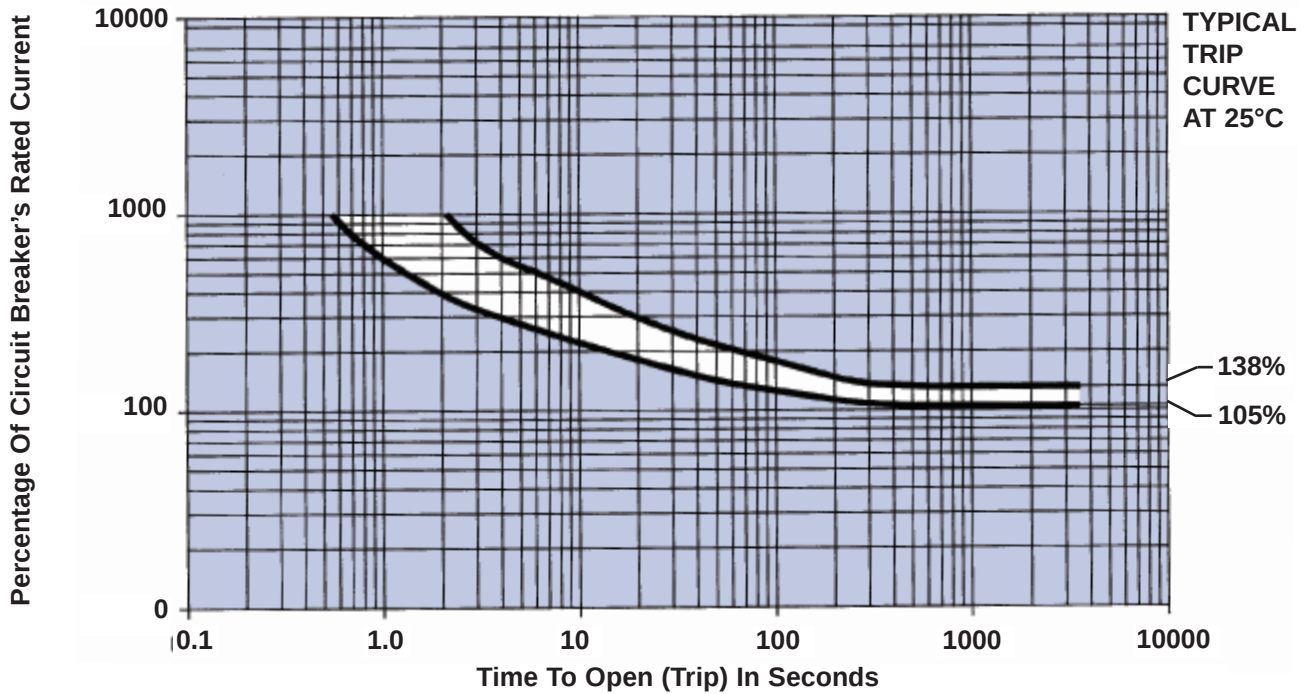
3 Phase variants are available as a 940 Series.

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

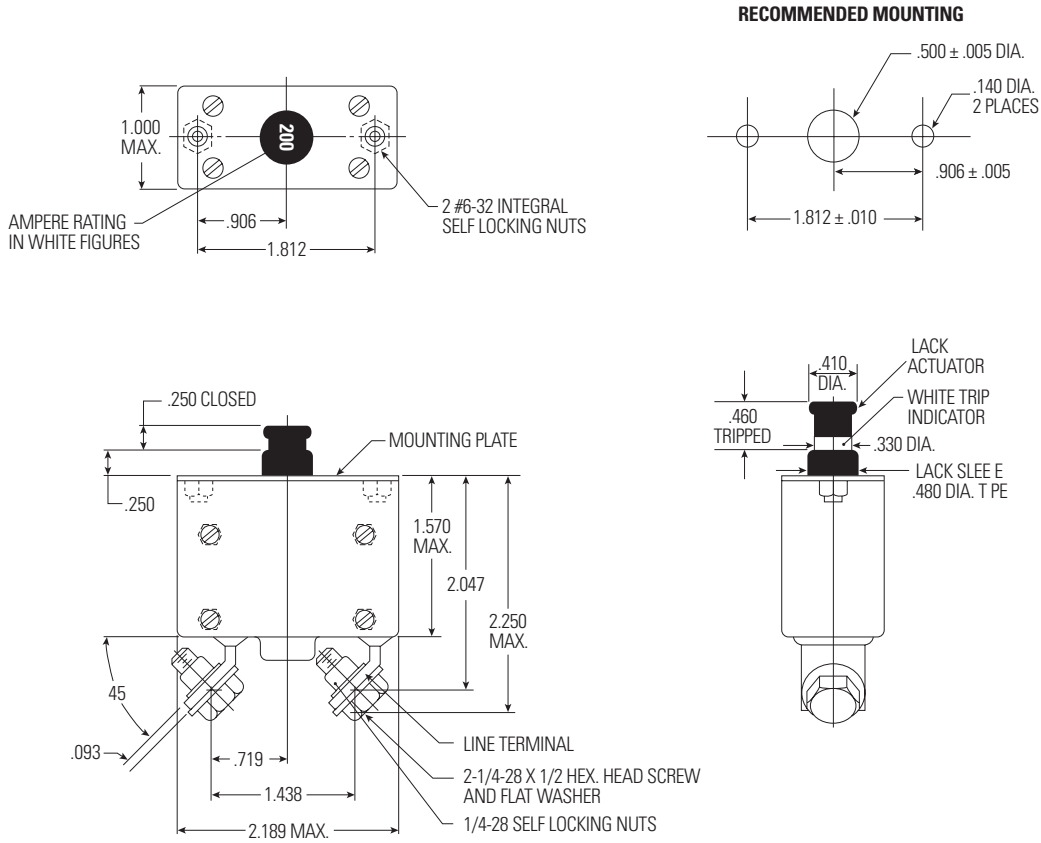
Ampere Rating	Voltage Drop Max.*	Part Number
125	.100	170-001-125
140	.100	170-001-140
150	.100	170-001-150
160	.100	170-001-160
180	.100	170-001-180
200	.100	170-001-200

* At rated nominal current.

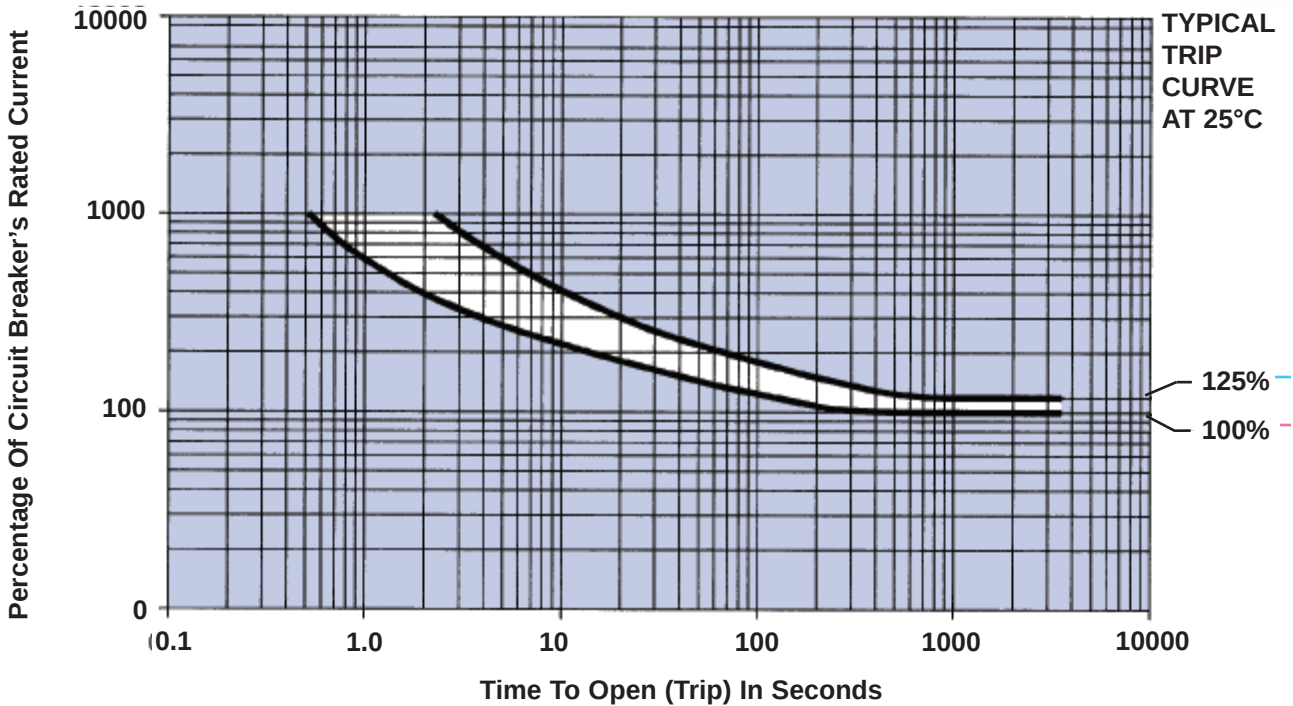
Three phase variants are available as a 970 Series. Also available as a 180 Series device for ratings up to 300 amperes.

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				Test Time Parameters
			0.5 – 7 1/2A		10 – 50A		0.5 – 7 1/2A		10 – 50A		
	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.											

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

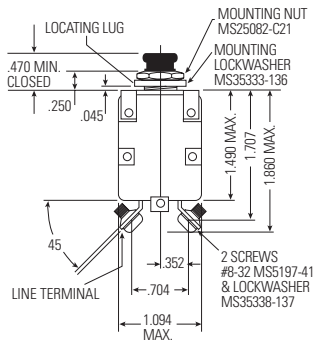
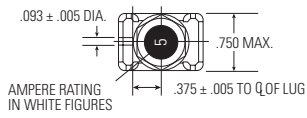
* AT RATED NOMINAL CURRENT

Three phase variants are available as a 930 Series.

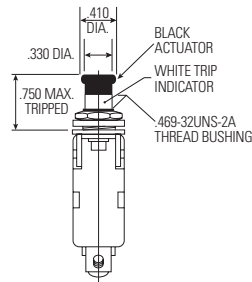
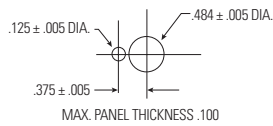
For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS

700-001 (MS25244)



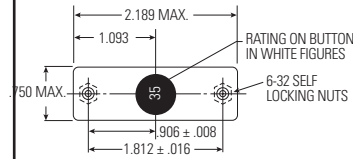
RECOMMENDED MOUNTING MS-25244



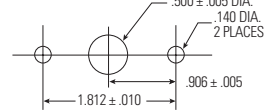
700-089 (MS25244-P)

700-092 (MS25244-PT)

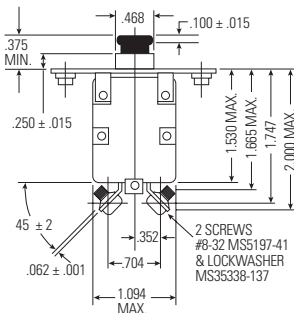
Dimensions Different Base & Terminal



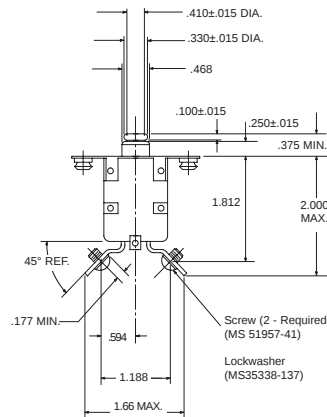
RECOMMENDED MOUNTING MS-25244-P & MS-25244-PT



