SWITCH CATALOG

SAFRAN

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.

Fast information Finder

- **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 the 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.**

- **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.**

Safran Electrical & Power groups all of Safran's electrical power system businesses for the aviation market, encompassing aircraft electrical systems (generation, distribution, conversion, wiring, load management, ventilation, systems integration and support services), along with engineering services for the aerospace, auto and rail sectors.

SAFRAN ELECTRICAL & POWER

A WORLD-CLASS MANUFACTURER

Already a recognized leader in power electronics, Safran Electrical & Power actively supports Safran's strategy in the fast-growing market for «more electric» aircraft. Safran Electrical & Power is a center of expertise in aircraft electrical wiring interconnection systems (EWIS), power systems, wiring and advanced engineering, making it the world's leading supplier of equipment for «more electric» aircraft.

Safran Electrical & Power at a glance

Over 13,800 employees at 45 offices and facilities worldwide.

Engineering

Through its engineering division, Safran Electrical & Power offers a full range of engineering services for the aerospace and ground transportation segments.

Aircraft wiring

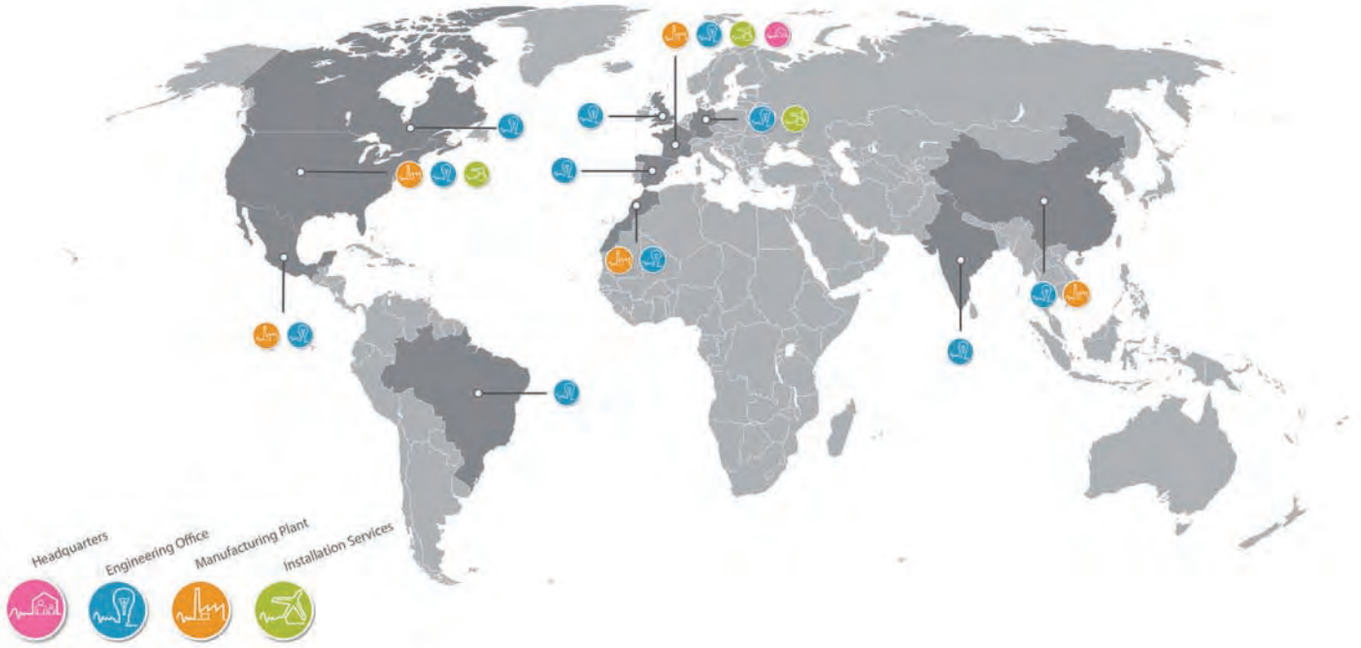
Safran Electrical & Power is the world's leading supplier of wiring systems for aircraft, covering design, integration, manufacture and support.

Power generation and power electronics

Safran Electrical & Power is one of the world's major players in power generation systems and power electronics, key components in tomorrow's «more electric» aircraft.

Ventilation

Technofan, a subsidiary of Safran Electrical & Power, supplies high-performance ventilation systems and components for civil and military aircraft.



SAFRAN

SAFRAN ELECTRICAL & POWER

Section A
Toggle Switches Index

**Most items listed in this catalog are standard products and are normally in Distributor Inventory; however, the current inventory status should be checked by contacting your Safran Electrical & Power Customer Service Representative at 800-955-7354 or your authorized Distributor before placing orders.*

Environmentally Sealed Toggle Switches

FEATURES

- Completely sealed against dust, moisture, and other contaminants
- 1, 2 and 4 pole circuitry
- One hole mounting for easy installation
- Multi-circuits offered
- 2 & 3 position with maintained and momentary action
- Molded-in terminal inserts
- Molded-in terminal numbers
- See 8520-8528 for UL recognized and CSA certified version on page 5
- Water tight seal per MIL-STD-108E and designed to meet IP68
- Thermoset molding materials meet flame retardant requirements
- Temperature Range: -50°F to +150°F (-46°C to +66°C)
- Life: 20,000 operations at rated load
- Bushing: 15/32" - 32 thread

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115 VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8510	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	15	7
2	8511	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8512	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

SELECTION TABLE

FLUSH TERMINAL SCREWS

8510

8511

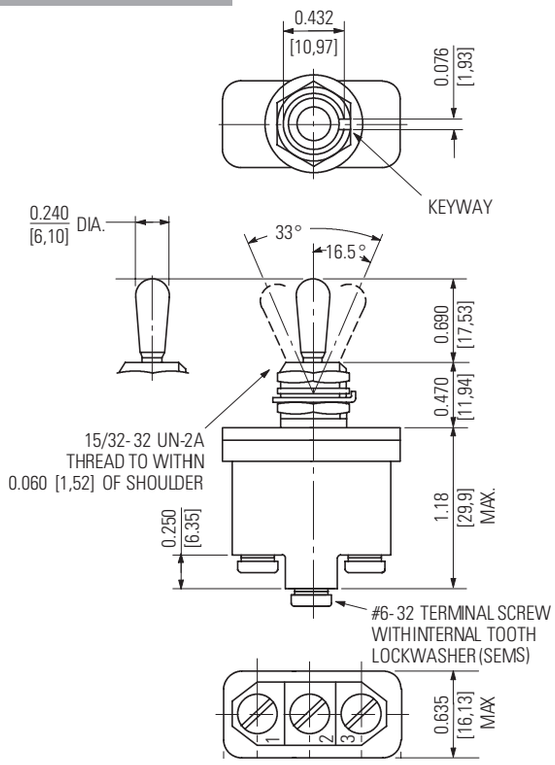
8512

CIRCUIT WITH LEVER IN . . .			ONE POLE	TWO POLE	FOUR POLE
Up Position	Center Position	Down Position (Keyway)	Catalog Number	Catalog Number	Catalog Number
ON	OFF	ON	8510K1	8511K1	8512K1
ON	NONE	OFF	K9	K9	K9
ON	NONE	ON	K4	K4	K4
ON	OFF	NONE	K6	K6	K6
ON	NONE	ON*	8510K5	8511K5	8512K5
* ON	OFF	ON*	K2	K2	K2
NONE	OFF	ON*	K7	K7	K7
ON	NONE	OFF*	K10	K10	K10
OFF	NONE	ON*	K11	K11	K11
ON	OFF	ON*	8510K3	8511K3	8512K3
* ON	ON	NONE	K12	K12	K12
ON	ON	NONE	K13	K13	K13
ON	ON	ON	—	8511K14	8512K15
ON	ON	ON*	—	K15	K16
* ON	ON	ON*	—	K16	K17
ON	ON	ON	—	8511K17	—
ON	ON	ON*	—	K18	—
* ON	ON	ON*	—	K19	—
ON	ON/OFF	ON	—	—	8512K20

*** Momentary contact.**

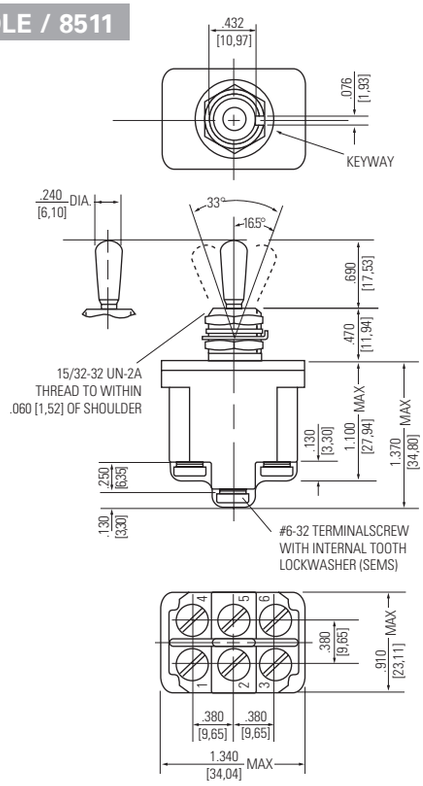
See Page A71 for circuit diagrams.

MOUNTING DIMENSIONS - ONE POLE / 8510



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8511



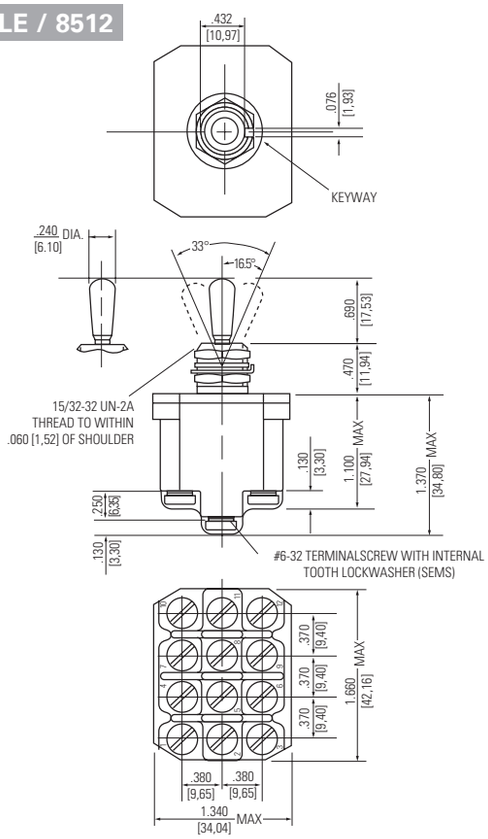
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE / 8512



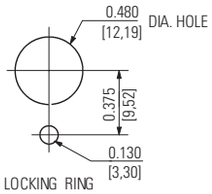
Terminal Identification

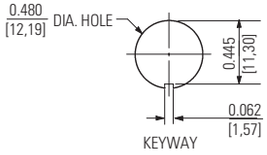
OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Terminal screws furnished assembled
- Special toggle levers
- Special circuits
- Panel seal, Part Number 32-341
- Spade terminal adapters available

PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING





STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

FEATURES

- Completely sealed against dust, moisture, and other contaminants
- UL and CSA approved
- One hole mounted bushing for easy installation
- Multi-circuits offered
- 2 & 3 position with maintained and momentary action
- Molded-in terminal inserts and terminal numbers
- 1, 2 and 4 pole circuitry

SPECIFICATIONS

- Watertight seal per MIL-STD-108E and designed to meet IP68
- Thermoset molding materials meet flame retardant requirements
- UL recognized and CSA certified per specifications listed below
- Temperature Range: -50°F to +150°F (-46°C to +66°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life
  6,000 operations at HP ratings per UL and CSA requirements
- Bushing: 15/32" - 32 thread

CURRENT RATINGS

		Amperes		Maximum Horsepower 1 Phase		3 Phase
No. of Poles	Catalog Number	125V	250V	125VAC	250VAC	125/250 VAC
1	8520	18	9	1/4	1/2	—
2	8521	18	9	1/2	1	—
4	8522	18	9	1/2	1	1
1, 2, 4	8526 thru 8528	18	9	—	—	—

SELECTION TABLE

FLUSH TERMINAL SCREWS

8520/8526

8521/8527

8522/8528

CIRCUIT WITH LEVER IN . . .			ONE POLE	TWO POLE	FOUR POLE
Up Position	Center Position	Down Position (Keyway)	Catalog Number	Catalog Number	Catalog Number
ON	OFF	ON	8520K1	8521K1	8522K1
ON	NONE	OFF	K9	K9	K9
ON	NONE	ON	K4	K4	K4
ON	NONE	ON*	8526K5	8527K5	8528K5
*ON	OFF	ON*	K2	K2	K2
ON	OFF	ON*	8526K3	8527K3	8528K3

*** Momentary contact.**

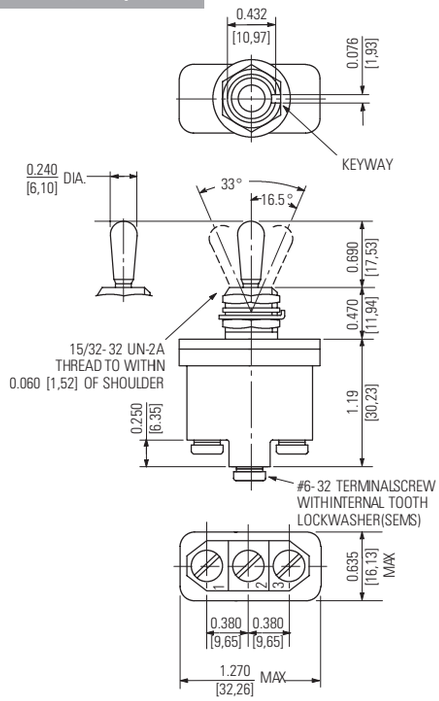
See page A71 for circuit diagrams.