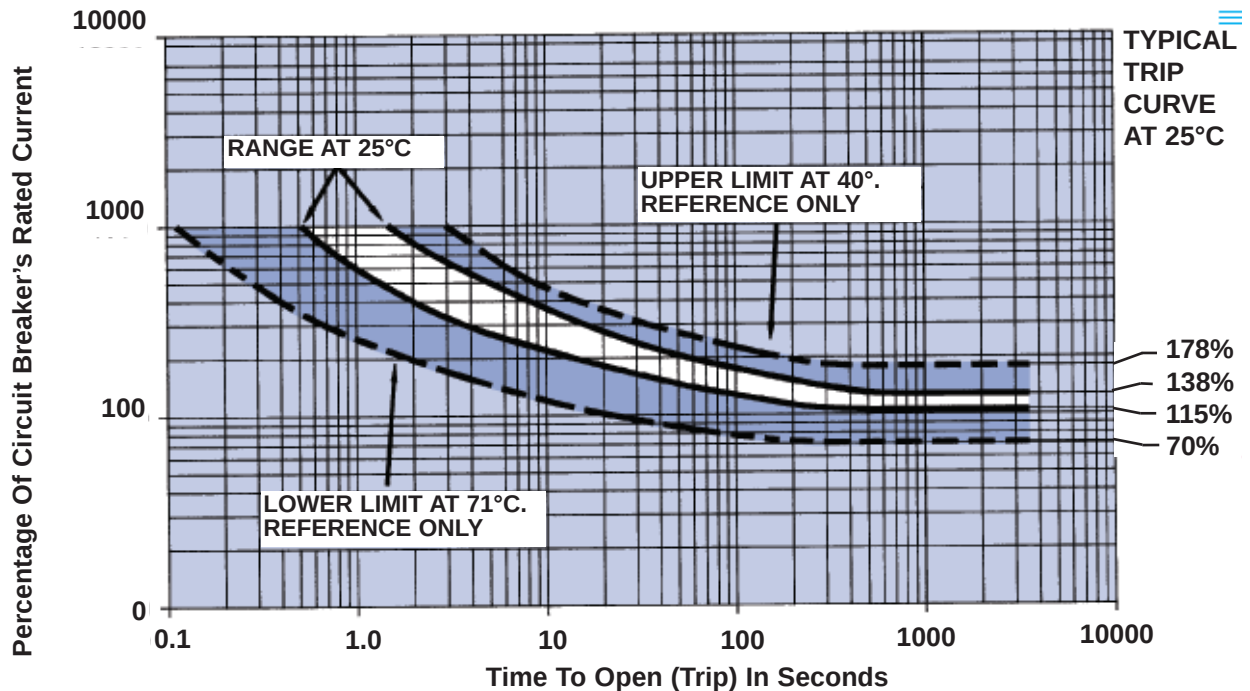
MS25244-P Base & Terminal



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

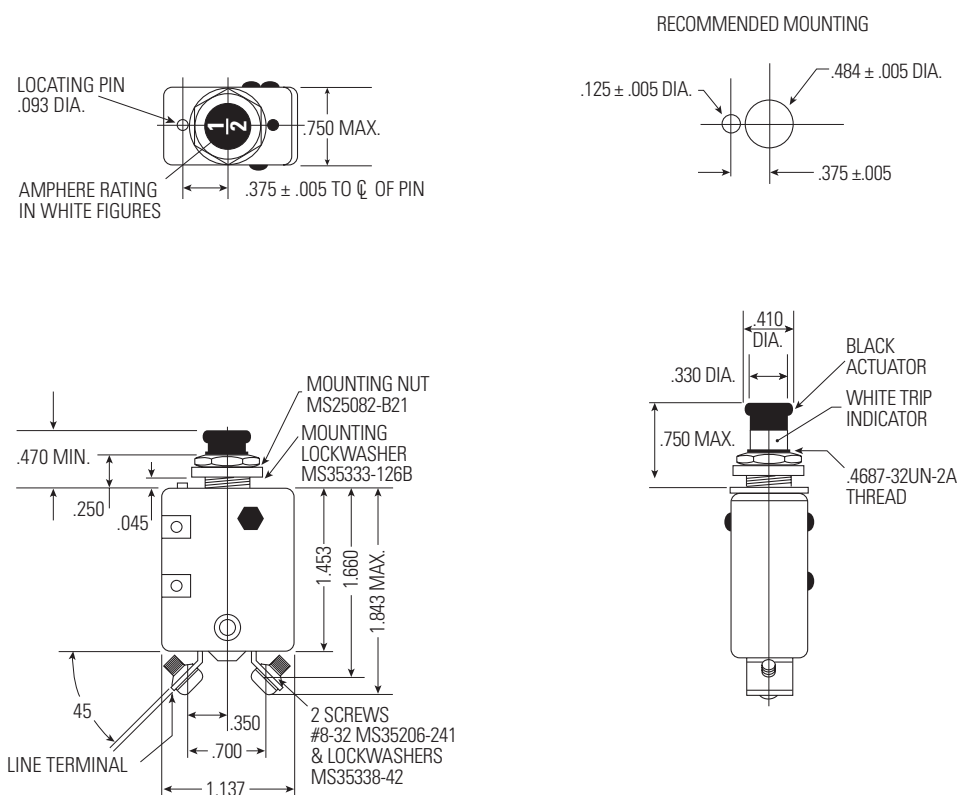
Trip curve available

ORDERING INFORMATION

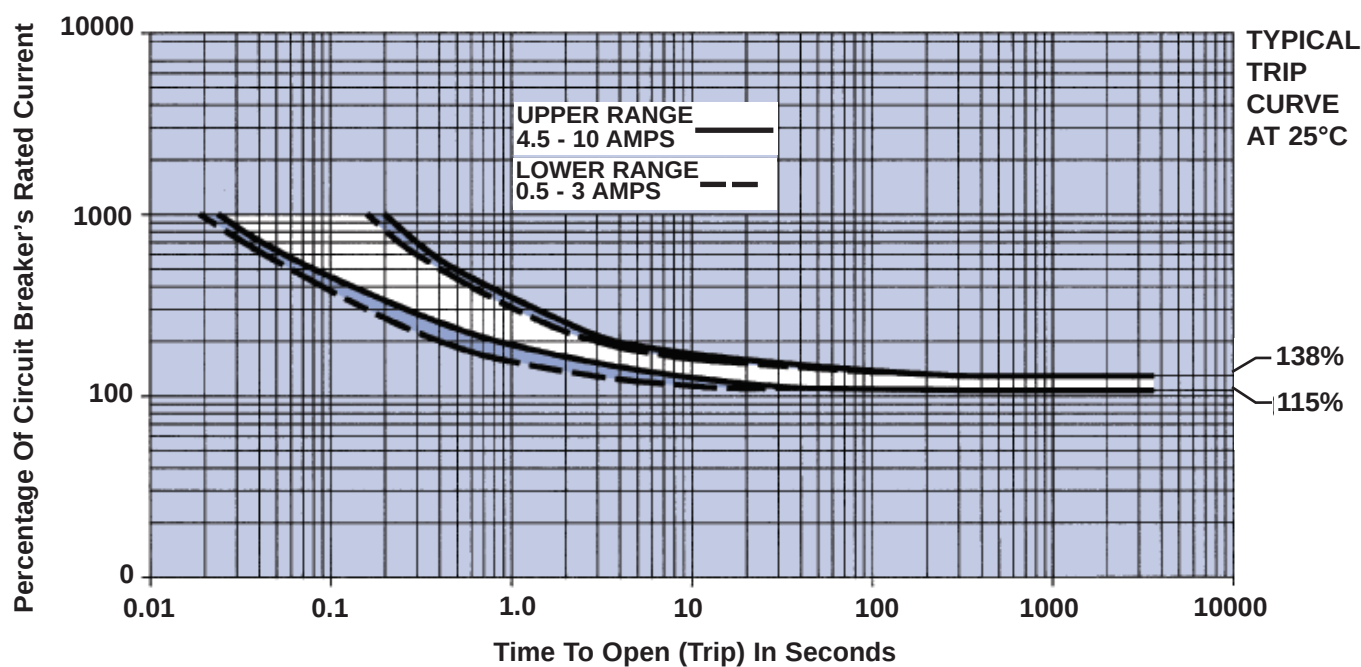
Ampere Rating	Voltage Drop Max.*	Part Number
1/2	1.21	1500-052-05
3/4	1.21	1500-052-075
1	1.20	1500-052-1
1 1/2	1.10	1500-052-105
2	0.95	1500-052-2
2 1/2	0.85	1500-052-205
3	0.81	1500-052-3
4	0.72	1500-052-4
5	0.65	1500-052-5
10	0.55	1500-052-10

* 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.)

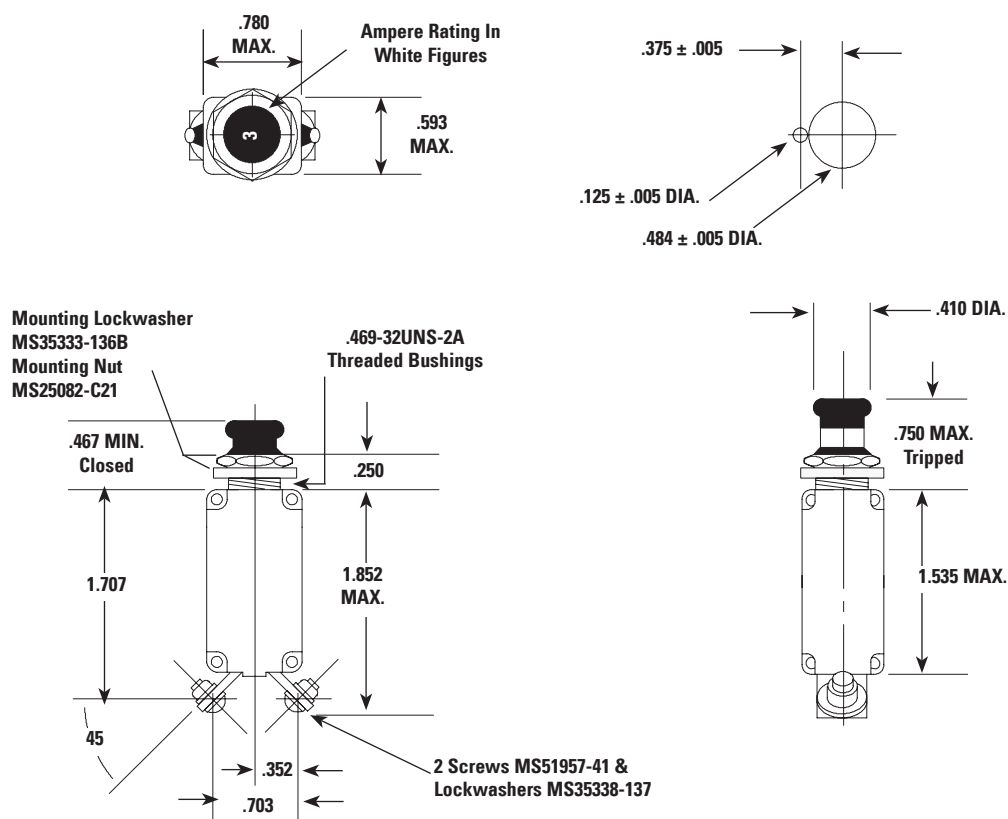
* Variations of these circuit breakers are capable of exceeding the standard Mil specification for endurance, vibration, and shock. Consult the business unit for more information.

OVERLOAD CALIBRATION DATA

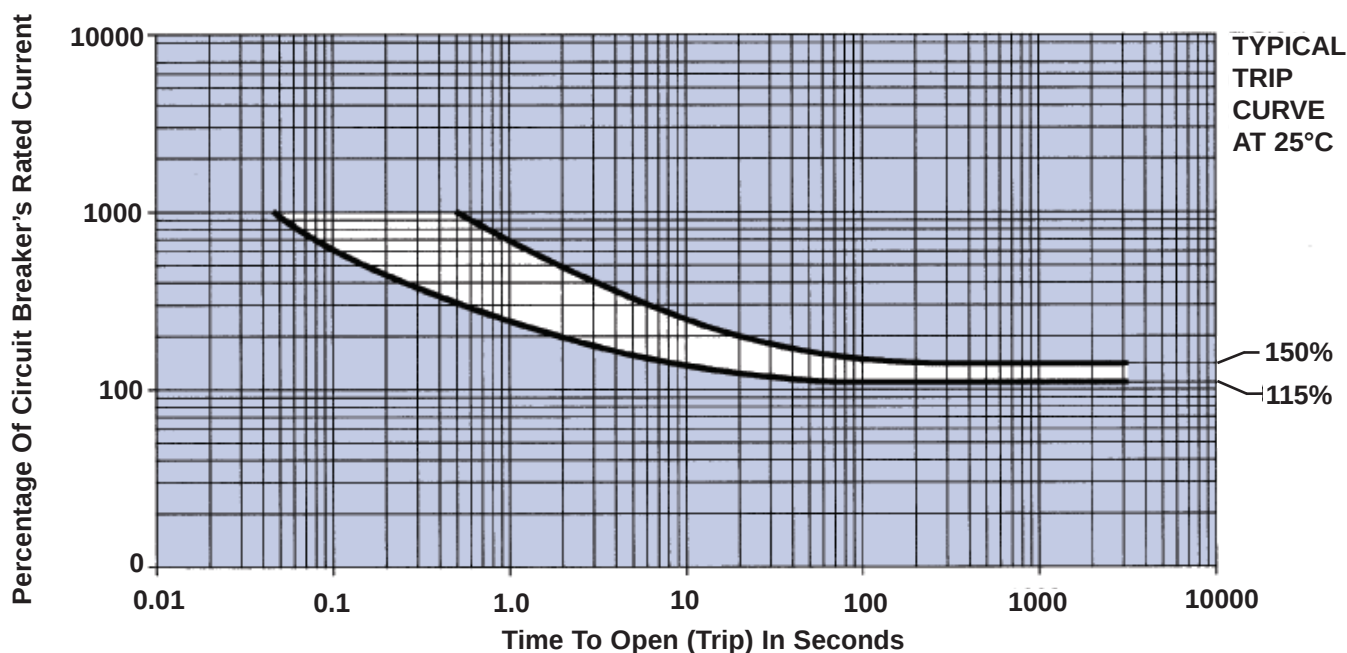
Specification Table	@ 25°C		@ +71°C		@ -55°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	90	—	135	—	% For 1 Hour
Must Trip	—	150	—	130	—	180	% Within 1 Hour
200% Overload	2.000	20.0	—	—	—	—	Seconds
500% Overload	0.160	2.0	—	—	—	—	Seconds
1000% Overload	0.046	0.5	—	—	—	—	Seconds

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	VOLTAGE DROP MAX.*	MS P/N	SAFRAN MPP P/N	MS P/N	SAFRAN MPP P/N	MS P/N	SAFRAN MPP P/N	MS P/N	SAFRAN MPP P/N	MS P/N	SAFRAN MPP P/N	MS P/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	

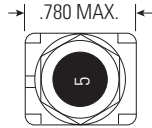
* AT RATED NOMINAL CURRENT

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

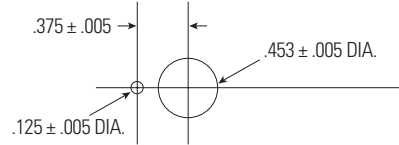
DIMENSIONS

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

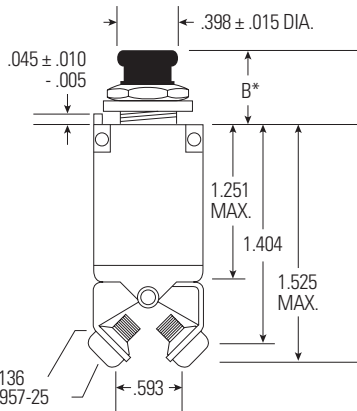
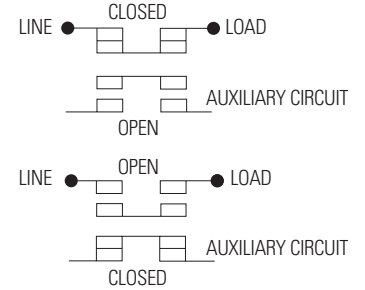
Min. Panel Thickness .025
Max. Panel Thickness .100



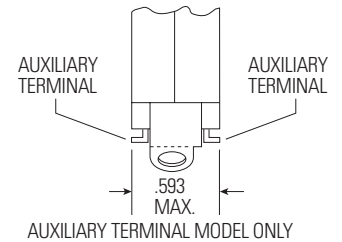
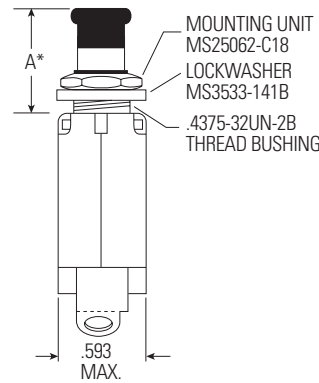
RECOMMENDED MOUNTING



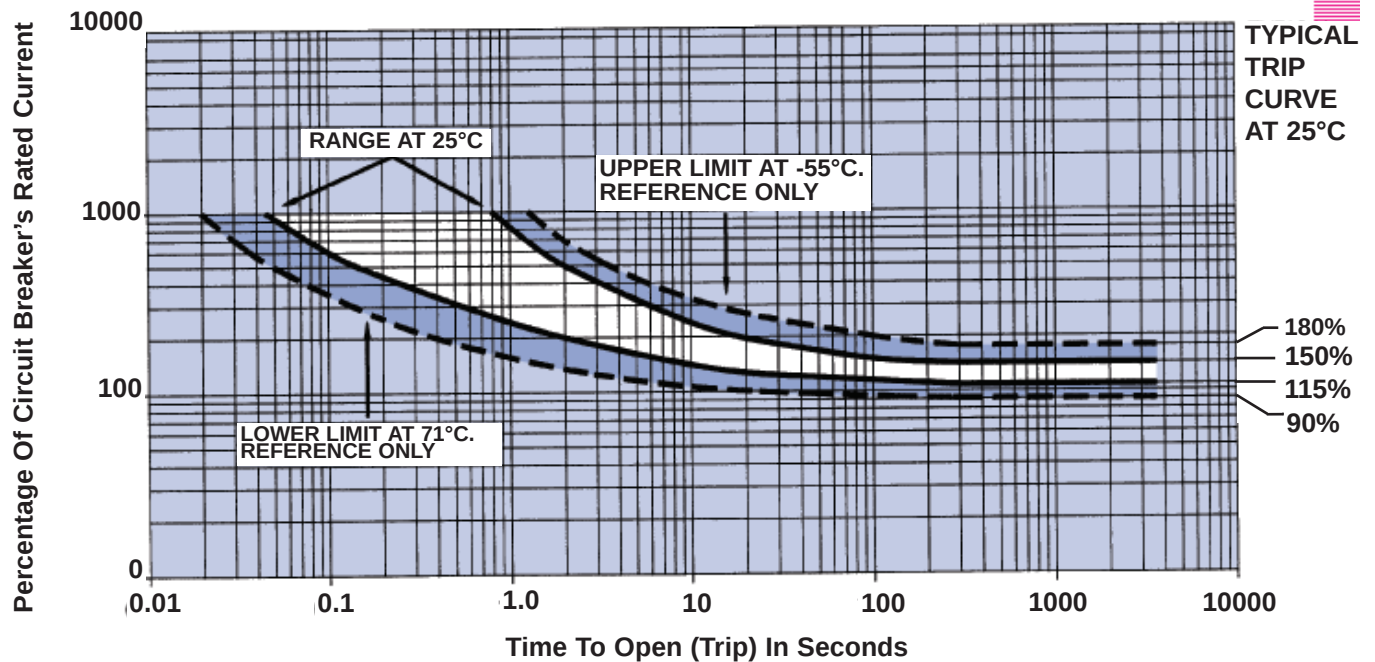
AUXILIARY SWITCH OPERATION



LOCKWASHER MS36336-136
TERMINAL SCREW MS51957-25



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.

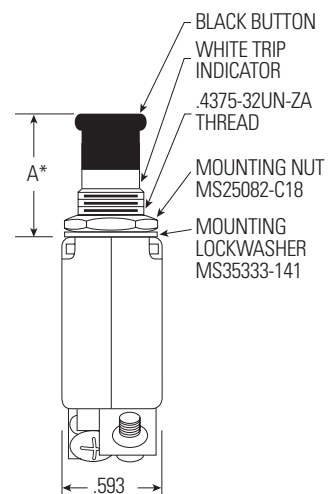
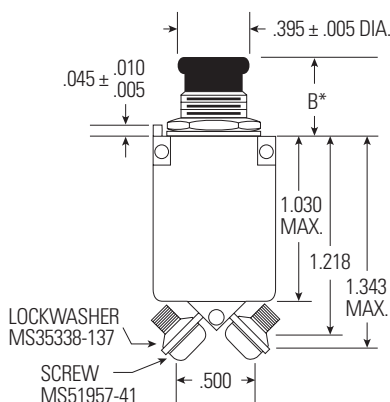
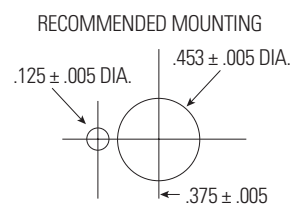
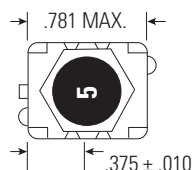
ORDERING INFORMATION

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

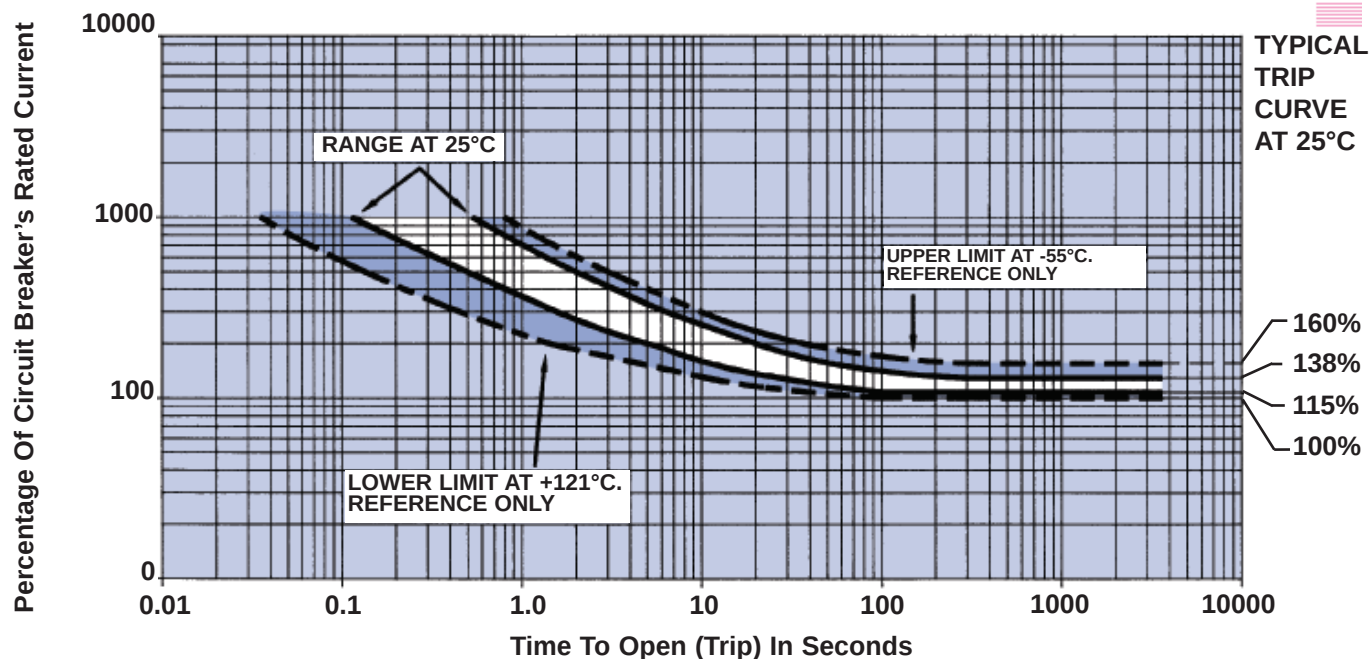
DIMENSIONS

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

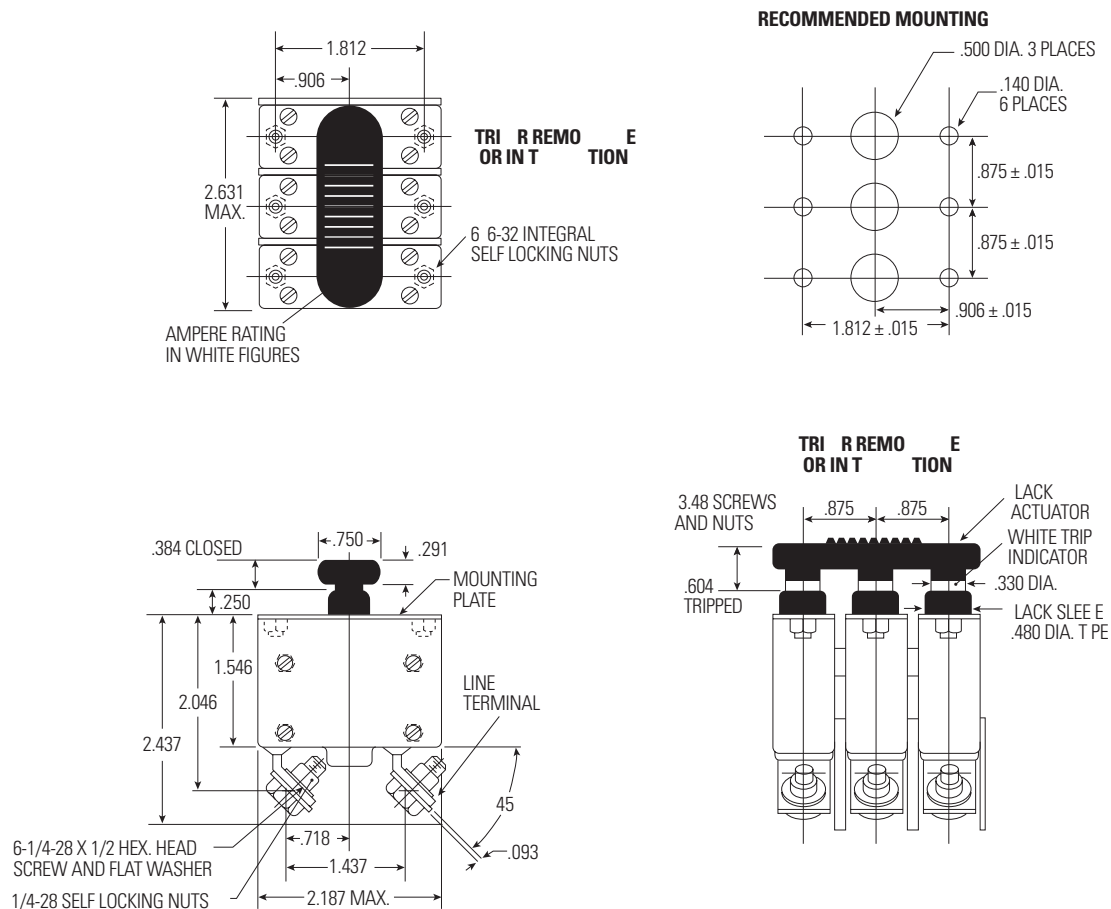
Ampere Rating	Voltage Drop Max.*	Part Number
50	0.15	940-006-50
60	0.15	940-006-60
70	0.15	940-006-70
75	0.15	940-006-75
80	0.15	940-006-80
90	0.15	940-006-90
100	0.15	940-006-100

* At rated nominal current.