UL & CSA Approval Numbers

UL - Where devices are UL recognized, recognition is listed under file number E15346; Guide card number is WOYR2.

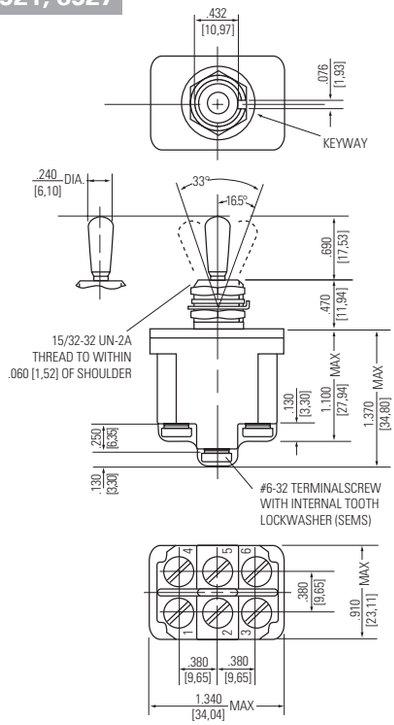
CSA = Where devices are CSA certified, certification number is LR40068, class number 6241.

MOUNTING DIMENSIONS - ONE POLE / 8520, 8526



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8521, 8527



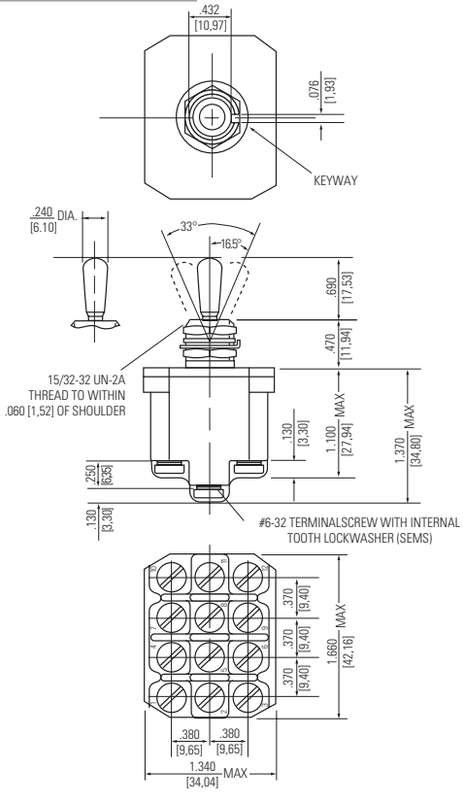
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE / 8522, 8528



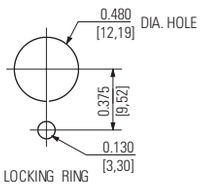
Terminal Identification

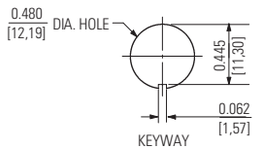
OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Terminal screws furnished assembled
- Special circuits
- Panel seal, part number 32-341
- Spade terminal adapters available

PANEL CUTOUT

15/32 DIA. BUSHING





STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

INDUSTRIAL - ENVIRONMENTALLY SEALED SWITCHES

Series - 8566, 8567, 8568 Environmentally Sealed Designerline Toggle Switches

FEATURES

- Completely sealed against dust, moisture, and other contaminants
- Variety of lever styles and colors
- One hole mounting for easy installation
- 2 & 3 position with maintained and momentary action
- 1, 2 and 4 pole circuitry
- Molded-in terminal inserts and terminal numbers
- Color-coded shaped levers for operator feel and cosmetic appearance

SPECIFICATIONS

- Watertight seal per MIL-STD-108E and designed to meet IP68
- Bushing: 15/32" - 32 thread
- Temperature Range: -50°F to +150°F (-46°C to + 66°C)
- Life: 20,000 operations at rated load 40,000 operations mechanical life
- Thermoset molding materials meet flame retardant requirements

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115 VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8566	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	15	7
2	8567	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8568	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

SELECTION TABLE

FLUSH SCREW TERMINALS

8566 8567 8568

CIRCUIT WITH LEVER IN . . .			ONE POLE	TWO POLE	FOUR POLE	LEVER SUFFIXES[1]		
Up Position	Center Position	Down Position (Keyway)	Catalog Number	Catalog Number	Catalog Number	Shape[2] Suffix	Color Letter	Suffix Number
ON	OFF	ON	8566K1	8567K1	8568K1			
ON	NONE	OFF	K9	K9	K9			
ON	NONE	ON	K4	K4	K4			
ON	OFF	NONE	K6	K6	K6	All	White	21
ON	NONE	ON*	8566K5	8567K5	8568K5			
* ON	OFF	ON*	K2	K2	K2			
NONE	OFF	ON*	K7	K7	K7			
ON	NONE	OFF*	K10	K10	K10			
OFF	NONE	ON*	K11	K11	K11	All	Red	22
ON	OFF	ON*	8566K3	8567K3	8568K3			
* ON	ON	NONE	K12	K12	K12			
ON	ON	NONE	K13	K13	K13			
ON	ON	ON	—	8567K14	8568K15			
ON	ON	ON*	—	K15	K16	All	Black	27
* ON	ON	ON*	—	K16	K17			
ON	ON	ON	—	8567K17	—			
ON	ON	ON*	—	K18	—			
* ON	ON	ON*	—	K19	—			

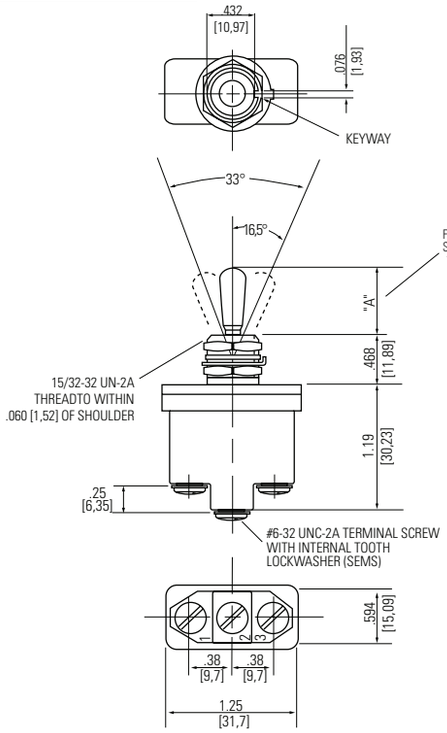
* **Momentary contact.**

See page A71 for circuit diagrams.

① A complete catalog number consists of a basic switch number followed by a lever shape suffix letter and a two-digit lever color suffix number. Example: 8566K1C21.

② Select lever shape suffix letter from page A10.

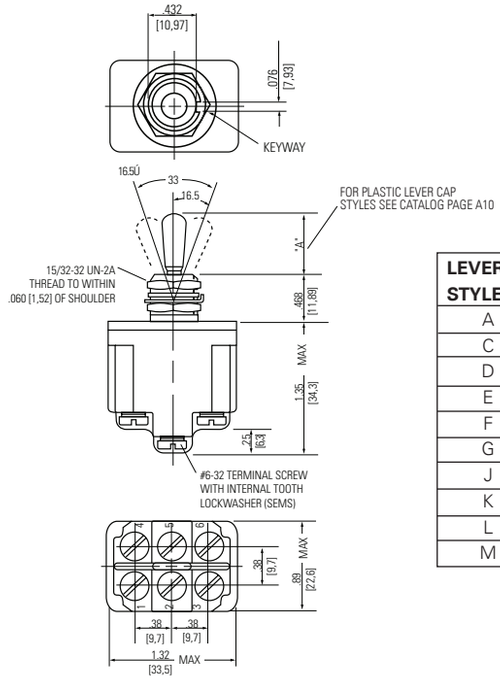
MOUNTING DIMENSIONS - ONE POLE / 8566



LEVER STYLE	DIM. "A" INCHES	DIM. "A" METRIC
A	.938	23,83
C	.859	21,82
D	.893	22,68
E	.893	22,68
F	1.021	25,93
G	.953	24,21
J	.950	24,13
K	.950	24,13
L	.950	24,13
M	1.150	29,21

Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8567



LEVER STYLE	DIM. "A" INCHES	DIM. "A" METRIC
A	.938	23,83
C	.859	21,82
D	.893	22,68
E	.893	22,68
F	1.021	25,93
G	.953	24,21
J	.950	24,13
K	.950	24,13
L	.950	24,13
M	1.150	29,21

Terminal Identification

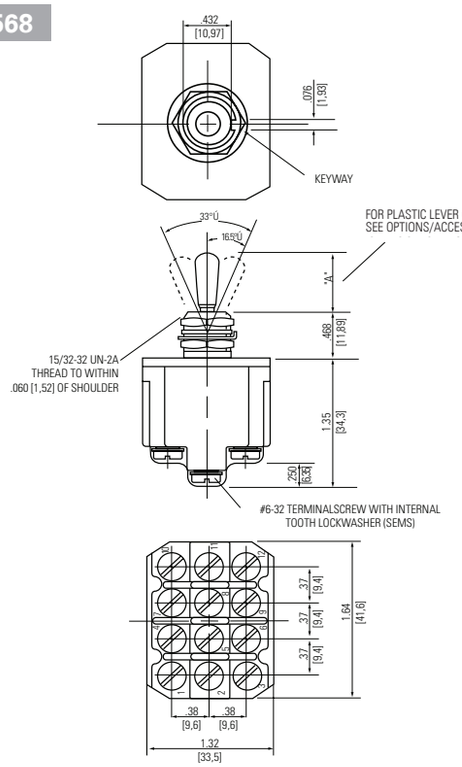
STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

INDUSTRIAL - ENVIRONMENTALLY SEALED SWITCHES
Series - 8566, 8567, 8568 Environmentally Sealed Designerline Toggle Switches

MOUNTING DIMENSIONS - FOUR POLE / 8568



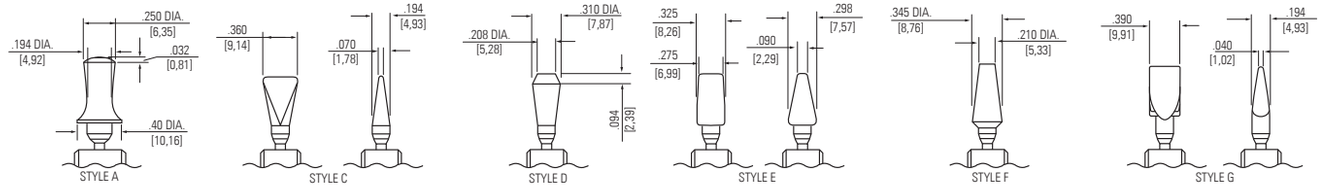
LEVER STYLE	DIM. "A" INCHES	DIM. "A" METRIC
A	.938	23,83
C	.859	21,82
D	.893	22,68
E	.893	22,68
F	1.021	25,93
G	.953	24,21
J	.950	24,13
K	.950	24,13
L	.950	24,13
M	1.150	29,21

Terminal Identification

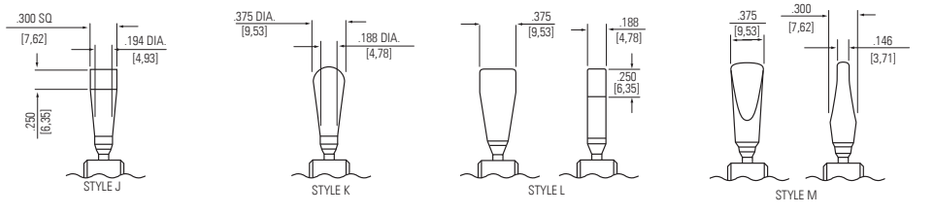
Non-functional terminals not supplied.

OPTIONS/ACCESSORIES

- Standard colors available - White, red and black

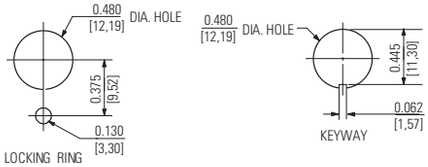


- Special mounting hardware
- Mounting hardware furnished assembled
- Terminal screws furnished assembled
- Spade terminal adapters available
- Panel seal, Part Number 32-341
- Special circuits



PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Series - 8530, 8531, 8532

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole Circuitry
- One hole mounting for easy installation
- Multi-circuits
- 2 & 3 position with maintained and momentary action
- Three types of termination offered as standard

SPECIFICATIONS

- Watertight seal per MIL-STD-108E and designed to meet IP68
- UL recognized and CSA certified
- Three standard types of terminals:
  Screw 6-32 UNC-2A
  Solder lug .125 [3,17] dia. hole
  Spade .250 [6,35] x .032 [0,81] thick
- Life: 50,000 operations at rated load. 100,000 operations mechanical life.
- Temperature Range: -50°F to +150°F (-46°C to + 66°C)

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8530	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	11	7
2	8531	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8532	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

For the UL/CSA ratings, see page A70.