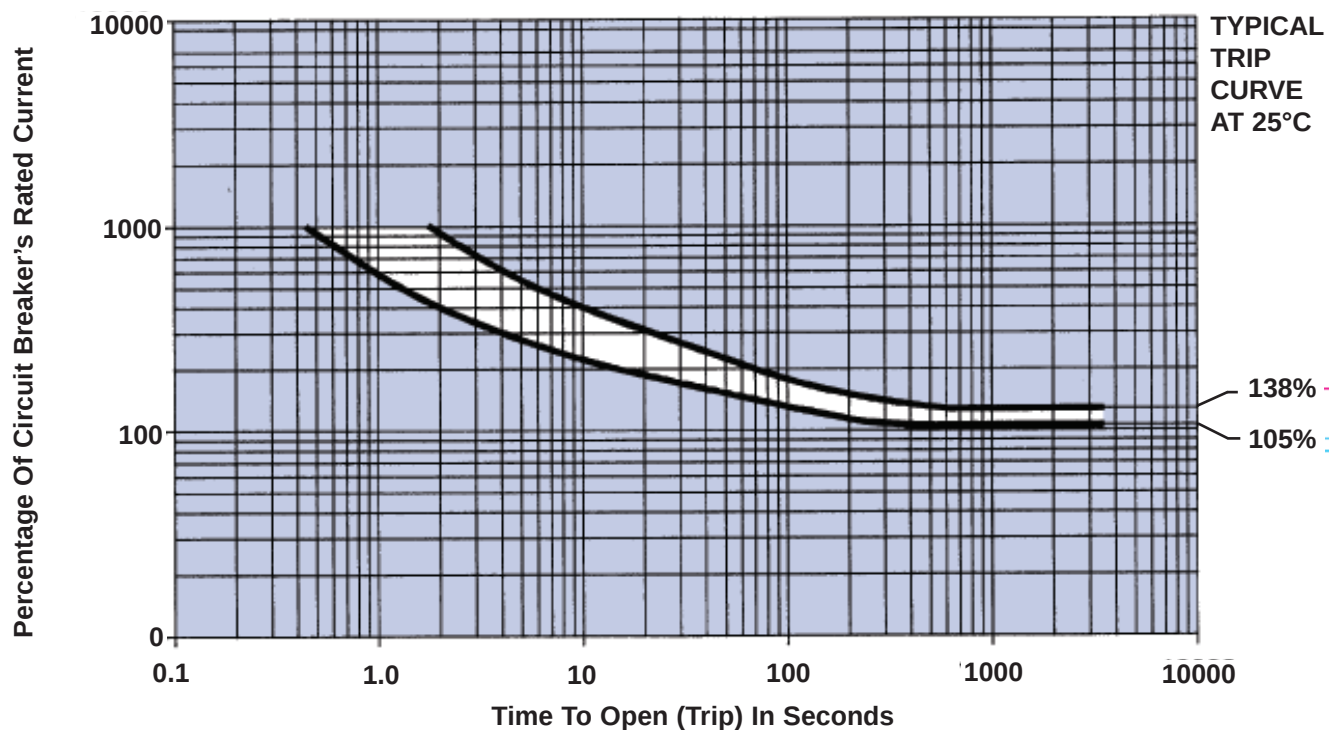
Data depicted is for the 940 Series. Also available to order are 920, 930, 960, and 970 Series devices.

For other ampere 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

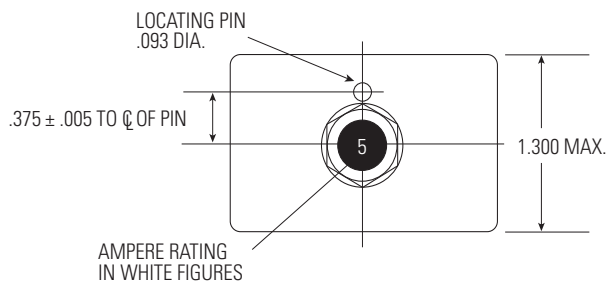
Trip curve available.

ORDERING INFORMATION

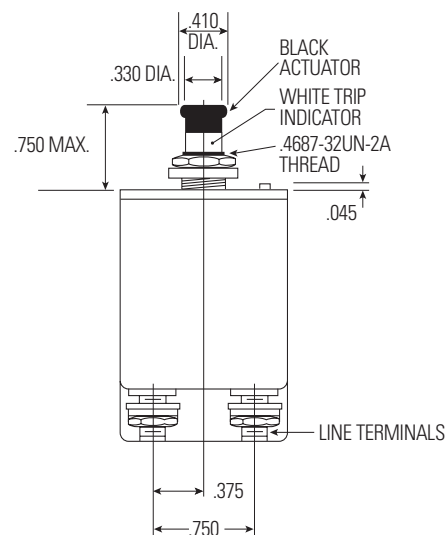
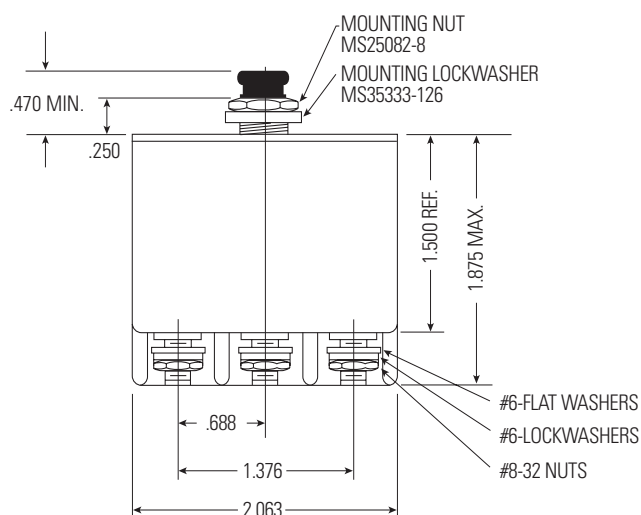
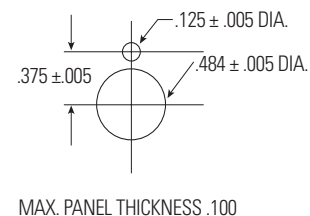
Ampere Rating	Voltage Drop Max.*	Part Number
1	1.20	1526-005-1
1 1/2	1.20	1526-005-105
2	0.95	1526-005-2
2 1/2	0.85	1526-005-205
3	0.85	1526-005-3
3 1/2	0.75	1526-005-305
4	0.72	1526-005-4
5	0.65	1526-005-5
7 1/2	0.60	1526-005-705
10	0.55	1526-005-10
15	0.50	1526-005-15

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

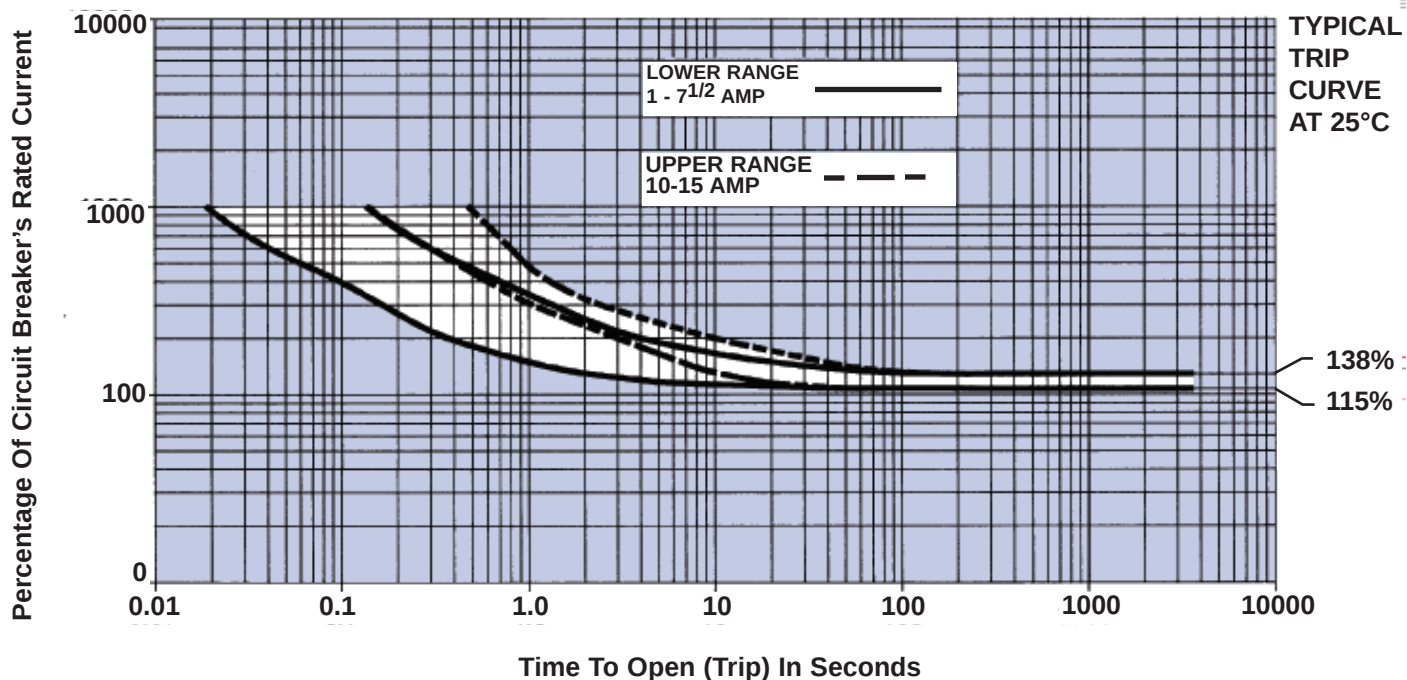
DIMENSIONS



RECOMMENDED MOUNTING



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

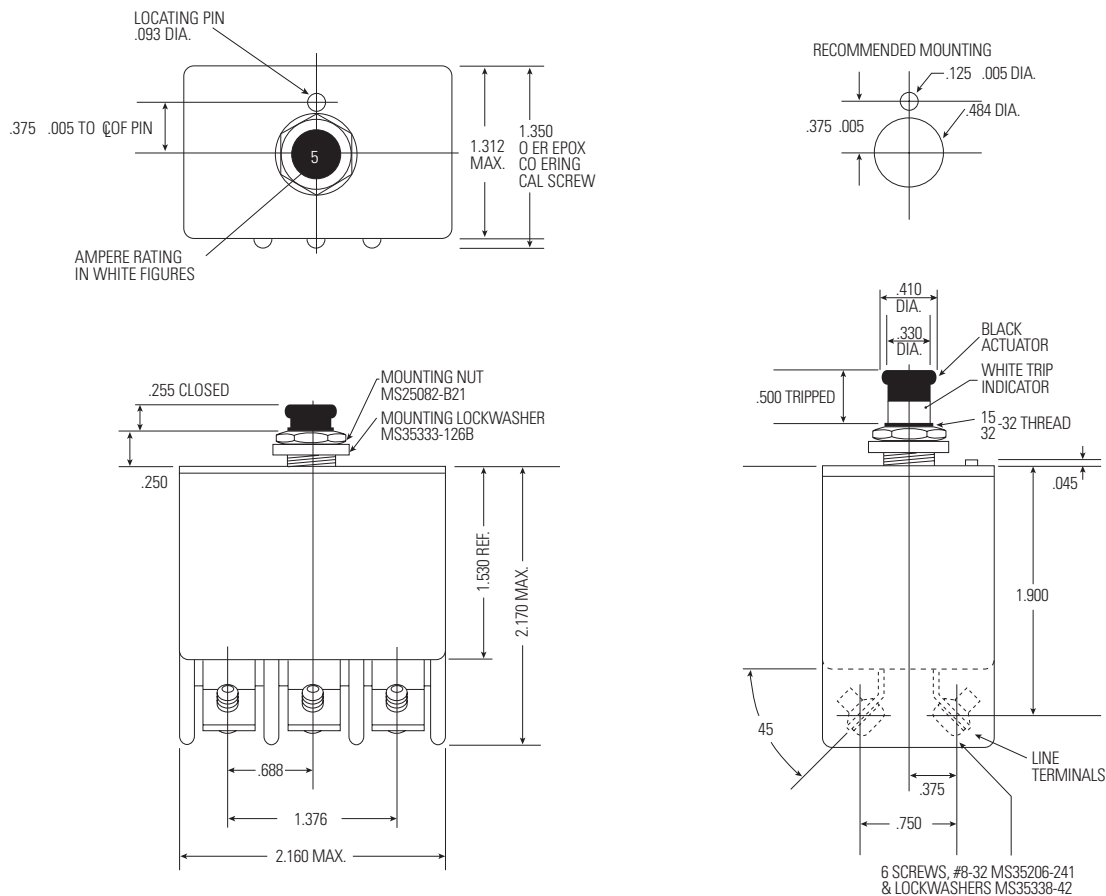
*Unbalanced load, individual phases: 145%
Trip curve available.

ORDERING INFORMATION

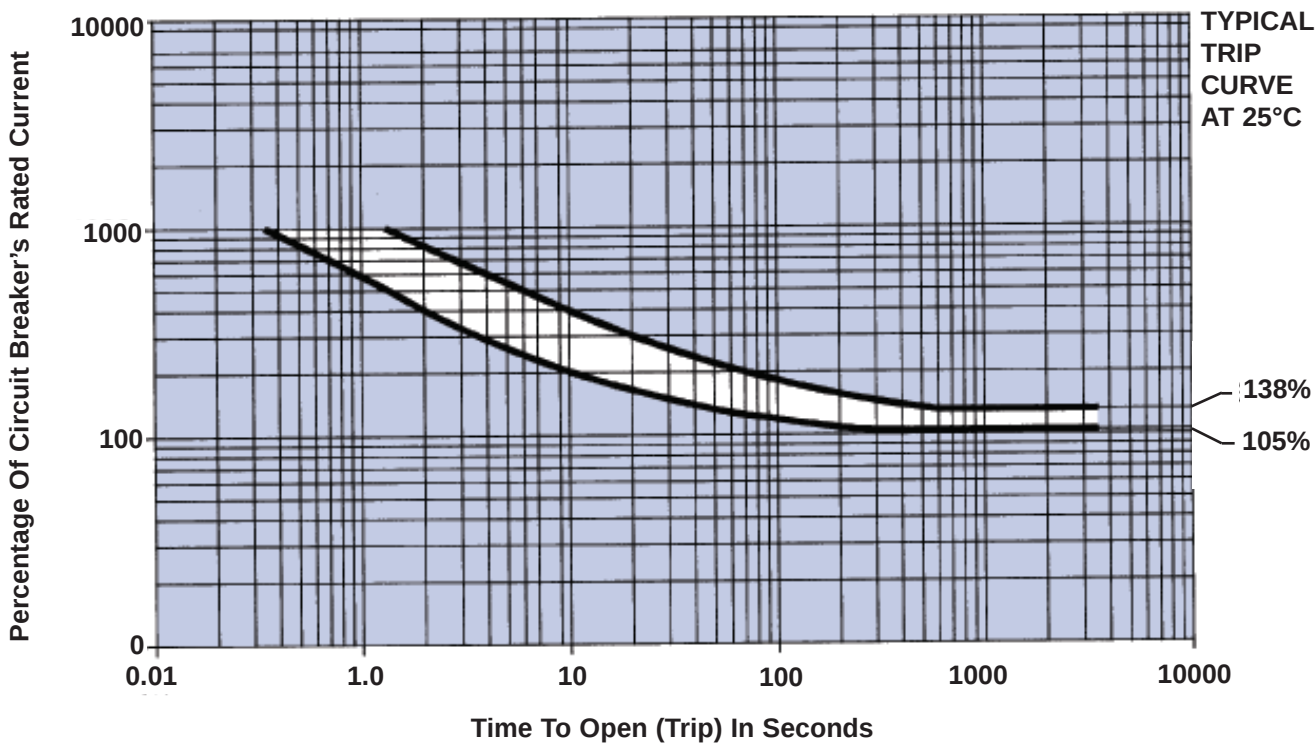
Ampere Rating	Voltage Drop Max.*	Part Number
5	0.350	1536-001-5
7 1/2	0.325	1536-001-705
10	0.300	1536-001-10
15	0.250	1536-001-15
20	0.200	1536-001-20
25	0.180	1536-001-25
30	1.180	1536-001-30
35	0.175	1536-001-35
40	0.175	1536-001-40
50	0.150	1536-001-50

* 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	VOLTAGE		SAFRAN MP P/N	SAFRAN MP P/N	SAFRAN MP P/N	SAFRAN MP P/N	SAFRAN MP P/N	SAFRAN MP P/N	SAFRAN MP P/N
	AMPERE RATING	DROP MAX *							
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

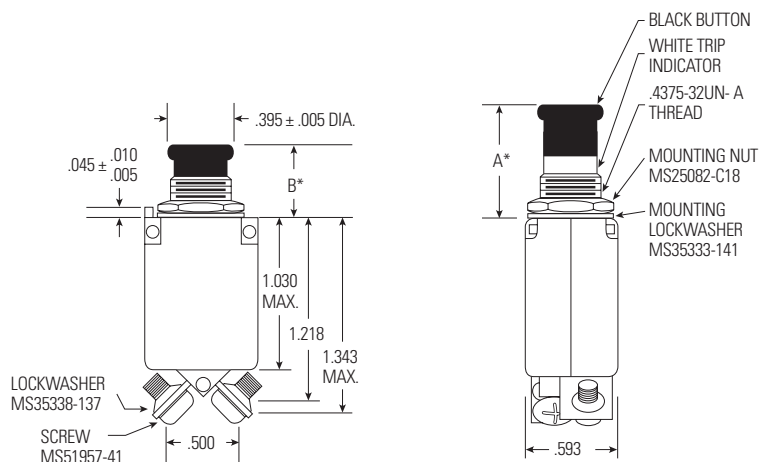
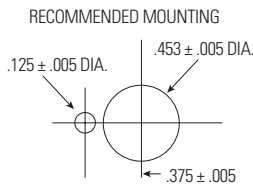
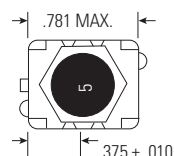
* AT RATED NOMINAL CURRENT

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

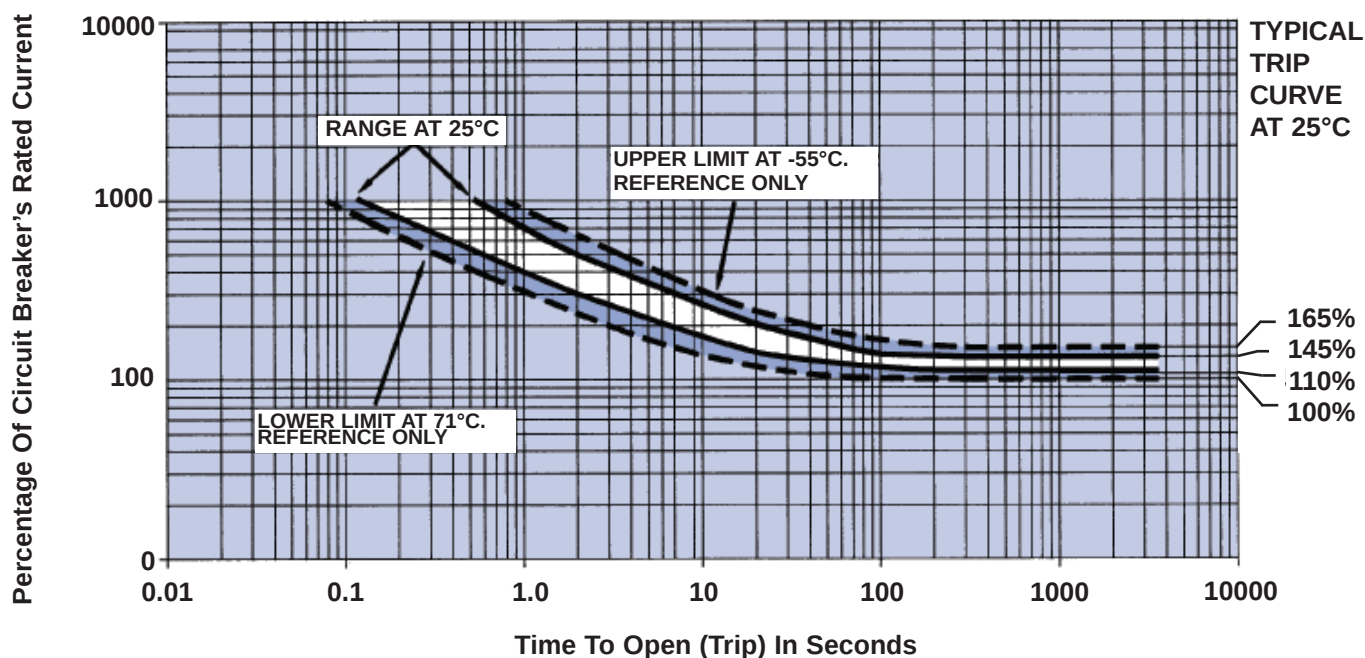
DIMENSIONS

MIL Spec	Part No.	A*Max.	B*Min.
MS14154	4330-001	0.750	0.470
MS14154L	4330-007	1.125	0.845
MS14154V	4330-008	0.750	0.470
MS14154VL	4330-009	1.125	0.845

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



TRIP CURVE



REMOTE CONTROLLED CIRCUIT BREAKER (RCCB)



Single Phase

- 28 VDC
- 115/200 VAC 400 Hz



Three Phase

- 115/200 VAC 400 Hz
- Three Phase Only

Qualified

Qualified to demanding performance parameters of MIL-PRF-83383 standard.

Use as a Relay, Circuit Breaker, Or Both

RCCBs combine the best attributes of a circuit breaker and a relay. Automatically protects the wires and the load device during circuit/load breakdown, but allows the flight deck control of the load during normal operation.

Weight and Cost Savings

In distributed-load applications, RCCBs are a more efficient power distribution solution promoting cost and weight savings through the elimination of long runs of heavy cables associated with the conventional relay-flight deck circuit protector method. Control of the RCCB requires only one #22 AWG control wire from the ICU on the flight deck to the RCCB.

Cockpit Space Savings

An RCCB system removes the presence of large circuit breakers from the cockpit while permitting remote On/Off operation from the flight deck. Combine Safran Electrical & Power RCCB with Indicator Control Unit (ICU) model #1500-053-05.

PERFORMANCE DATA

Rupture Levels	3600 A (115 VAC or 28VDC for 1 Pole and 115VAC for 3 Pole)
Endurance (Resistive & Inductive(Motor))	50,000 Cycles
Endurance (Motor)	5-50A: 50,000 cycles; 60-100A: 25,000 cycles
Endurance (Lamp)	5-25A: 50,000 cycles; 35-50A: 25,000 cycles; 60-100A: no rating
Dielectric Strength	1500V, 60Hz, MIL-STD-202, method 301, 0.5 MA max
Insulation Resistance	100 mega ohm min, MIL-STD-202, method 302
Thermal Temperature Range	-54°C to 71°C (-65°F to 160°F). MIL-STD-202, Method 107
Vibration	10G's to 2000 Hz. Exceeds MIL-STD-202, Method 204, Condition C, 10 microseconds max. chatter
Shock	25G's. MIL-STD-202, Method 213, 10 microseconds max. chatter
Altitude	50,000 ft.
EMI Requirements	MIL-STD-461, Requirements CS114 and RE102 over the frequency range of 14 KHz to 400 MHz and RE102 limits for Aircraft and Space Systems.
EMI/RFI Susceptibility and Generation	MIL-STD-461, Class 1D
Moisture Resistance	MIL-STD-202, method 106
Salt Spray Resistance	MIL-STD-202, method 101, Condition B
Sand and Dust Resistance	MIL-STD-202, method 110, Condition A
Fungus Resistance	MIL-HDBK-454, Guideline 4
Explosion Proof	MIL-STD-202, method 109
Weight (Standard)	5-25A: 318 grams (0.703 lbs.); 35-50A: 325 grams (0.719 lbs.); 60-100A: 332 grams (0.734 lbs.)
Weight (w/ Auxiliary Contacts)	5-25A: 332 grams (0.734 lbs.); 35-50A: 339 grams (0.750 lbs.); 60-100A: 346 grams (0.766 lbs.)