STANDARD LEVER SELECTION TABLE


8530


8531

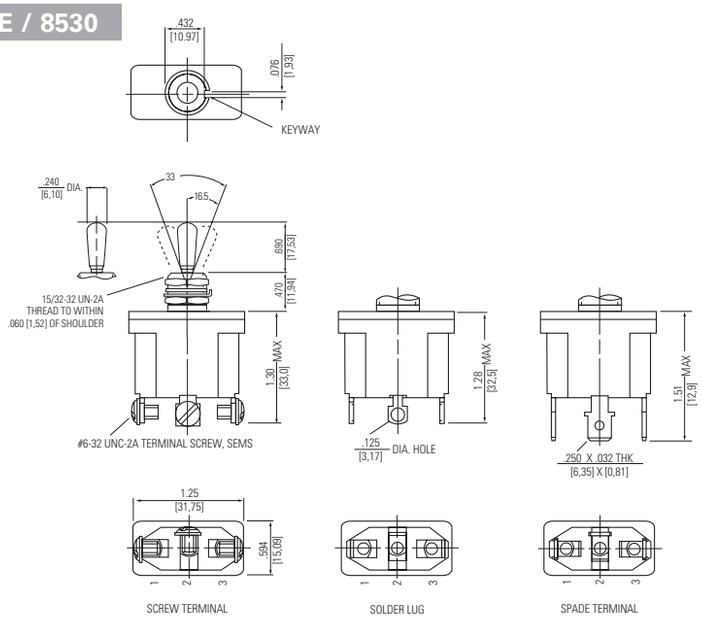

8532

CIRCUIT WITH LEVER IN . . .			CATALOG NUMBER		
Up Position	Center Position	Down Position (Keyway)	Screw Terminals	Solder Lug Terminals	Spade Terminals
ONE POLE					
ON	OFF	ON	8530K1	8530K91	8530K31
ON	NONE	OFF	K9	K99	K39
ON	NONE	ON	K4	K94	K34
ON	OFF	NONE	K6	K96	K36
ON	NONE	ON*	8530K5	8530K95	8530K35
ON*	OFF	ON*	K2	K92	K32
NONE	OFF	ON*	K7	K97	K37
ON	NONE	OFF*	K10	K910	K310
OFF	NONE	ON*	K11	K911	K311
ON	OFF	ON*	8530K3	8530K93	8530K33
ON*	ON	NONE	K12	K912	K312
ON	ON	NONE	K13	K913	K313
TWO POLE					
ON	OFF	ON	8531K1	8531K91	8531K31
ON	NONE	OFF	K9	K99	K39
ON	NONE	ON	K4	K94	K34
ON	OFF	NONE	K6	K96	K36
ON	NONE	ON*	8531K5	8531K95	8531K35
ON*	OFF	ON*	K2	K92	K32
NONE	OFF	ON*	K7	K97	K37
ON	NONE	OFF*	K10	K910	K310
OFF	NONE	ON*	K11	K911	K311
ON	OFF	ON*	8531K3	8531K93	8531K33
ON*	ON	NONE	K12	K912	K312
ON	ON	NONE	K13	K913	K313
ON	ON	ON	K14	K914	K314
ON	ON	ON*	K15	K915	K315
ON*	ON	ON*	8531K16	8531K916	8531K316
ON	ON	ON	K17	K917	K317
ON	ON	ON*	K18	K918	K318
ON*	ON	ON*	K19		K319
				K919	
FOUR POLE					
ON	OFF	ON	8532K1	8532K91	8532K31
ON	NONE	OFF	K9	K99	K39
ON	NONE	ON	K4	K94	K34
ON	OFF	NONE	K6	K96	K36
ON	NONE	ON*	8532K5	8532K95	8532K35
* ON	OFF	ON*	K2	K92	K32
NONE	OFF	ON*	K7	K97	K37
ON	NONE	OFF*	K10	K910	K310
OFF	NONE	ON*	K11	K911	K311
ON	OFF	ON*	8532K3	8532K93	8532K33
* ON	ON	NONE	K12	K912	K312
ON	ON	NONE	K13	K913	K313
ON	ON	ON	K15	K915	K315
ON	ON	ON*	K16	K916	K316
* ON	ON	ON*	K17	K917	K317

*** Momentary contact.**

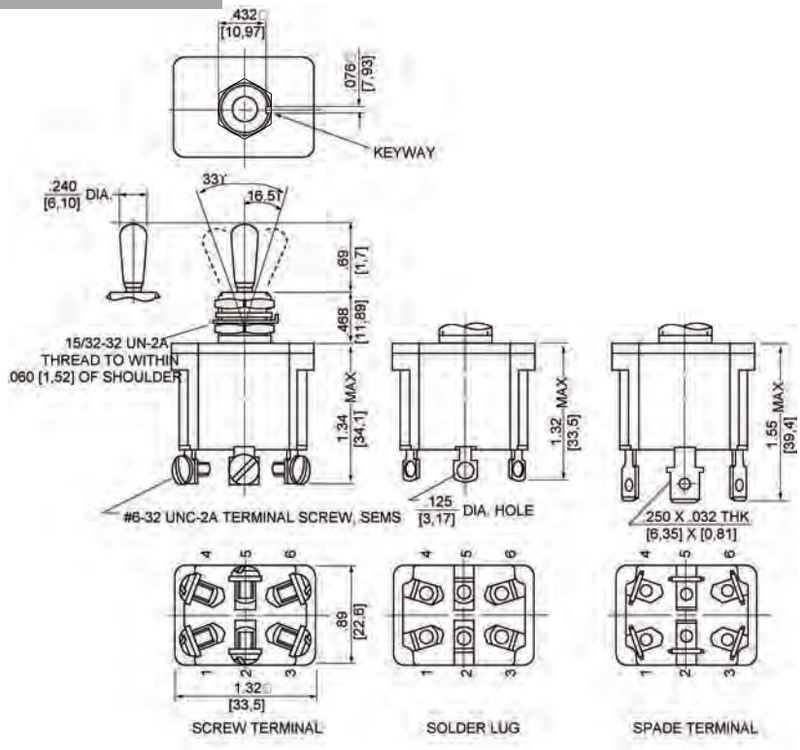
See page A71 for circuit diagrams.

MOUNTING DIMENSIONS - ONE POLE / 8530



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8531



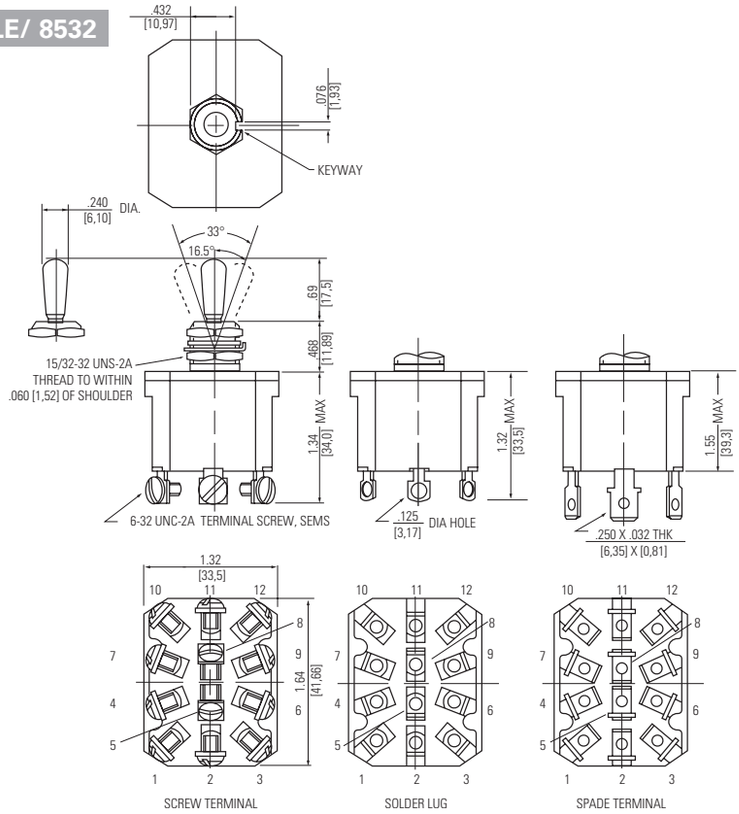
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE/ 8532



Terminal Identification

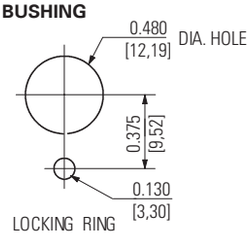
Non-functional terminals not supplied.

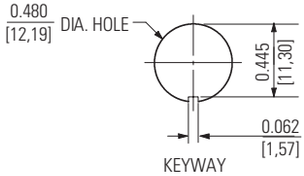
OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Terminal screws furnished assembled
- Special circuits
- Panel seal, Part Number 32-341
- Custom wire harnesses
- Mating connector available for two poles with spade terminal
- External jumpers available
  - bussing jumper
  - reversing jumpers

PANEL CUTOUT

15/32 DIA. BUSHING





STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

ECONOSWITCH - ENVIRONMENTALLY SEALED SWITCHES

Series - 8536, 8537, 8538 Econoswitch Sealed Leverlock Toggle Switches

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- Locking actuator for safety
- One hole mounting for easy installation
- Over 25 standard locking configurations
- 2 & 3 position with maintained and momentary action
- Multi-circuits
- Three types of termination offered as standard
- Also available with toggle and Designerline Actuator. For details see page A11 for toggles and page A17 for Designerline.

SPECIFICATIONS

- Watertight seal per MIL-STD-108E and designed to meet IP68
- UL recognized and CSA certified
- Temperature range: -50°F to +150°F (-46°C to + 66°C)
- Life: 50,000 operations at rated load 100,000 operations mechanical life
- Bushing: 15/32" - 32 thread

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8536	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	11	7
2	8537	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8538	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

For the UL/CSA ratings, see page A70.

LEVER LOCK SELECTION TABLE


8536


8537


8538

CIRCUIT WITH LEVER IN . . . Up Position	Center Position	Down Position (Keyway)	CATALOG NUMBER Screw Terminals	Solder Lug Terminals	Spade Terminals	Available Locking Configurations
ONE POLE						
ON	OFF	ON	8536K1 △	8536K91 △	8536K31 △	ALL
ON	NONE	OFF	K9 △	K99 △	K39 △	D, F, G
ON	NONE	ON	K4 △	K94 △	K34 △	D, F, G
ON	OFF	NONE	K6 △	K96 △	K36 △	E, F, K, M
ON	NONE	ON*	8536K5 △	8536K95 △	8536K35 △	F
*ON	OFF	ON*	K2 △	K92 △	K32 △	E, L, N
NONE	OFF	ON*	K7 △	K97 △	K37 △	E
ON	NONE	OFF*	K10△	K910△	K310 △	F
OFF	NONE	ON*	K11△	K911△	K311 △	F
ON	OFF	ON*	8536K3 △	8536K93 △	8536K33 △	E, F, K, L, M, N
*ON	ON	NONE	K12△	K912△	K312 △	E
ON	ON	NONE	K13△	K913△	K313 △	E, F, K, M
TWO POLE						
ON	OFF	ON	8537K1 △	8537K91 △	8537K31 △	ALL
ON	NONE	OFF	K9 △	K99 △	K39 △	D, F, G
ON	NONE	ON	K4 △	K94 △	K34 △	D, F, G
ON	OFF	NONE	K6 △	K96 △	K36 △	E, F, K, M
ON	NONE	ON*	8537K5 △	8537K95 △	8537K35 △	F
*ON	OFF	ON*	K2 △	K92 △	K32 △	E, L, N
NONE	OFF	ON*	K7 △	K97 △	K37 △	E
ON	NONE	OFF*	K10△	K910△	K310 △	F
OFF	NONE	ON*	K11△	K911△	K311 △	F
ON	OFF	ON*	8537K3 △	8537K93 △	8537K33 △	E, F, K, L, M, N
*ON	ON	NONE	K12△	K912△	K312△	E
ON	ON	NONE	K13△	K913△	K313△	E, F, K, M
ON	ON	ON	8537K14△	8537K914△	8537K314 △	ALL
ON	ON	ON*	K15△	K915△	K315△	E, F, K, L, M, N
*ON	ON	ON*	K16△	K916△	K316△	E, L, N
*ON	ON	ON*	K19△	K919△	K319△	E, L, N
FOUR POLE						
ON	OFF	ON	8538K1 △	8538K91 △	8538K31 △	ALL
ON	NONE	OFF	K9 △	K99 △	K39 △	D, F, G
ON	NONE	ON	K4 △	K94 △	K34 △	D, F, G
ON	OFF	NONE	K6 △	K96 △	K36 △	E, F, K, M
ON	NONE	ON*	8538K5 △	8538K95 △	8538K35 △	F
*ON	OFF	ON*	K2 △	K92 △	K32 △	E, L, N
NONE	OFF	ON*	K7 △	K97 △	K37 △	E
ON	NONE	OFF*	K10△	K910△	K310 △	F
OFF	NONE	ON*	K11△	K911△	K311 △	F
ON	OFF	ON*	8538K3 △	8538K93 △	8538K33 △	E, F, K, L, M, N
*ON	ON	NONE	K12△	K912△	K312 △	E
ON	ON	NONE	K13△	K913△	K313 △	E, F, K, M
ON	ON	ON	8538K15△	8538K915△	K315 △	ALL
ON	ON	ON*	K16△	K916△	K316 △	E, F, K, L, M, N
*ON	ON	ON*	K17△	K917△	K317 △	E, L, N