OVERLOAD CALIBRATION DATA

Specification Table	@ 25°C		@ +71°C		@ -54°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115%		115%		115%		% for 1 Hour
Must Trip		138%		138%		150%	% Within 1 Hour

ORDERING INFORMATION

Single Pole Single Throw (Double Break Contacts)					Three Pole Single Throw (Double Break Contacts)	
Standard			w/ Auxiliary Contacts		w/ Auxiliary Contacts	
AMPERE RATING	MS P/N	SAFRAN P/N	MS P/N	SAFRAN P/N	MS P/N	SAFRAN P/N
5	M83383/01-01	SM600BA5N1	M83383/02-01	SM600BA5A1		**
7.5		**		**		**
10	M83383/01-03	SM600BA10N1	M83383/02-03	SM600BA10A1	M83383/04-03	SM601BA10A1
15	M83383/01-04	SM600BA15N1	M83383/02-04	SM600BA15A1		SM601BA15A1
20	M83383/01-05	SM600BA20N1	M83383/02-05	SM600BA20A1	M83383/04-05	SM601BA20A1
25	M83383/01-06	SM600BA25N1	M83383/02-06	SM600BA25A1		SM601BA25A1
35	M83383/01-07	SM600BA35N1	M83383/02-07	SM600BA35A1	M83383/04-07	SM601BA35A1
40	M83383/01-08	SM600BA40N1	M83383/02-08	SM600BA40A1	M83383/04-08	SM601BA40A1
50	M83383/01-09	SM600BA50N1	M83383/02-09	SM600BA50A1		SM601BA50A1
60	* M83383/01-10	SM600BA60N1	M83383/02-10	SM600BA60A1	M83383/04-10	SM601BA60A1
75	* M83383/01-11	SM600BA75N1	M83383/02-11	SM600BA75A1		
80	*	**		**		
100	* M83383/01-13	SM600BA100N1	M83383/02-13	SM600BA100A1		

All Ampere Ratings equal to Rated Contact Loads (Resistive, Inductive, Motor, and Lamp) except as noted.

* No Lamp Load Rating

** Contact Business Unit

Not for use as a contact business unit on Alternate Amperages, Trip Times, Control Configurations, Grounding, Auxiliary Switches, Mounting Systems, etc.

OVERLOAD CALIBRATION DATA - SINGLE POLE

AMPERE RATING	200% Trip Times -54°C to +71°C		400% Trip Times -54°C to +71°C		1000% Trip Times -54°C to +71°C	
	MIN	MAX	MIN	MAX	MIN	MAX
AMPERES	SECONDS	SECONDS	SECONDS	SECONDS	SECONDS	SECONDS
5	7	40	1.2	6.4	0.3	1.2
7.5	11	40	2.4	6.8	0.33	1.1
10	12	42	2.8	8.5	0.42	1.05
15	13	45	1.7	8.3	0.35	1.2
20	14	46	2.9	7.6	0.4	1.15
25	15	50	2.6	8.7	0.4	1.3
35	16	55	2.8	8.3	0.35	1.3
40	16	55	2.9	9.2	0.36	1.3
50	13	55	2.9	10	0.4	1.25
60	13	60	2.6	13	0.26	1.8
75	13	60	2.5	13	0.26	1.8
80	14	60	2.7	12.5	0.3	2
100	17	63	3.5	13	0.38	1.9

OVERLOAD CALIBRATION DATA - THREE POLE

AMPERE RATING	200% Trip Times -54°C to +71°C		400% Trip Times -54°C to +71°C		1000% Trip Times -54°C to +71°C	
	MIN	MAX	MIN	MAX	MIN	MAX
AMPERES	SECONDS	SECONDS	SECONDS	SECONDS	SECONDS	SECONDS
10	12	80	2.8	11	0.42	1.3
15	13	80	1.7	10	0.35	1.2
20	14	80	2.9	9.6	0.4	1.15
25	15	80	2.6	10	0.4	1.3
35	16	80	2.8	11	0.35	1.3
40	16	80	2.6	10	0.36	1.3
50	13	80	2.9	10	0.4	1.25
60	13	80	2.4	16	0.26	1.8

TRIP CURVE

Contact business unit for trip curve.

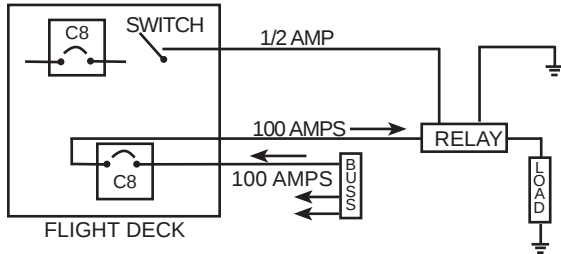
REMOTE CONTROLLED CIRCUIT BREAKER (RCCB)

1 POLE AND 3 POLE

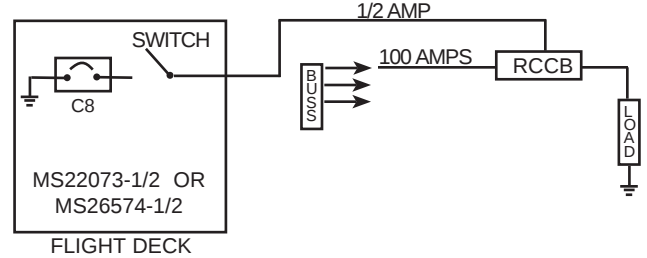
Engineering Data

Application Note

Without RCCB



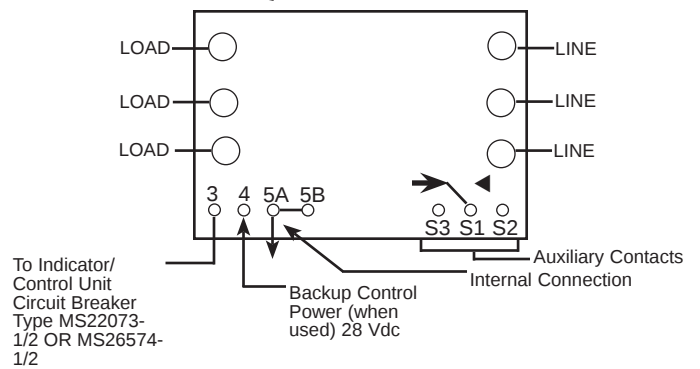
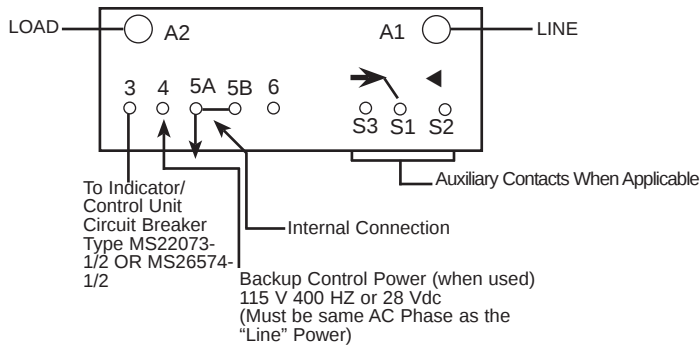
With RCCB



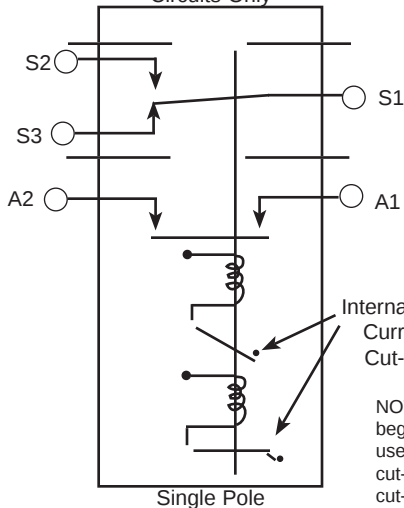
Distributed Load Concept

Typical Wiring Diagram

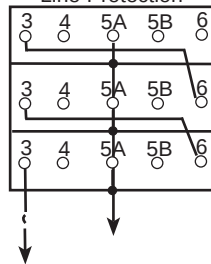
Integrated Wire Termination Module (MIL-STD-1549)



Contacts and Coil Circuits Only

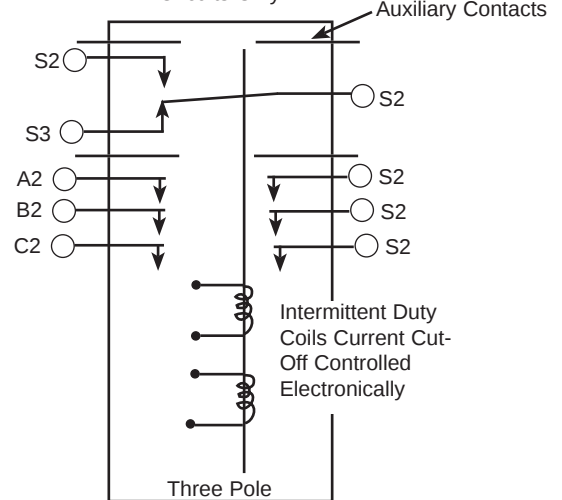


Wiring for Multiple Line Protection



NOTE: Units with date codes beginning with third quarter 1993 use electronically controlled coil cut-off without internal coil current cut-off.

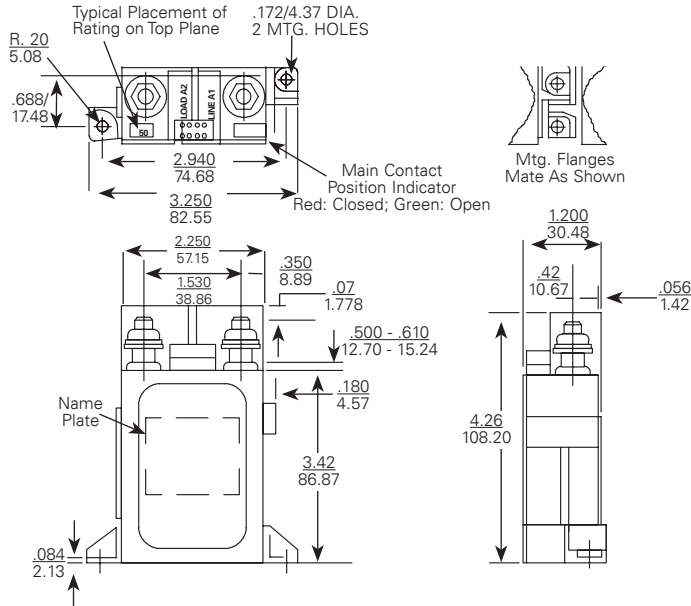
Contacts and Coil Circuits Only



NOTE: Terminals 5A and 5B internally grounded to the mounting leg (s). Integrated wire termination (IWT) module accepts pin contacts P/N M39029/1-100 or -101. Use with insertion/extraction tool M81969/14-02.

Engineering Data

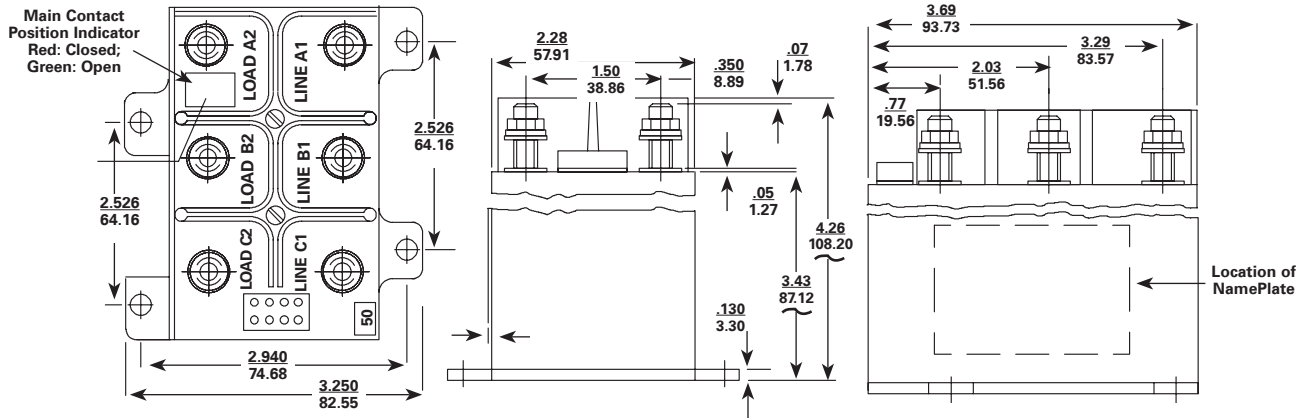
Approximate Dimensions - 1 Pole



Options

- Special application auxiliary switches
- Unique grounding
- Power sources
- Other current ratings
- Control via systems other than I/CU
- Low level auxiliary contacts available
- Data Bus/Interface capability available
- Electronically held coil

3 Pole



Coil Operate Current/Set And Trip Time RCCB

Circuits	Nominal System Voltage	I/CU Set Current @ Nom Voltage (Mulliamper)	Set Coil Current @ Nom Voltage Pulse	MAX. Set Time		*I/CU. Trip Current Nominal					MAX. Standby Current Milliamp
				Nominal Voltage & Room Temp.	Most Adverse Condition - MIN. Voltage 71°C. Ambient	71°C & Nominal Voltage	-54°C & Nominal Voltage	Room Temp. Nominal Voltage	71°C & Nominal Voltage	-54°C & Nominal Voltage	
1 Pole	28 Vdc (18 Volts MIN.)	2	3.0 AMP MAX	20 Millisec	35 Millisec	1.4 AMP	1.9 AMP	1.6 AMP	0.9 AMP ***	2.1 AMP	10
	115 Vac 400 Hz (104 V. MIN.)	2	10 AMP MAX	15 Millisec	30 Millisec	6.8 AMP **	6.3 AMP **	8.6 AMP **	6.1 AMP **	7.0 AMP **	10
3 Pole	28 Vdc (18 Volts MIN.)	2	7.0 AMP MAX	20 Millisec	35 Millisec	1.5 AMP	2.0 AMP	1.7 AMP	0.9 AMP ***	2.2 AMP	10
	115 Vac 400 Hz (104 V. MIN.)	2	13.0 AMP MAX	15 Millisec	30 Millisec	4.3 AMP **	3.3 AMP **	4.5 AMP **	4.0 AMP **	3.1 AMP **	10

* MAX. I/CU. Line Impedance 75
 ** Average Half-Wave Rectified DC Current

Current Decreases w/Time so that I^2t
 *** Absolute Min. Value from -54° to +71°C

REMOTE POWER CONTROLLER (RPC)



- Single Pole
- 28 VDC

Electronic Current Sensing

The electronic over current sensing of these devices offer several advantages over the bi-metal sensing RCCB. Trip current levels can be closely controlled, for better protection of sensitive loads, trip times are faster, and both can be customized for specific applications. Other advantages included less heat buildup, and higher current capabilities in the same small package.

Use as a Relay, Circuit Breaker, Or Both

RPCs, like RCCBs, combine the best attributes of a circuit breaker and a relay. Automatically protects the wires and the load device during circuit/load breakdown, but allows the flight deck control of the load during normal operation.

Weight and Cost Savings

In distributed-load applications, RPCs are a more efficient power distribution solution promoting cost and weight savings through the elimination of long runs of heavy cables associated with the conventional relay - flight deck circuit protector method. Control of the RPC requires only one #22 AWG control wire from the ICU (model #1500-053-05) on the flight deck to the RPC.

PERFORMANCE DATA

Rupture Levels	2500 A (28V _{DC})
Endurance (Resistive)	50,000 Cycles
Endurance (Inductive and Motor)	25,000 cycles
Endurance (Lamp)	No Rating
Mechanical Life	100,000 cycles
Dielectric Strength	Sea Level - VRMS .2-3 seconds: Coil to Case - 1250 initial, 1,000 After Life, All other Points 1,800 Initial, 1350 After Life 50,000 Ft. - VRMS 1 Minute: Coil to Case 500 Initial & After Life. All other Points 700 Initial & After Life
Insulation Resistance	1100 Megaohms initial, 50 Megohms after Life, MIL-STD-202, method 302, test condition B
Thermal Temperature Range	-55°C to 85°C (-67°F to 185°F).
Vibration	Sinusoidal 5 to 10 Hz: 0.08 DA; 10 TO 55 Hz: 0.06 DA; 55 to 2000 Hz: 10G's
Shock	50G's. (1/2 sine, 10-12 ms)
Altitude	50,000 Ft. Maximum
EMI Requirements	MIL-STD-461, Requirements CS114 and RE102 over the frequency range of 14 KHz to 400 MHz and RE102 limits for Aircraft and Space Systems
Moisture Resistance	MIL-STD-202, method 106
Salt Spray Resistance	MIL-STD-202, method 101, Condition B
Sand and Dust Resistance	MIL-STD-202, method 110, Condition A
Fungus Resistance	MIL-HDBK-454, Guideline 4
Explosion Proof	MIL-STD-202, method 109
Weight (Standard)	425.017 grams (0.937 lbs.)

OVERLOAD DATA

% Rated Current	Trip in Seconds -55°C to +85°C
100%	No Trip
125%	45 Sec. Trip
200%	0.22 Sec. Trip
400%	0.095 Sec. Trip

ORDERING INFORMATION

Single Pole Single Throw (Double Break Contacts)

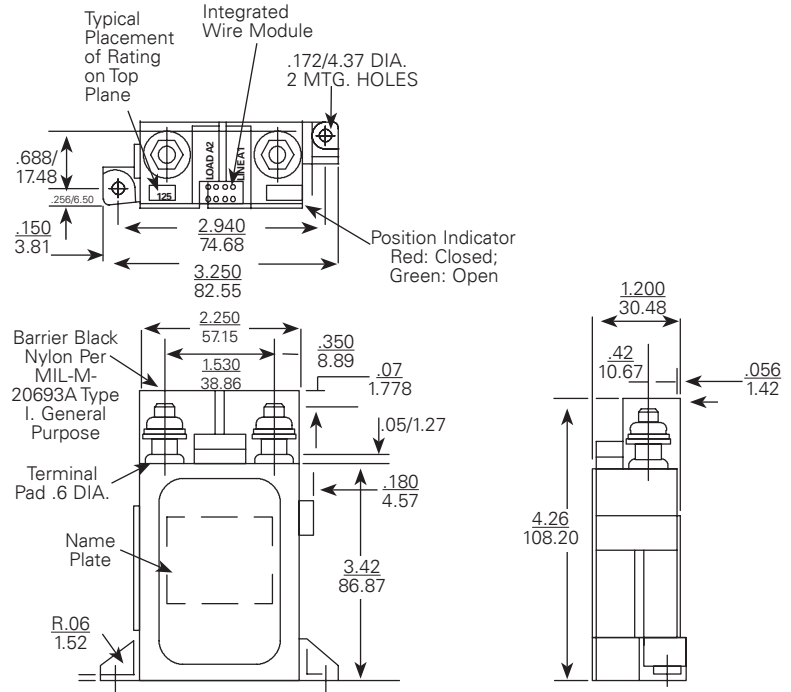
AMPERE RATING	SAFRAN P/N	Rated Contact Load (Amperes) 28 VDC			
125	SM600BA125A1	125	125	125	5
150	SM600BA150A1	150	150	150	5
175	SM600BA175A1	175	150	175	5
200	SM600BA200A1	200	150	175	5

Notes:

- One auxiliary contact included on each unit
- Contact Business Unit on Alternate Amperages, Trip Times, Control Configurations, Grounding, Auxiliary Switches, Mounting Systems, etc.

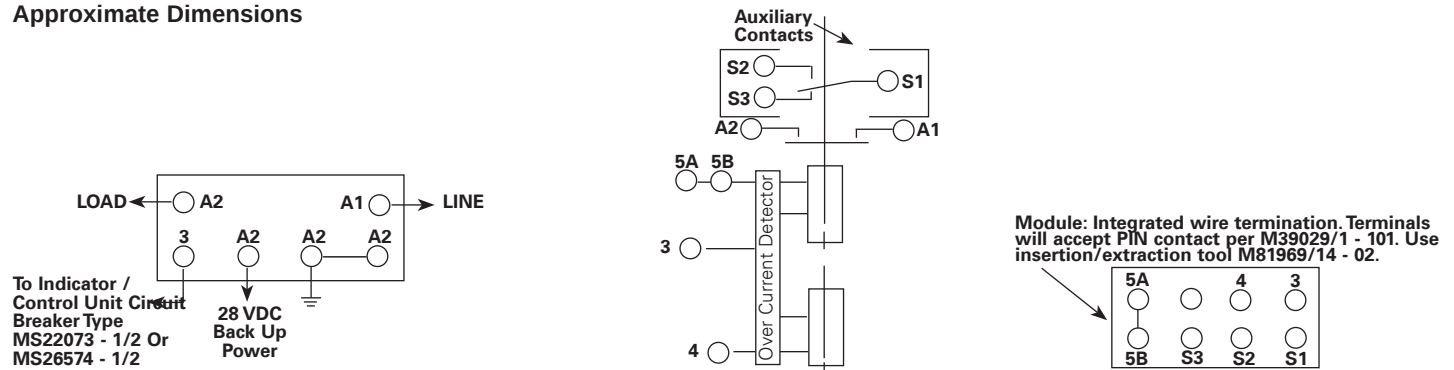
Engineering Data

Approximate Dimensions - 1 Pole



Typical Wiring Diagram

Approximate Dimensions



COIL OPERATE CURRENT/SET AND TRIP TIME

Nominal System Voltage	I/C Set Current @ Nom. Voltage (milliamp)	Set Coil Current @Nom Voltage Pulse	MAX. Set Time		*I/CU. Trip Current Nominal			
			Nominal Voltage @ Room Temp	Most Adverse Condition-Min. Voltage 71°C Ambient	71°C and Nominal Voltage	-54°C and Nominal Voltage	Room Temp and Nominal Voltage	Max. Standby Current (milliamp)
28 VDC (18 Volts Min)	2	3.7 Amp	20 Millisec	35 Millisec	1.76 Amp	1.25 Amp	1.89 Amp	30

* MAX I/CU. LINE IMPEDANCE 7.5 Ohms

CURRENT DECREASES W/TIME SO THAT $I^2t \geq 2$

ADDITIONAL PRODUCTS



Additional Series

In addition to the circuit breaker products described in this catalog, Safran Electrical & Power has the capability to manufacture over twenty additional series of circuit breakers. Please contact the Business Unit at 1-800-955-7354 for details or ordering information on these unique devices.

- Series 60
- Series 100
- Series 130
- Series 140
- Series 180
- Series 260
- Series 270
- Series 780
- Series 920
- Series 930
- Series 960
- Series 970
- Series 1200
- Series 1538
- Series 1540
- Series 1585
- Series 2100
- Series 4380
- Series 8500
- Series 9500

Additional Product Design Options

If your application calls for an amperage, feature, or option we do not currently list in our catalog, please contact the Business Unit at 1-800-955-7354.

Glossary of Terms



ACTUATOR - Mechanism of the switch that when operated transfers the internal contacts.

ALLOY - A metal composed of two or more different metals to obtain a desired physical property.

ALTERNATE ACTION - Typically associated with pushbutton switches; switch contacts remain in a given circuit condition after removal of actuating force; when actuating force is applied a second time, the opposite circuit is engaged.

ALTERNATING CURRENT (AC) - An electric current that reverses direction at regularly recurring intervals of time.

AMBIENT TEMPERATURE - Refers to the temperature of the air immediately surrounding the device.

AMBIENT TEMPERATURE RANGE - Operating temperature range.

ANGLE OF THROW - Associated with rocker and toggle switches to indicate the total travel arc of the actuator, measured in degrees.

ANNEALED - To heat and then cool (as steel or glass) for softening and making the material less brittle; for example, annealed copper is less brittle.

ARCING - The flow or movement of electric current between opening or closing switch contacts.

BASIC SWITCH - Classified as a self-contained switching unit. May be used independently or with a gang-mounted assembly. Usually mechanically actuated.

BREAK - To open an electrical set of closed contacts.

BREAK BEFORE MAKE - To interrupt one circuit of a pole before completing a second circuit of the same pole.

CAPACITIVE LOAD - A lumped capacitance that is switched as a unit.

CONTACT BOUNCE - The repeated rebounding of the movable contact during the transfer from one throw to the next; typically measured in micro or milliseconds.

CONTACT RESISTANCE - The resistance measured across a pair of closed contacts, which is in series with the load. Resistance levels will increase over time based on usage load conditions and environment. Measured in milliohms.

CREEPAGE - The unwanted flow of electrical current from one conductive part to another.

CURRENT - The flow of electrons within a wire or a circuit; measured in amperes.

CYCLE - An interval of time during which a sequence of a recurring succession of events or phenomena is completed.

DETENT - A mechanical positioning device designed to stop the actuator travel at each successive electrical circuit.

DIELECTRIC STRENGTH - The ability of an insulating material to withstand an over voltage without exceeding minimal leak-age current levels or material breakdown. Specified in voltage (VAC), usually between a live metal part and ground or between open contacts of a device.

DIFFERENTIAL TRAVEL (D.T.) - The amount of actuator or plunger travel measured from the point where contacts "snap over" to the point where they "snap back."