*** Momentary contact.**

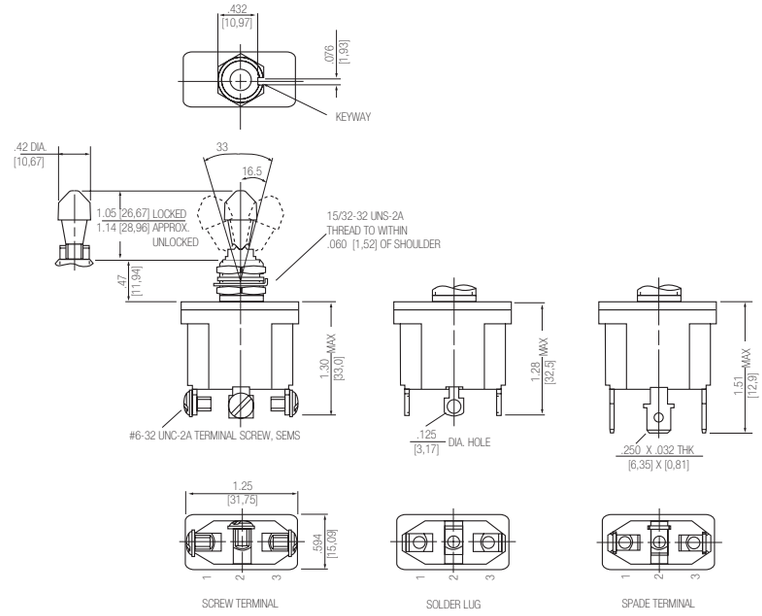
△ Complete part number requires this symbol to be replaced with a locking configuration letter - selected from page A16.

Example: **8536K31△** (Basic Switch) **E** (Locking Style) **8536K31E** (Complete Part Number)

See Page A71 for circuit diagrams.

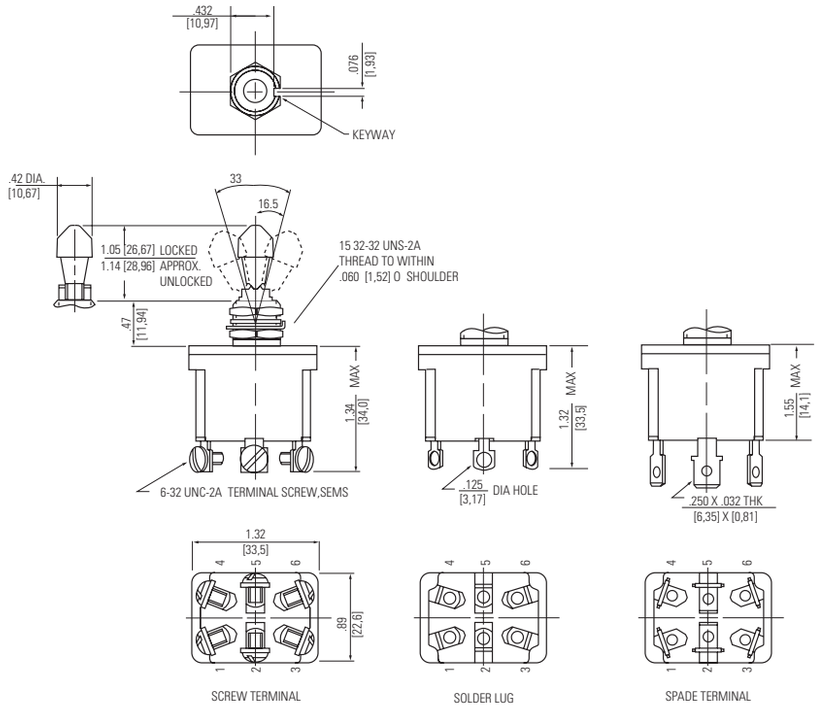
Series - 8536, 8537, 8538

MOUNTING DIMENSIONS - ONE POLE / 8536



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8537



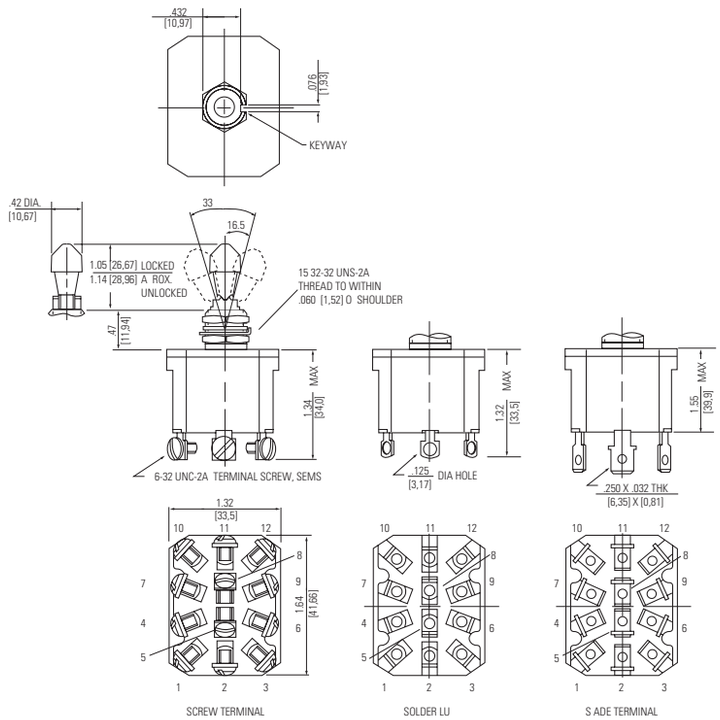
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE / 8538

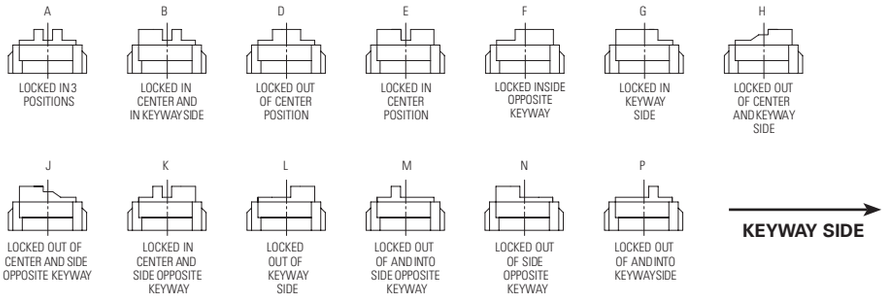


Terminal Identification

Non-functional terminals not supplied.

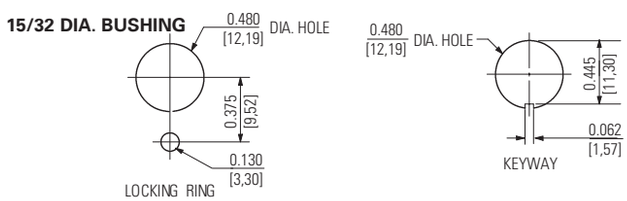
OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Terminal screws furnished assembled
- Special circuits
- Panel seals, Part Number 32-341



Figures A thru P do not represent details of construction. They schematically illustrate locking function.

PANEL CUTOUT DIMENSIONS



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Series - 8533, 8534, 8535

Econoswitch Sealed Designerline Toggle Switches

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- One hole mounting for easy installation
- Variety of lever styles and colors
- Color-coded, shaped levers for operator feel and cosmetic appearance
- 2 & 3 position with maintained and momentary action
- Three types of termination offered as standard
- Multi-circuits
- Also available with toggle and lever lock Actuator. For details, see page A11 for toggles and page A14 for lever locks.

SPECIFICATIONS

- Watertight seal per MIL-STD-108E designed to meet IP68
- UL recognized and CSA certified
- Bushing: 15/32" - 32 thread
- Temperature range: -50°F to +150°F (-46°C to + 66°C)
- Life: 50,000 operations at rated load
  100,000 operations mechanical life

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115 VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8533	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	11	7
2	8534	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8535	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

For the UL/ CSA ratings, see page A70.

SELECTION TABLE

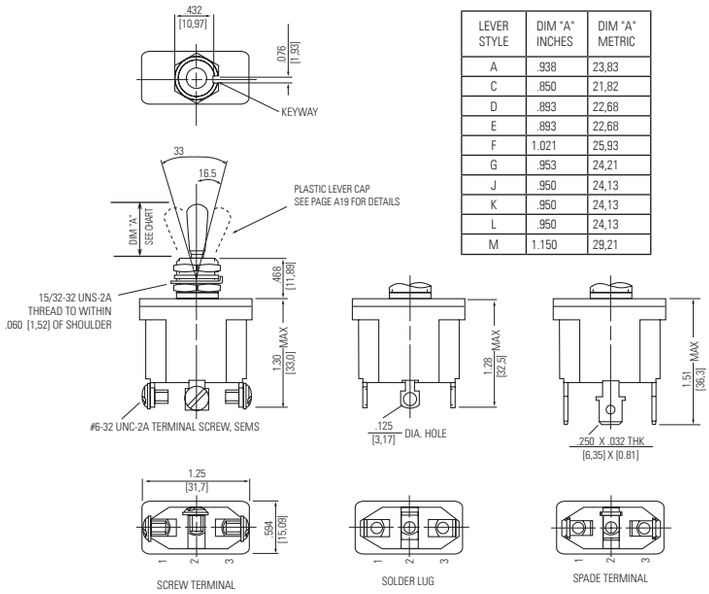
CIRCUIT WITH LEVER IN . . . Up Position	Center Position	Down Position (Keyway)	Screw Terminals ①	Solder Lug Terminals ①	Spade Terminals ①	Shape Suffix ②	Color Letter	Suffix Number
ONE POLE								
ON	OFF	ON	8533K1	8533K91	88533K31			
ON	NONE	OFF	K9	K99	K39			
ON	NONE	ON	K4	K94	K34	All	White	21
ON	OFF	NONE	K6	K96	K36			
ON	NONE	ON*	8533K5	8533K95	8533K35	All	Red	22
* ON	OFF	ON*	K2	K92	K32			
NONE	OFF	ON*	K7	K97	K37			
ON	NONE	OFF*	K10	K910	K310			
OFF	NONE	ON*	K11	K911	K311	All	Black	27
ON	OFF	ON*	8533K3	8533K93	8533K33			
* ON	ON	NONE	K12	K912	K312			
ON	ON	NONE	K13	K913	K313			
TWO POLE								
ON	OFF	ON	8534K1	8534K91	8534K31			
ON	NONE	OFF	K9	K99	K39			
ON	NONE	ON	K4	K94	K34			
ON	OFF	NONE	K6	K96	K36	All	White	21
ON	NONE	ON*	8534K5	8534K95	8534K35			
* ON	OFF	ON*	K2	K92	K32			
NONE	OFF	ON*	K7	K97	K37	All	Red	22
ON	NONE	OFF*	K10	K910	K310			
OFF	NONE	ON*	K11	K911	K311			
ON	OFF	ON*	8534K3	8534K93	8534K33			
* ON	ON	NONE	K12	K912	K312	All	Black	27
ON	ON	NONE	K13	K913	K313			
ON	ON	ON	8534K14	8534K914	8534K314			
ON	ON	ON*	K15	K915	K315			
* ON	ON	ON*	K16	K916	K316			
FOUR POLE								
ON	OFF	ON	8535K1	8535K91	8535K31			
ON	NONE	OFF	K9	K99	K39			
ON	NONE	ON	K4	K94	K34			
ON	OFF	NONE	K6	K96	K36	All	White	21
ON	NONE	ON*	8535K5	8535K95	8535K35			
* ON	OFF	ON*	K2	K92	K32			
NONE	OFF	ON*	K7	K97	K37	All	Red	22
ON	NONE	OFF*	K10	K910	K310			
OFF	NONE	ON*	K11	K911	K311			
ON	OFF	ON*	8535K3	8535K93	8535K33			
* ON	ON	NONE	K12	K912	K312	All	Black	27
ON	ON	NONE	K13	K913	K313			
ON	ON	ON	8535K15	8535K915	8535K315			
ON	ON	ON*	K16	K916	K316			
* ON	ON	ON*	K17	K917	K317			

*** Momentary contact.**

① A complete catalog number consists of a basic switch number followed by a lever shape suffix letter and a two-digit lever color suffix number. Example: 8533K91E27.
See page A71 for circuit diagrams.

② Select lever shape suffix letter from page A19.

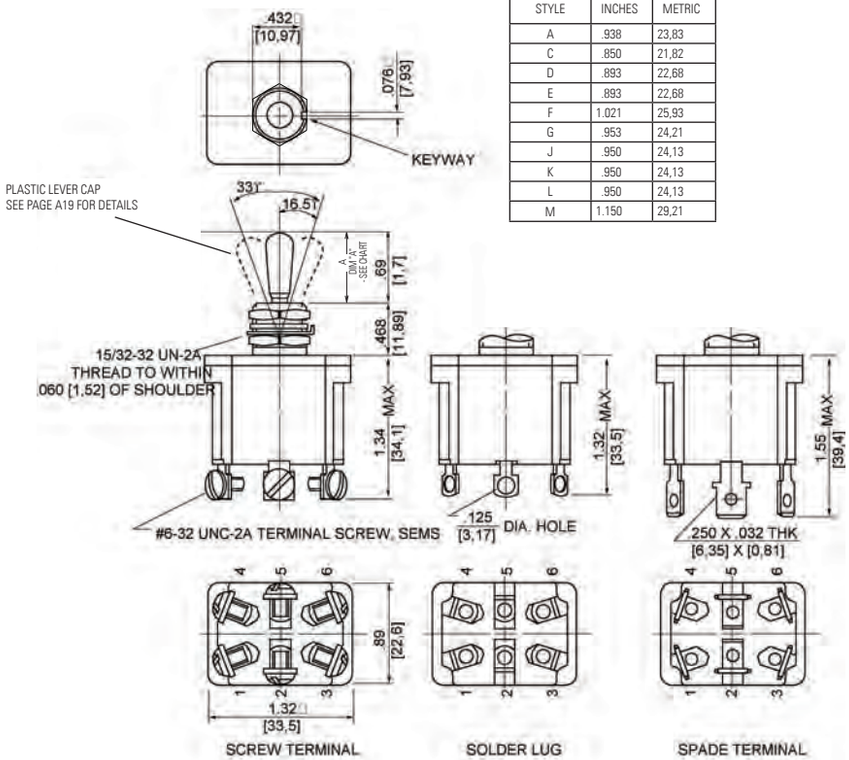
MOUNTING DIMENSIONS - ONE POLE / 8533



LEVER STYLE	DIM "A" INCHES	DIM "A" METRIC
A	.938	23,83
C	.850	21,82
D	.893	22,68
E	.893	22,68
F	1.021	25,93
G	.953	24,21
J	.950	24,13
K	.950	24,13
L	.950	24,13
M	1.150	29,21

Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8534



LEVER STYLE	DIM "A" INCHES	DIM "A" METRIC
A	.938	23,83
C	.850	21,82
D	.893	22,68
E	.893	22,68
F	1.021	25,93
G	.953	24,21
J	.950	24,13
K	.950	24,13
L	.950	24,13
M	1.150	29,21

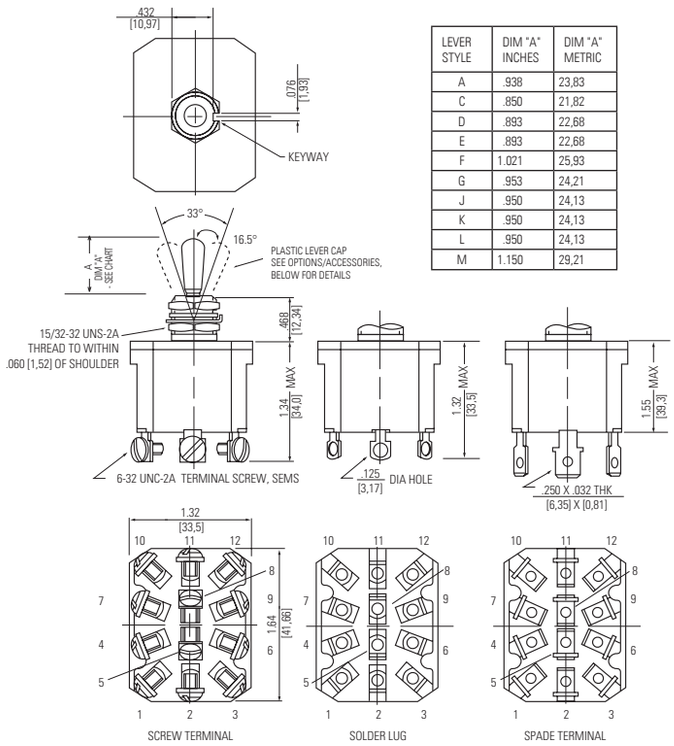
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE / 8535



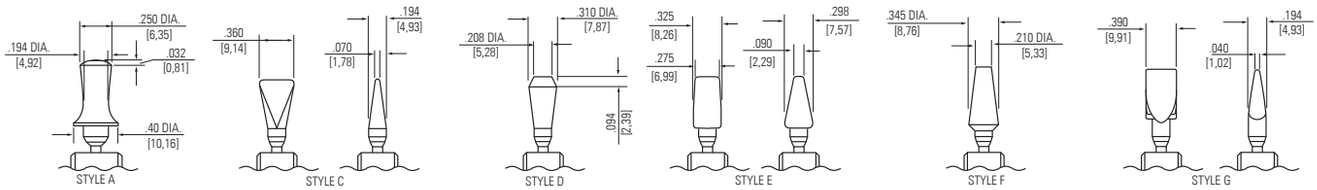
LEVER STYLE	DIM "A" INCHES	DIM "A" METRIC
A	.938	23,83
C	.850	21,82
D	.893	22,68
E	.893	22,68
F	1.021	25,93
G	.953	24,21
J	.950	24,13
K	.950	24,13
L	.950	24,13
M	1.150	29,21

Terminal Identification

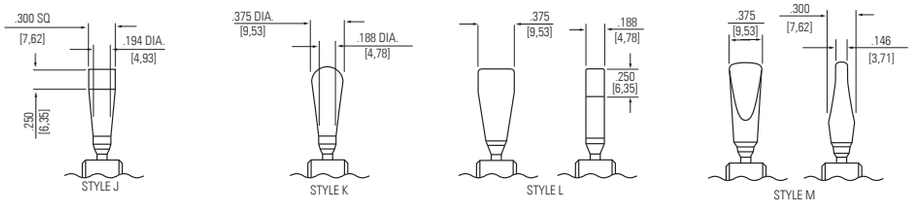
Non-functional terminals not supplied.

OPTIONS/ACCESSORIES

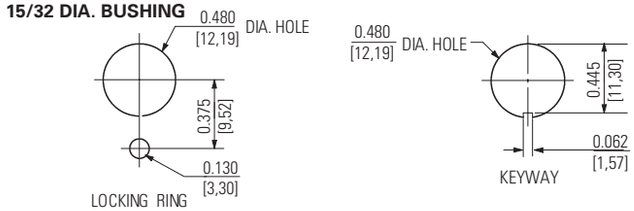
- Standard colors available - White, red and black



- Special mounting hardware
- Mounting hardware furnished assembled
- Special circuits
- Panel seal, Part Number 32-341



PANEL CUTOUT DIMENSIONS



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

MILITARY - ENVIRONMENTALLY SEALED SWITCHES
Series - 8500, 8501, 8502

MIL-DTL-3950 Toggle Switches

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Molded-in terminal inserts and terminal numbers

SPECIFICATIONS

- Environmentally sealed per MIL-DTL-3950
- MS approved and QPL'd per MIL-DTL-3950
- Thermoset molding materials meet flame retardant requirements
- Bushing: 15/32" - 32 thread
- Temperature Range: -85°F to +160°F (-65°C to +71°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8500	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	15	7
2	8501	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8502	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

Minimum Rating: "Intermediate Current" per MIL-DTL-3950.

STANDARD LEVER SELECTION TABLE

8500

8501

8502

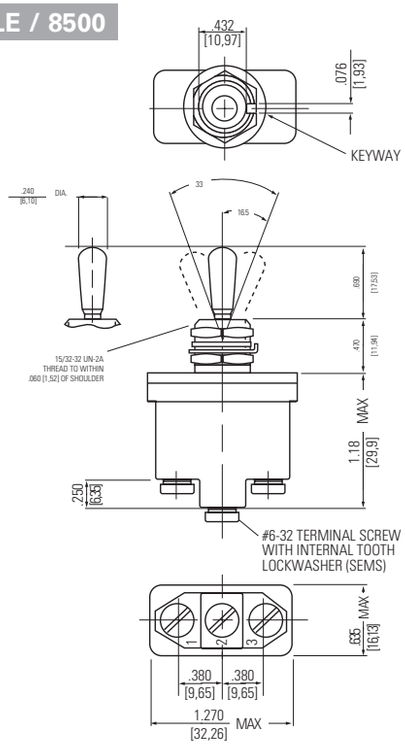
CIRCUIT WITH LEVER IN . . .			ONE POLE		TWO POLE		FOUR POLE	
Up Position	Center Position	Down Position (Keyway)	MS Part Number	Catalog Number	MS Part Number	Catalog Number	MS Part Number	Catalog Number
ON	OFF	ON	MS24523-21	8500K1	MS24524-21	8501K1	MS24525-21	8502K1
ON	NONE	OFF	-22	K9	-22	K9	-22	K9
ON	NONE	ON	-23	K4	-23	K4	-23	K4
ON	OFF	NONE	-24	K6	-24	K6	-24	K6
ON	NONE	ON*	MS24523-26	8500K5	MS24524-26	8501K5	MS24525-26	8502K5
* ON	OFF	ON*	-27	K2	-27	K2	-27	K2
NONE	OFF	ON*	-28	K7	-28	K7	-28	K7
ON	NONE	OFF*	-29	K10	-29	K10	-29	K10
OFF	NONE	ON*	-30	K11	-30	K11	-30	K11
ON	OFF	ON*	MS24523-31	8500K3	MS24524-31	8501K3	MS24525-31	8502K3
* ON	ON	NONE	-32	K12	-32	K12	-32	K12
ON	ON	NONE	-33	K13	-33	K13	-33	K13
ON	ON	ON	—	—	MS27407-1	8501K14	MS27406-1	8502K15
ON	ON	ON*	—	—	-2	K15	-2	K16
* ON	ON	ON*	—	—	-3	K16	-3	K17
ON	ON	ON	—	—	-4	K17	—	—
ON	ON	ON*	—	—	-5	K18	—	—
* ON	ON	ON*	—	—	-6	K19	—	—

*** Momentary contact.**

See page A71 for circuit diagrams.

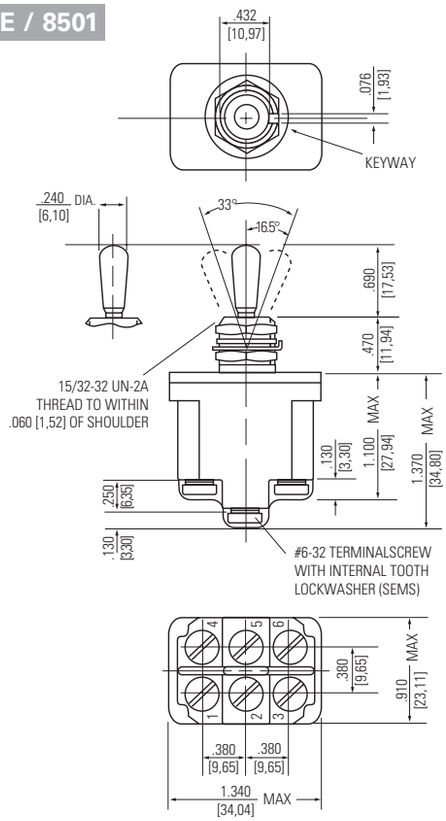
Series - 8500, 8501, 8502

MOUNTING DIMENSIONS - ONE POLE / 8500



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8501



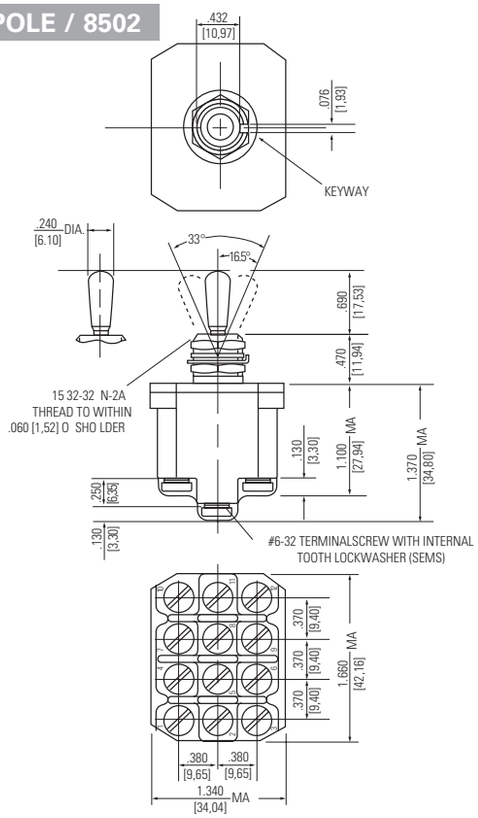
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE / 8502



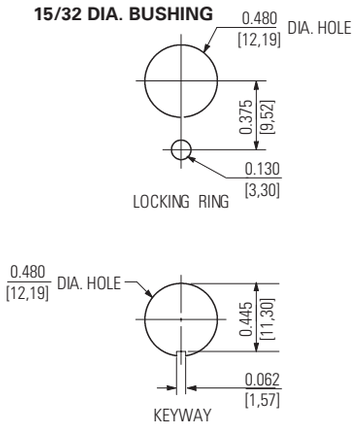
Terminal Identification

Non-functional terminals not supplied.

OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Terminal screws furnished assembled
- Special circuits
- Panel seal, part number 32-341 (See Accessories and Custom Components section)
- Special "3 Cateye" luminous lever attachment
- Lever extensions and attachable tips (See Accessories and Custom Components section)
- Custom wiring harnesses

PANEL CUTOUT



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Series - 8503, 8504, 8505

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Locking actuator for safety
- Molded-in terminal inserts and terminal numbers

SPECIFICATIONS

- Environmentally sealed per MIL-DTL-3950
- MS approved and QPL'd per MIL-DTL-3950
- Thermoset molding materials meet flame retardant requirements
- Bushing: 15/32" - 32 thread
- Temperature Range: -85°F to +160°F (-65°C to +71°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115 VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8503	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	15	7
2	8504	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8505	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

Minimum Rating: "Intermediate Current" per MIL-DTL-3950.

LEVER LOCK SELECTION TABLE

8503

8504

8505

CIRCUIT WITH LEVER IN . . .				ONE POLE		TWO POLE		FOUR POLE	
Up Position	Center Position	Down Position (Keyway)	Lever ① Lock Bushing Style	Flush Screw Terminals		Flush Screw Terminals		Flush Screw Terminals	
				MS Part Number	Catalog Number	MS Part Number	Catalog Number	MS Part Number	Catalog Number
ON →	← OFF →	← ON	A	MS24658-21A	8503K1	MS24659-21A	8504K1	MS24660-21A	8505K1
ON	← OFF →	← ON	B	-21B	K27	-21B	K27	-21B	K27
ON →	OFF	← ON	D	-21D	K5	-21D	K5	-21D	K5
ON	← OFF →	ON	E	-21E	K2	-21E	K2	-21E	K2
ON →	OFF	ON	F	-21F	K28	-21F	K28	-21F	K28
ON	OFF	← ON	G	MS24658-21G	8503K3	MS24659-21G	8504K3	MS24660-21G	8505K3
ON →	OFF →	ON	H	-21H	K29	-21H	K29	-21H	K29
ON	← OFF	← ON	J	-21J	K30	-21J	K30	-21J	K30
ON →	← OFF →	ON	K	-21K	K31	-21K	K31	-21K	K31
ON	OFF→	ON	L	-21L	K32	-21L	K32	-21L	K32
ON →	← OFF	ON	M	MS24658-21M	8503K33	MS24659-21M	8504K33	MS24660-21M	8505K33
ON	← OFF	ON	N	-21N	K4	-21N	K4	-21N	K4
ON	OFF →	← ON	P	-21P	K34	-21P	K34	-21P	K34
ON →	NONE	← OFF	D	-22D	K10	-22D	K10	-22D	K10
ON →	NONE	OFF	F	-22F	K35	-22F	K35	-22F	K35
ON	NONE	← OFF	G	MS24658-22G	8503K9	MS24659-22G	8504K9	MS24660-22G	8505K9
ON →	NONE	← ON	D	-23D	K6	-23D	K6	-23D	K6
ON →	NONE	ON	F	-23F	K36	-23F	K36	-23F	K36
ON	NONE	← ON	G	-23G	K7	-23G	K7	-23G	K7
ON	← OFF	NONE	E	-24E	K16	-24E	K16	-24E	K16
ON →	OFF	NONE	F	MS24658-24F	8503K37	MS24659-24F	8504K37	MS24660-24F	8505K37
ON →	← OFF	NONE	K	-24K	K38	-24K	K38	-24K	K38
ON →	← OFF	NONE	M	-24M	K11	-24M	K11	-24M	K11
ON →	NONE	ON*	F	-26F	K20	-26F	K20	-26F	K20
* ON	← OFF →	ON*	E	MS24658-27E	8503K12	MS24659-27E	8504K12	MS24660-27E	8505K12
* ON	OFF →	ON*	L	-27L	K39	-27L	K39	-27L	K39
* ON	← OFF	ON*	N	-27N	K14	-27N	K14	-27N	K14
NONE	OFF →	ON*	E	-28E	K15	-28E	K15	-28E	K15
ON →	NONE	OFF*	F	-29F	K21	-29F	K21	-29F	K21
OFF→	NONE	ON*	F	MS24658-30F	8503K19	MS24659-30F	8504K19	MS24660-30F	8505K19
ON	← OFF →	ON*	E	-31E	K18	-31E	K18	-31E	K18
ON →	OFF	ON*	F	-31F	K40	-31F	K40	-31F	K40
ON →	← OFF →	ON*	K	-31K	K41	-31K	K41	-31K	K41
ON	OFF →	ON*	L	-31L	K13	-31L	K13	-31L	K13

* **Momentary contact.**
→ Indicates direction against which lever is locked.
See page A71 for circuit diagrams.
① Reference bushing styles on page A26.

LEVER LOCK SELECTION TABLE, CONT'D


8503

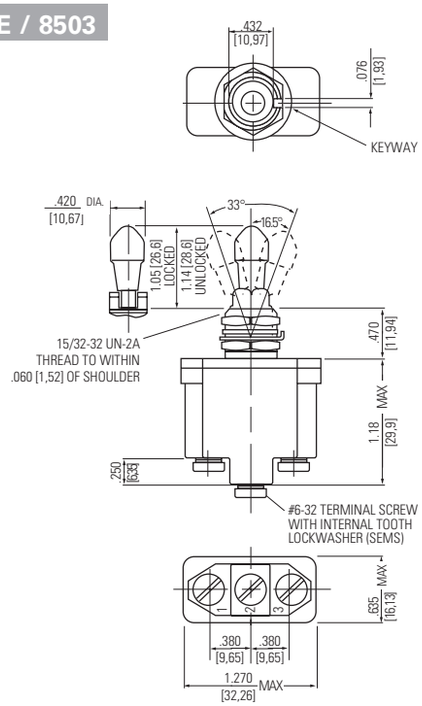

8504


8505

CIRCUIT WITH LEVER IN . . .				ONE POLE		TWO POLE		FOUR POLE	
Up Position	Center Position	Down Position (Keyway)	Lever ① Lock Bushing Style	Flush Screw Terminals MS Part Number	Flush Screw Terminals Catalog Number	Flush Screw Terminals MS Part Number	Flush Screw Terminals Catalog Number	Flush Screw Terminals MS Part Number	Flush Screw Terminals Catalog Number
ON→	←OFF	ON *	M	MS24658-31M	8503K17	MS24659-31M	8504K17	MS24660-31M	8505K17
ON	←OFF	ON *	N	-31N	K8	-31N	K8	-31N	K8
* ON	←ON	NONE	E	-32E	K23	-32E	K23	-32E	K23
ON	←ON	NONE	E	-33E	K24	-33E	K24	-33E	K24
ON→	ON	NONE	F	-33F	K25	-33F	K25	-33F	K25
ON→	←ON	NONE	K	MS24658-33K	8503K26	MS24659-33K	8504K26	MS24660-33K	8505K26
ON→	←ON	NONE	M	-33M	K42	-33M	K42	-33M	K42
ON→	←ON →	← ON	A	—	—	MS27408-1A	K43	MS27409-1A	K43
ON	←ON →	← ON	B	—	—	-1B	K44	-1B	K44
ON→	ON	← ON	D	—	—	-1D	K45	-1D	K45
ON	←ON →	ON	E			MS27408-1E	8504K46	MS27409-1E	8505K46
ON→	ON	ON	F			-1F	K47	-1F	K47
ON	ON	← ON	G	—	—	-1G	K48	-1G	K48
ON→	ON→	ON	H			-1H	K49	-1H	K49
ON	←ON	← ON	J			-1J	K50	-1J	K50
ON→	←ON →	ON	K			MS27408-1K	8504K51	MS27409-1K	8505K51
ON	ON→	ON	L			-1L	K52	-1L	K52
ON→	←ON	ON	M	—	—	-1M	K53	-1M	K53
ON	←ON	ON	N			-1N	K54	-1N	K54
ON	ON→	← ON	P			-1P	K55	-1P	K55
ON	←ON →	ON*	E			MS27408-2E	8504K56	MS27409-2E	8505K56
ON→	ON	ON*	F			-2F	K57	-2F	K57
ON→	←ON →	ON*	K	—	—	-2K	K58	-2K	K58
ON	ON→	ON*	L			-2L	K59	-2L	K59
ON→	←ON	ON*	M			-2M	K60	-2M	K60
ON	←ON	ON*	N			MS27408-2N	8504K61	MS27409-2N	8505K61
* ON	←ON →	ON*	E			-3E	K62	-3E	K62
* ON	ON→	ON*	L	—	—	-3L	K63	-3L	K63
* ON	←ON	ON*	N			-3N	K64	-3N	K64
ON→	←ON →	← ON	A			-4A	K65	—	—
ON	←ON →	← ON	B			MS27408-4B	8504K66		
ON→	ON	← ON	D			-4D	K67		
ON	←ON →	ON	E	—	—	-4E	K68	—	—
ON→	ON	ON	F			-4F	K69		
ON	ON	← ON	G			-4G	K70		
ON→	ON →	ON	H			MS27408-4H	8504K71		
ON	←ON	← ON	J			-4J	K72		
ON→	←ON →	ON	K	—	—	-4K	K73	—	—
ON	ON→	ON	L			-4L	K74		
ON→	←ON	ON	M			-4M	K75		
ON	←ON	ON	N			MS27408-4N	8504K76		
ON	ON→	← ON	P			-4P	K77		
ON	←ON →	ON*	E	—	—	-5E	K78	—	—
ON→	ON	ON*	F			-5F	K79		
ON→	←ON →	ON*	K			-5K	K80		
ON	ON→	ON*	L			MS27408-5L	8504K81		
ON→	←ON	ON*	M			-5M	K82		
ON	←ON	ON*	N	—	—	-5N	K83	—	—
* ON	←ON →	ON*	E			-6E	K84		
* ON	ON→	ON*	L			-6L	K85		
* ON	←ON	ON*	N	—	—	-6N	K86	—	—
ON	←ON-OFF→	← ON	B			-7B	K87		

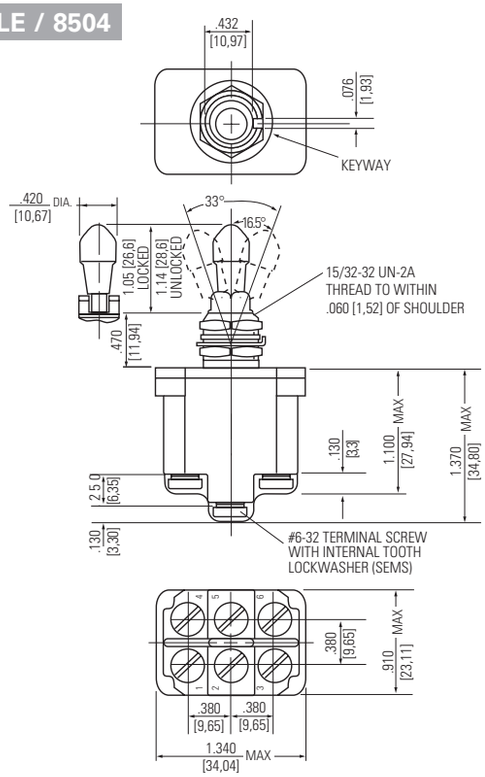
*** Momentary contact.**
→ Indicates direction against which lever is locked.
See page A71 for circuit diagrams.
① Reference bushing styles on page A26.

MOUNTING DIMENSIONS - ONE POLE / 8503



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8504



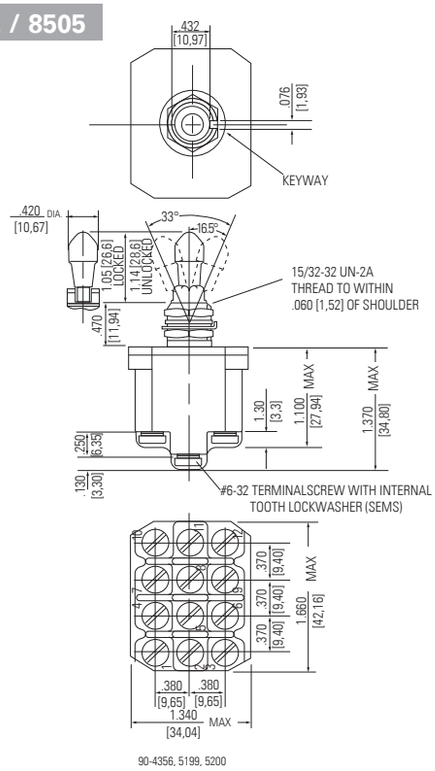
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE / 8505



90-4356, 5199, 5200

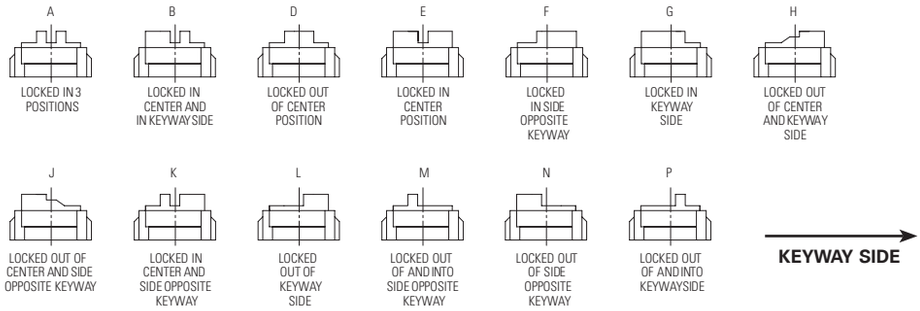
Terminal Identification

Non-functional terminals not supplied.