DIRECT CURRENT (DC) - A unidirectional current in which changes in value are either zero or so small that they may be neglected. As originally used, the term designates a practically non-pulsating current.

DOUBLE BREAK CONTACTS - (Twin break.) Switch circuit breaks in two places. Also referred to as form Z circuitry.

DOUBLE POLE (DP) - see Pole.

DOUBLE-POLE DOUBLE-THROW (DPDT) - Switches which make and break two separate circuits. Both normally open and normally closed set of contacts offered with each pole.

DOUBLE THROW (DT) - see Throw.

DRY CIRCUIT - A low energy circuit condition where no arcing occurs during contact switching; typically in millivolt and milliamp ranges of current and voltage.

FLASH PLATING - A very thin or "instant plating" process usually measuring less than 10 micro-inches thick.

FLUX - A substance (such as rosin) applied to surfaces to be joined by soldering, brazing or welding to clean and free them from oxide and promoting their union.

FREE POSITION (FP) - Switch plunger or actuator position when no outside force is applied, other than gravity.

FULL OVERTRAVEL FORCE - The amount of force required to achieve full overtravel of the switch actuator.

GROUND - A conducting path between an electric circuit or equipment and the earth, or some large conducting body serving in place of the earth whether the connection is intentional or accidental.

HERMETICALLY SEALED SWITCH - A switch in a gas tight enclosure that has been completely sealed by fusion or comparable means to insure a low rate of gas leakage over a long period of time. All junctures made with glass-to-metal or metal-to-metal.

INDUCTIVE LOAD - A load in which the initial current on make (contact closing) is lower than steady state and the voltage is greater than steady state upon break (contact opening). When contacts are opened (break), the stored energy of the inductor combined with the long arcing time is severe on the switch contacts.

INRUSH - The amount of current that a load draws when initially closing the switch contacts. May cause severe degradation of contacts.

INSULATION RESISTANCE - The electrical resistance between two normally insulated parts.

IP - Part of the IEC529 standard recommending the degree of protection of enclosures for low-voltage switch gear. Deals with the prevention of ingress of liquids and solid foreign matter in enclosures.

ISOLATED LAMP CIRCUIT - Independent of switching circuit; lamp is operated on a completely separate circuit from the switch circuit.

LAMP LOAD - Upon initial contact closure (make), high inrush current occurs (approximately 10 times greater than the steady state).

LATCHDOWN - One type of alternate action in which the push-button is mechanically secured in the down position; the pushbutton is at "normal" position for one circuit and latched down position for the other circuit condition.

LED (LIGHT EMITTING DIODE) - A solid state diode that provides variable light.

LOGIC LEVEL - An application in which power levels do not cause arcing, melting, or softening of contacts; also referred to as dry circuit or low energy; typically requiring gold contacts for reliability.

MAINTAINED ACTION - To remain in a given circuit condition until actuated into the next circuit condition.

MAKE BEFORE BREAK - Completing one circuit of a pole before interrupting another of the same pole.

MOMENTARY ACTION - Mechanically returning from a temporary circuit condition to the maintained circuit condition as soon as the actuating force is removed.

NC - Normally Closed contacts; circuit is closed when actuator is in its normal at-rest position.

NEMA - National Electrical Manufacturers Association, an agency of the United States, setting standards for products distributed worldwide; applied to switches in their degrees of protection against the intrusion of liquids, dust, and other contaminants.

NO - Normally Open contacts; circuit is open when actuator is in its normal or at-rest position.

NOISE, ELECTRICAL - Unwanted electrical signals that produce undesirable effects in the circuits of the control systems in which they occur.

NOMINAL - The result of the calculated actual value range.

NONSHORTING CONTACTS - Contacts which break before make.

OPAQUE - A condition that is not pervious to radiant energy and especially light.

OPERATING FORCE (O.F.) - A measured amount of force applied to switch plunger or actuator to cause contact "snap-over" to occur.

OPERATING POSITION (O.P.) - Position of switch plunger or actuator at which point the internal switch contacts snap from normal to operated position.

OVERTRAVEL (O.T.) - Switch plunger or actuator travel designed to go safely beyond the operating position.

PANEL SEAL - Prevents liquids and solid particles from reaching the switch contacts from the front of the panel if the panel is subjected to foreign contamination usually caused by spills or splashing.

PARALLEL CIRCUIT - Electrical circuit having two or more inductors or paths for the current to flow.

PF - Power Factor; a means of determining contact capability when used with inductive loads relative to the standard resistive load rating; for example, if $PF = 1.0$, the inductive load is 100% of the resistive load, or if $PF = 0.6$, the inductive load is 60% of the resistive load.

POLE - A single common electrical input having one or more outputs.

POSITION - The mechanical stops or detents associated with the switch actuator.

PRECISION SNAP-ACTING SWITCH - An electromechanical switch having predetermined and accurately controlled characteristics and having a spring-loaded quick make and break contact action.

PRETRAVEL (PT.) - Measured travel associated with the moving of the plunger or actuator from free position to operating position.

PUSH-PUSH - Considered a form of alternate action, but is not latchdown.

Glossary of Terms



RELEASE FORCE (R.F.) - Amount of force still applied to switch plunger or actuator at moment contacts snap from operated position to unoperated position.

RMS - Root Mean Square.

SHORTING CONTACTS - Electrical switch contacts that are designed to make before break.

SILICONE RUBBER - Rubber produced from silicone elastomers with a high amount of flexibility, resilience, and tensile strength over a wide temperature range.

SNAP ACTION - Very fast mechanical transfer of contacts from one position to another. Contact transfer action is independent of speed of actuator travel.

SPST - Single Pole Single Throw - see Pole; also Throw.

TACTILE FEEDBACK - The switching action felt by an operator as he operates the switch from position to position.

THROW - The number of electrical circuits within a switch pole.

TOTAL TRAVEL - Combined distance of actuator pretravel and overtravel; total distance actuator moves from relaxed position past the point of electrical contact and to the end of travel.

TRANSLUCENT - Transmitting and diffusing light so that objects beyond cannot be seen clearly.

TRANSPARENT - Having the property of transmitting light without appreciably scattering so that objects lying beyond are entirely visible.

TRAVEL - The distance the switch actuator moves which causes a change of electrical circuits.

TWO CIRCUIT - Circuit in which one circuit is made in one position and a separate circuit is made in the other position.

VOLTAGE DROP - The voltage decreases across the terminals due to the internal resistance of the device.

WIPING ACTION - The action caused by the movable switch contact sliding across the stationary contact, resulting in the cleaning of the contact surfaces.

Glossary of Terms - Circuit Breaker Specific

AMBIENT COMPENSATION - Limits or eliminates thermal derating (lowering of capabilities) caused by extreme ambient temperatures.

AUTOMATIC RESET - Device that will automatically open an overload circuit. It will also automatically close or complete the circuit after a period of time. If the overload is still present, the device will continue to cycle until either the power or the overload is removed.

CIRCUIT BREAKER - Device designed to open and close a circuit manually and to open the circuit automatically on a predetermined overload of current.

CURRENT RATING - Designation of rating given in amperes at which the device will not trip. A specific temperature is usually assigned.

FUSE - A protective device using a special metal-alloyed conductor that is often notched or otherwise engineered to control the cross sectional area. A fault current will melt the narrow cross section, interrupting the flow of current.

FUSIBLE LINK/FAIL SAFE - A metallic sacrificial element within the RCCB or circuit breaker that melts and then arcs due to the joule heating of an over current. This feature ensures that a fault cannot cause the RCCB or circuit breaker to fail in the closed position.

INTERRUPT CAPACITY - The highest level of fault current that a circuit protective system is intended to interrupt. Depending on qualification requirements, some devices must clear the fault, be operable afterwards, and still be capable of tripping on 200 percent overloads. While other qualified devices may have a backup device wherein the combination must successfully clear the fault while leaving the protector in a fail-safe condition (no loss of case integrity, external materials remaining unignited by gaseous emissions, and no dielectric path to grounded parts).

MANUAL RESET - Refers to breakers in which the electrical contacts remain open after a trip until someone physically closes or completes the circuit by either pushing a reset button or throwing a switch.

MAXIMUM ULTIMATE TRIP (MUST TRIP) - Current rating at which a circuit protection device will trip within a certain period of time at a specified temperature.

MINIMUM ULTIMATE TRIP (MUST HOLD) - Current rating for which a circuit protection device will not trip for an extended period of time at a specified temperature.

NUISANCE TRIPS - Those trips caused by a response to non-damaging inrush or start-up current surges, as opposed to an actual overcurrent trip.

OVERCURRENT - That current which may cause dangerous overheating.

OVERCURRENT PROTECTION - Protection achieved by limiting the duration and magnitude of exposure to an overcurrent.

OVERLOAD - An electrical load or current flow greater than that which a circuit is designed to handle.

OVERLOAD CAPACITY - The highest level of overload current that devices will interrupt and remain in operable condition, capable of clearing additional overloads.

SAFETY FACTOR - The allowance added to the steady-state application current to ensure that the protective device selected will be more than sufficient to handle the application without nuisance trips. Safran Electrical & Power recommends a minimum safety factor of 15 percent.

SLOW-BLOW FUSE - A dual element fuse that allows for slow response to overloads (less than 10x rating) and fast response to fault currents.

TRIP-FREE - A characteristic of certain breakers that provides independence between the protection mechanism and the operating button or handle, such that a fault cannot be maintained manually (or held closed) against an overload.

TRIP INDICATION - Visual sign the breaker has opened.

TRIP CURVE - Graphic displaying minimum and maximum time a breaker takes to trip for given levels of overload.

QUALIFIED PRODUCTS UNDER MILITARY SPECIFICATION FOR MIL-C-8509 AND MIL-C-83383

MS P/N	SAFRAN P/N	Page	MS P/N	SAFRAN P/N	Page	MS P/N	LSAFRAN P/N	Page	MS P/N	SAFRAN P/N	Page
MIL-C-8509			MS14154-4VL	4300-009-4	32	MS25244-30	700-001-30	16	MS26574-10A	4200-004-10	22
MS3320-1	4310-001-1	24	MS14154-5	4330-001-5	32	MS25244-35	700-001-35	16	MS26574-10L	4200-003-10	22
MS3320-1L	4310-005-1	24	MS14154-5L	4330-007-5	32	MS25244-P5	700-089-5	16	MS26574-15	4200-001-15	22
MS3320-1V	4310-019-1	24	MS14154-5V	4330-008-5	32	MS25244-P7 1/2	700-089-705	16	MS26574-15A	4200-004-15	22
MS3320-1VL	4310-024-1	24	MS14154-5VL	4330-009-5	32	MS25244-P10	700-089-10	16	MS26574-15L	4200-003-15	22
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MS3320-4VL	4310-024-4	24	MS14154-20VL	4330-009-20	32	MS25361-60	160-012-60	12	MS26574-D4	4200-006-4	22
MS3320-5	4310-001-5	24	MS22073-1	4001-001-1	32	MS25361-60V	160-086-60	12	MS26574-D4L	4200-007-4	22
MS3320-5L	4310-005-5	24	MS22073-1V	4001-008-1	32	MS25361-70	160-012-70	12	MS26574-D5	4200-006-5	22
MS3320-5V	4310-019-5	24	MS22073-1 1/2	4001-001-105	20	MS25361-70V	160-086-70	12	MS26574-D5L	4200-007-5	22
MS3320-5VL	4310-024-5	24	MS22073-1 1/2V	4001-008-105	20	MS25361-75	160-012-75	12	MS26574-D7 1/2	4200-006-705	22
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MS3320-7 1/2VL	4310-024-705	24	MS22073-2 1/2V	4001-008-205	20	MS25361-90	160-012-90	12	MS26574-D15	4200-006-15	22
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MS14154-4L	4330-007-4	32	MS25244-20	700-001-20	16	MS26574-7 1/2L	4200-003-705	22	M83383/04-08	SM601BA40A1	34
MS14154-4V	4330-008-4	32	MS25244-25	700-001-25	16	MS26574-10	4200-001-10	22	M83383/04-10	SM601BA60A1	34

Product Application Information and Warranty Disclaimer

It is buyer's responsibility to determine the suitability of the particular device for its application, and Safran Electrical & Power makes no warranties, and assumes no liability as to the suitability of sufficiency for buyer's application of the device. Ratings and switch performance are valid only on devices which have not been subjected to unauthorized modifications or misapplications. Dimensional drawings are available upon request.

Notice

The use of Safran Electrical & Power devices should be in accordance with the provisions of the National Electric Code, U.L. and/or other local, military or industry standards that are pertinent to the particular end use. Installation or use not in accordance with these codes and standards could be hazardous to personnel and/or equipment.

Government Cage Code

The Government Cage Codes for electrical power management products manufactured by Safran Electrical & Power are 81640 and 76374.



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