OPTIONS/ACCESSORIES

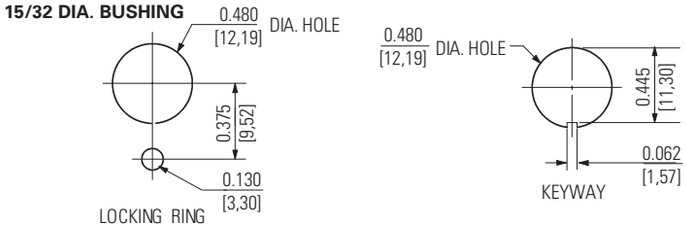
- Special mounting hardware
- Mounting hardware furnished assembled
- Terminal screws furnished assembled
- Substitute SEMS screws
- Special circuits
- Panel seal, part number 32-341 (See Accessories and Custom Components section)
- Special shaped caps available
- Custom wiring harnesses

LEVER LOCK - BUSHING STYLES



Figures A thru P do not represent details of construction. They schematically illustrate locking function.

PANEL CUTOUT DIMENSIONS



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Integrated Wire Termination System (IWTS) for ease of wiring
- Terminal numbers molded into silicone base seal

SPECIFICATIONS

- Environmentally sealed per MIL-DTL-3950
- MS approved and QPL'd per MIL-DTL-3950
- Thermoset molding materials meet flame retardant requirements
- Bushing: 15/32" - 32 thread
- Temperature Range: -85°F to +160°F (-65°C to +71°C)
- Accepts MIL-C-39029/1-101 pin
- Life: 20,000 operations at rated load
  40,000 operations mechanical life

CURRENT RATINGS

CURRENT RATINGS FOR -16

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8570	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	15	7
2	8571	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8572	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

CURRENT RATINGS

CURRENT RATINGS FOR -20

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8570	Maintained	5	7.5	7.5	3	7.5	7.5
		Momentary	4	7.5	7.5	2	7.5	7
2	8571	Maintained	7.5	7.5	7.5	4	7.5	7.5
		Momentary	5	7.5	7.5	2	7.5	7.5
4	8572	Maintained	5	7.5	7.5	4	7.5	7.5
		Momentary	4	7.5	7.5	2	7.5	7.5

STANDARD LEVER SELECTION TABLE

— Terminals Accept Wire Contact Within Dimensional Limits of M39029/1-102 for -16 wire size.
— Terminals Accept Wire Contact Within Dimensional Limits of M39029/1-101 for -20 wire size.

8570

8571

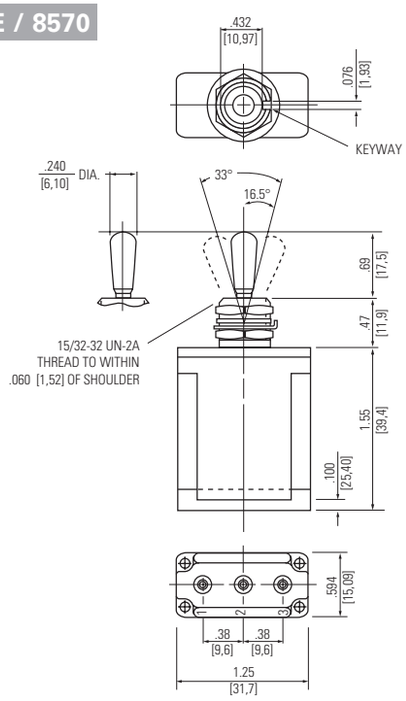
8572

CIRCUIT WITH LEVER IN . . .			ONE POLE		TWO POLE		FOUR POLE	
Up Position	Center Position	Down Position (Keyway)	MS Part Number	Catalog Number	MS Part Number	Catalog Number	MS Part Number	Catalog Number
ON	OFF	ON	MS27722-21	8570K1-16	MS27723-21	8571K1-16	MS27724-21	8572K1-16
ON	NONE	OFF	-22	K9-16	-22	K9-16	-22	K9-16
ON	NONE	ON	-23	K4-16	-23	K4-16	-23	K4-16
ON	OFF	NONE	-24	K6-16	-24	K6-16	-24	K6-16
ON	NONE	ON *	MS27722-26	8570K5-16	MS27723-26	8571K5-16	MS27724-26	8572K5-16
* ON	OFF	ON *	-27	K2-16	-27	K2-16	-27	K2-16
NONE	OFF	ON *	-28	K7-16	-28	K7-16	-28	K7-16
ON	NONE	OFF *	-29	K10-16	-29	K10-16	-29	K10-16
OFF	NONE	ON *	-30	K11-16	-30	K11-16	-30	K11-16
ON	OFF	ON *	MS27722-31	8570K3-16	MS27723-31	8571K3-16	MS27724-31	8572K3-16
* ON	ON	NONE	-32	K12-16	-32	K12-16	-32	K12-16
ON	ON	NONE	-33	K13-16	-33	K13-16	-33	K13-16
ON	ON	ON	—	—	MS27723-1	8571K17-16	MS27724-1	8572K15-16
ON	ON	ON *	—	—	-2	K18-16	-2	K16-16
* ON	ON	ON *	—	—	-3	K19-16	-3	K17-16
ON	OFF	ON	MS27784-21	8570K1-20	MS27785-21	8571K1-20	MS27786-21	8572K1-20
ON	NONE	OFF	-22	K9-20	-22	K9-20	-22	K9-20
ON	NONE	ON	-23	K4-20	-23	K4-20	-23	K4-20
ON	OFF	NONE	-24	K6-20	-24	K6-20	-24	K6-20
ON	NONE	ON *	MS27784-26	8570K5-20	MS27785-26	8571K5-20	MS27786-26	8572K5-20
* ON	OFF	ON *	-27	K2-20	-27	K2-20	-27	K2-20
NONE	OFF	ON *	-28	K7-20	-28	K7-20	-28	K7-20
ON	NONE	OFF *	-29	K10-20	-29	K10-20	-29	K10-20
OFF	NONE	ON *	-30	K11-20	-30	K11-20	-30	K11-20
ON	OFF	ON *	MS27784-31	8570K3-20	MS27785-31	8571K3-20	MS27786-31	8572K3-20
* ON	ON	NONE	-32	K12-20	-32	K12-20	-32	K12-20
ON	ON	NONE	-33	K13-20	-33	K13-20	-33	K13-20
ON	ON	ON	—	—	MS27785-1	8571K17-20	MS27786-1	8572K15-20
ON	ON	ON *	—	—	-2	K18-20	-2	K16-20
* ON	ON	ON *	—	—	-3	K19-20	-3	K17-20

*** Momentary contact.**

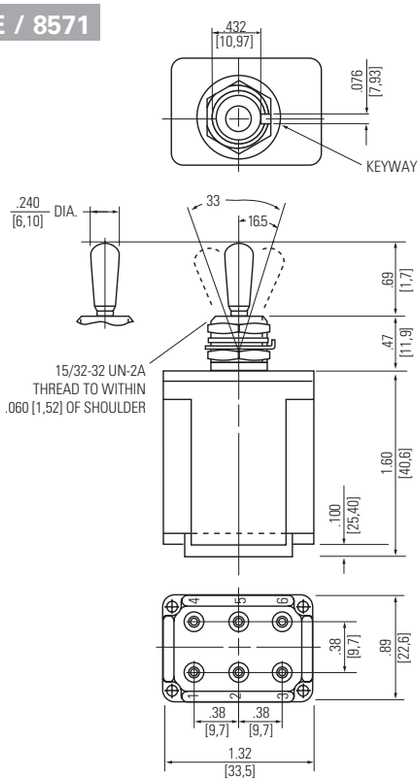
See page A71 for circuit diagrams

MOUNTING DIMENSIONS - ONE POLE / 8570



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8571



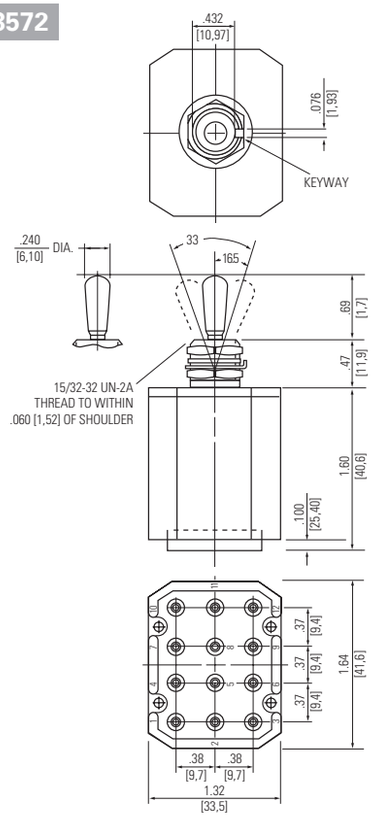
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE/ 8572



Terminal Identification

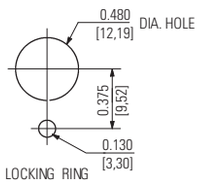
Non-functional terminals not supplied.

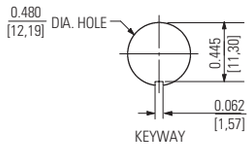
OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Special circuits
- Panel seal, part number 32-341 (See Accessories and Custom Components section)
- Special "3 Cateye" luminous lever attachment
- Lever extensions and attachable tips (See Accessories and Custom Components section)
- Custom wiring harnesses

PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING





STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

MILITARY - ENVIRONMENTALLY SEALED SWITCHES
Series - 8573, 8574, 8575

MIL-DTL-3950 IWTS Lever Locks

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Integrated Wire Termination System (IWTS) for ease of wiring
- Terminal numbers molded into silicone base seal

SPECIFICATIONS

- Environmentally sealed per MIL-DTL-3950
- MS approved and QPL'd per MIL-DTL-3950
- Thermoset molding materials meet flame retardant requirements
- Bushing: 15/32" - 32 thread
- Temperature Range: -85°F to +160°F (65°C to +71°C)
- Accepts MIL-C-39029/1-101 pin
- Life: 20,000 operations at rated load
  40,000 operations mechanical life

CURRENT RATINGS FOR -16

No. of Poles	Catalog Number	Type of Operation	28VDC			115 VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8573	Maintained	5	20	15	3	15	10
		Momentary	4	15	10	2	15	7
2	8574	Maintained	7	20	15	4	15	15
		Momentary	5	18	10	2	11	8
4	8575	Maintained	5	20	12	4	15	15
		Momentary	4	18	10	2	11	8

Minimum Rating: "Intermediate Current" per MIL-DTL-3950.

CURRENT RATINGS FOR -20

			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8573	Maintained	5	7.5	7.5	3	7.5	7.5
		Momentary	4	7.5	7.5	2	7.5	7
2	8574	Maintained	7	7.5	7.5	4	7.5	7.5
		Momentary	5	7.5	7.5	2	7.5	7.5
4	8575	Maintained	5	7.5	7.5	4	7.5	7.5
		Momentary	4	7.5	7.5	2	7.5	7.5

LEVER LOCK SELECTION TABLE — Terminals Accept Wire Contact Within Dimensional Limits of M39029/1-102 for -16 wire size.
— Terminals Accept Wire Contact Within Dimensional Limits of M39029/1-101 for -20 wire size.

8573

8574

8575

CIRCUIT WITH LEVER IN . . .				ONE POLE		TWO POLE		FOUR POLE	
Up Position	Center Position	Down Position (Keyway)	Lever ① Lock Bushing Style	MS Part Number	Catalog Number	MS Part Number	Catalog Number	MS Part Number	Catalog Number
ON→	OFF→	← ON	A	MS27781-21A	8573K1-16	MS27782-21A	8574K1-16	MS27783-21A	8575K1-16
ON	←OFF→	← ON	B	-21B	K27-16	-21B	K27-16	-21B	K27-16
ON→	OFF	← ON	D	-21D	K5-16	-21D	K5-16	-21D	K5-16
ON	←OFF→	ON	E	-21E	K2-16	-21E	K2-16	-21E	K2-16
ON→	OFF	ON	F	-21F	K28-16	-21F	K28-16	-21F	K28-16
ON	OFF	← ON	G	MS27781-21G	8573K3-16	MS27782-21G	8574K3-16	MS27783-21G	8575K3-16
ON→	OFF→	ON	H	-21H	K29-16	-21H	K29-16	-21H	K29-16
ON	←OFF	← ON	J	-21J	K30-16	-21J	K30-16	-21J	K30-16
ON→	←OFF→	ON	K	-21K	K31-16	-21K	K31-16	-21K	K31-16
ON	OFF→	ON	L	-21L	K32-16	-21L	K32-16	-21L	K32-16
ON→	←OFF	ON	M	MS27781-21M	8573K33-16	MS27782-21M	8574K33-16	MS27783-21M	8575K33-16
ON	←OFF	ON	N	-21N	K4-16	-21N	K4-16	-21N	K4-16
ON	OFF→	← ON	P	-21P	K34-16	-21P	K34-16	-21P	K34-16
ON→	NONE	← OFF	D	-22D	K10-16	-22D	K10-16	-22D	K10-16
ON→	NONE	OFF	F	-22F	K35-16	-22F	K35-16	-22F	K35-16
ON	NONE	← OFF	G	MS27781-22G	8573K9-16	MS27782-22G	8574K9-16	MS27783-22G	8575K9-16
ON→	NONE	← ON	D	-23D	K6-16	-23D	K6-16	-23D	K6-16
ON→	NONE	ON	F	-23F	K36-16	- 23F	K36-16	-23F	K36-16
ON	NONE	← ON	G	-23G	K7-16	-23G	K7-16	-23G	K7-16
ON	← OFF	NONE	E	-24E	K16-16	-24E	K16-16	-24E	K16-16
ON→	OFF	NONE	F	MS27781-24F	8573K37-16	MS27782-24F	8574K37-16	MS27783-24F	8575K37-16
ON→	← OFF	NONE	K	-24K	K38-16	-24K	K38-16	-24K	K38-16
ON→	← OFF	NONE	M	-24M	K11-16	-24M	K11-16	-24M	K11-16
ON→	NONE	ON*	F	-26F	K20-16	-26F	K20-16	-26F	K20-16
*ON	← OFF→	ON*	E	MS27781-27E	8573K12-16	MS27782-27E	8574K12-16	MS27783-27E	8575K12-16
*ON	OFF→	ON*	L	-27L	K39-16	-27L	K39-16	-27L	K39-16
*ON	← OFF	ON*	N	-27N	K14-16	-27N	K14-16	-27N	K14-16
NONE	OFF→	ON*	E	-28E	K15-16	-28E	K15-16	-28E	K15-16
ON→	NONE	OFF*	F	-29F	K21-16	-29F	K21-16	-29F	K21-16
OFF→	NONE	ON*	F	MS27781-30F	8573K19-16	MS27782-30F	8574K19-16	MS27783-30F	8575K19-16
ON	← OFF→	ON*	E	-31E	K18-16	-31E	K18-16	-31E	K18-16
ON→	OFF	ON*	F	-31F	K40-16	-31F	K40-16	-31F	K40-16
ON→	← OFF→	ON*	K	-31K	K41-16	-31K	K41-16	-31K	K41-16
ON	OFF→	ON*	L	-31L	K13-16	-31L	K13-16	-31L	K13-16

*** Momentary contact.**

→ Indicates direction against which lever is locked. See page A71 for circuit diagrams. ① Reference bushing styles on page A34.

LEVER LOCK SELECTION TABLE, CONT'D

8573

8574

8575

CIRCUIT WITH LEVER IN . . .				ONE POLE		TWO POLE		FOUR POLE	
Up Position	Center Position	Down Position (Keyway)	Lever ① Lock Bushing Style	MS Part Number	Catalog Number	MS Part Number	Catalog Number	MS Part Number	Catalog Number
ON→	← OFF	ON*	M	MS27781-31M	8573K17-16	MS27782-31M	8574K17-16	MS27783-31M	8575K17-16
ON	← OFF	ON*	N	-31N	K8-16	-31N	K8-16	-31N	K8-16
*ON	← ON	NONE	E	-32E	K23-16	-32E	K23-16	-32E	K23-16
ON	← ON	NONE	E	-33E	K24-16	-33E	K24-16	-33E	K24-16
ON→	ON	NONE	F	-33F	K25-16	-33F	K25-16	-33F	K25-16
ON→	← ON	NONE	K	MS27781-33K	8573K26-16	MS27782-33K	8574K26-16	MS27783-33K	8575K26-16
ON→	← ON	NONE	M	-33M	K42-16	-33M	K42-16	-33M	K42-16
ON→	← ON→	ON	A	—	—	-1A	K65-16	-1A	K43-16
ON	← ON→	←ON	B	—	—	-1B	K66-16	-1B	K44-16
ON→	ON	←ON	D	—		-1D	K67-16	-1D	K45-16
ON	← ON→	ON	E			MS27782-1E	8574K68-16	MS27783-1E	8575K46-16
ON→	ON	ON	F	—	—	-1F	K69-16	-1F	K47-16
ON	ON	←ON	G			-1G	K70-16	-1G	K48-16
ON→	ON→	ON	H			-1H	K71-16	-1H	K49-16
ON	← ON	←ON	J			-1J	K72-16	-1J	K50-16
ON→	← ON→	ON	K			MS27782-1K	8574K73-16	MS27783-1K	8575K51-16
ON	ON→	ON	L	—	—	-1L	K74-16	-1L	K52-16
ON→	← ON	ON	M			-1M	K75-16	-1M	K53-16
ON	← ON	ON	N			-1N	K76-16	-1N	K54-16
ON	ON→	←ON	P			-1P	K77-16	-1P	K55-16
ON	← ON→	ON*	E			MS27782-2E	8574K78-16	MS27783-2E	8575K56-16
ON→	ON	ON*	F	—	—	-2F	K79-16	-2F	K57-16
ON→	← ON→	ON*	K			-2K	K80-16	-2K	K58-16
ON	ON→	ON*	L			-2L	K81-16	-2L	K59-16
ON→	← ON	ON*	M			-2M	K82-16	-2M	K60-16
ON	← ON	ON*	N	—	—	MS27782-2N	8574K83-16	MS27783-2N	8575K61-16
*ON	← ON→	ON*	E			-3E	K84-16	-3E	K62-16
*ON	← ON→	ON*	L			-3L	K85-16	-3L	K63-16
*ON	← ON	ON*	N			-3N	K86-16	-3N	K64-16

*** Momentary contact.**
→ Indicates direction against which lever is locked.
See page A71 for circuit diagrams.
① Reference bushing styles on page A34.

MIL-DTL-3950 IWTS Lever Locks

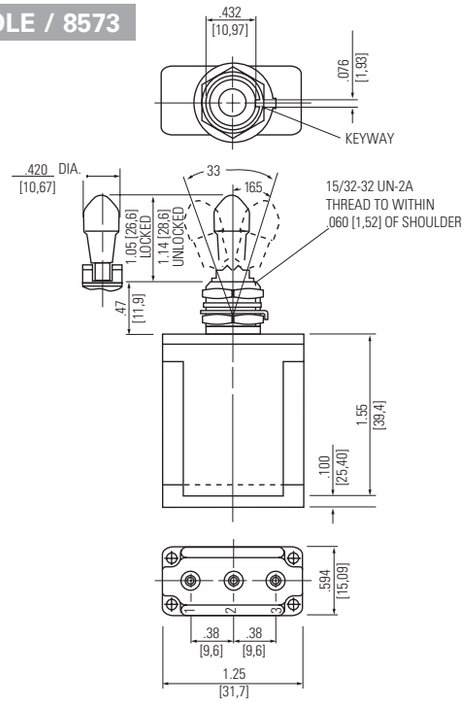
CIRCUIT WITH LEVER IN . . .				ONE POLE		TWO POLE		FOUR POLE	
Up Position	Center Position	Down Position (Keyway)	Lever ① Lock Bushing Style	MS Part Number	Catalog Number	MS Part Number	Catalog Number	MS Part Number	Catalog Number
ON →	← OFF →	← ON	A	MS27787-21A	8573K1-20	MS27788-21A	8574K1-20	MS27789-21A	8575K1-20
ON	← OFF →	← ON	B	-21B	K27-20	-21B	K27-20	-21B	K27-20
ON →	OFF	← ON	D	-21D	K5-20	-21D	K5-20	-21D	K5-20
ON	← OFF →	ON	E	-21E	K2-20	-21E	K2-20	-21E	K2-20
ON →	OFF	ON	F	-21F	K28-20	-21F	K28-20	-21F	K28-20
ON	OFF	← ON	G	MS27787-21G	8573K3-20	MS27788-21G	8574K3-20	MS27789-21G	8575K3-20
ON →	OFF →	ON	H	-21H	K29-20	-21H	K29-20	-21H	K29-20
ON	← OFF	← ON	J	-21J	K30-20	-21J	K30-20	-21J	K30-20
ON →	← OFF →	ON	K	-21K	K31-20	-21K	K31-20	-21K	K31-20
ON	OFF →	ON	L	-21L	K32-20	-21L	K32-20	-21L	K32-20
ON →	← OFF	ON	M	MS27787-21M	8573K33-20	MS27788-21M	8574K33-20	MS27789-21M	8575K33-20
ON	← OFF	ON	N	-21N	K4-20	-21N	K4-20	-21N	K4-20
ON	OFF →	← ON	P	-21P	K34-20	-21P	K34-20	-21P	K34-20
ON →	NONE	← OFF	D	-22D	K10-20	-22D	K10-20	-22D	K10-20
ON →	NONE	OFF	F	-22F	K35-20	-22F	K35-20	-22F	K35-20
ON	NONE	← OFF	G	MS27787-22G	8573K9-20	MS27788-22G	8574K9-20	MS27789-22G	8575K9-20
ON →	NONE	← ON	D	-23D	K6-20	-23D	K6-20	-23D	K6-20
ON →	NONE	ON	F	-23F	K36-20	-23F	K36-20	-23F	K36-20
ON	NONE	← ON	G	-23G	K7-20	-23G	K7-20	-23G	K7-20
ON	← OFF	NONE	E	-24E	K16-20	-24E	K16-20	-24E	K16-20
ON →	OFF	NONE	F	MS27787-24F	8573K37-20	MS27788-24F	8574K37-20	MS27789-24F	8575K37-20
ON →	← OFF	NONE	K	-24K	K38-20	-24K	K38-20	-24K	K38-20
ON →	← OFF	NONE	M	-24M	K11-20	-24M	K11-20	-24M	K11-20
ON →	NONE	ON *	F	-26F	K20-20	-26F	K20-20	-26F	K20-20
*ON	← OFF →	ON *	E	MS27787-27E	8573K12-20	MS27788-27E	8574K12-20	MS27789-27E	8575K12-20
*ON	OFF →	ON *	L	-27L	K39-20	-27L	K39-20	-27L	K39-20
*ON	← OFF	ON *	N	-27N	K14-20	-27N	K14-20	-27N	K14-20
NONE	OFF →	ON *	E	-28E	K15-20	-28E	K15-20	-28E	K15-20
ON →	NONE	OFF*	F	-29F	K21-20	-29F	K21-20	-29F	K21-20
OFF→	NONE	ON *	F	MS27787-30F	8573K19-20	MS27788-30F	8574K19-20	MS27789-30F	8575K19-20
ON	← OFF →	ON *	E	-31E	K18-20	-31E	K18-20	-31E	K18-20
ON →	OFF	ON *	F	-31F	K40-20	-31F	K40-20	-31F	K40-20
ON →	← OFF →	ON *	K	-31K	K41-20	-31K	K41-20	-31K	K41-20
ON	OFF →	ON *	L	-31L	K13-20	-31L	K13-20	-31L	K13-20
ON →	← OFF	ON *	M	MS27787-31M	8573K17-20	MS27788-31M	8574K17-20	MS27789-31M	8575K17-20
ON	← OFF	ON *	N	-31N	K8-20	-31N	K8-20	-31N	K8-20
*ON	← ON	NONE	E	-32E	K23-20	-32E	K23-20	-32E	K23-20
ON	← ON	NONE	E	-33E	K24-20	-33E	K24-20	-33E	K24-20
ON →	ON	NONE	F	-33F	K25-20	-33F	K25-20	-33F	K25-20
ON →	← ON	NONE	K	MS27787-33K	8573K26-20	MS27788-33K	8574K26-20	MS27789-33K	8575K26-20
ON →	← ON	NONE	M	-33M	K42-20	-33M	K42-20	-33M	K42-20
ON →	← ON →	← ON	A		—	-1A	K65-20	-1A	K43-20
ON	← ON →	← ON	B			-1B	K66-20	-1B	K44-20
ON →	ON	← ON	D	—	—	MS27788-1D	K67-20	-1D	K45-20
ON	← ON →	ON	E	—	—	-1E	8574K68-20	MS27789-1E	8575K46-20
ON →	ON	ON	F	—		-1F	K69-20	-1F	K47-20
ON	ON	← ON	G			-1G	K70-20	-1G	K48-20
ON →	ON →	ON	H		—	-1H	K71-20	-1H	K49-20
ON	← ON	← ON	J	—		-1J	K72-20	-1J	K50-20
ON →	← ON →	ON	K			MS27788-1K	8574K73-20	MS27789-1K	8575K51-20
ON	ON →	ON	L			-1L	K74-20	-1L	K52-20
ON →	← ON	ON	M			-1M	K75-20	-1M	K53-20
ON	← ON	ON	N		—	-1N	K76-20	-1N	K54-20
ON	ON →	← ON	P	—		-1P	K77-20	-1P	K55-20
ON	← ON →	ON *	E			MS27788-2E	8574K78-20	MS27789-2E	8575K56-20
ON→	ON	ON *	F			-2F	K79-20	-2F	K57-20
ON→	← ON →	ON *	K			-2K	K80-20	-2K	K58-20
ON	ON →	ON *	L		—	-2L	K81-20	-2L	K59-20
ON→	← ON	ON *	M	—		-2M	K82-20	-2M	K60-20
ON	← ON	ON *	N			MS27788-2N	8574K83-20	MS27789-2N	8575K61-20
*ON	← ON →	ON *	E			-3E	K84-20	-3E	K62-20
*ON	ON →	ON *	L		—	-3L	K85-20	-3L	K63-20
*ON	← ON	ON *	N	—		-3N	K86-20	-3N	K64-20

*** Momentary contact.**

→ Indicates direction against which lever is locked.
See page A71 for circuit diagrams.

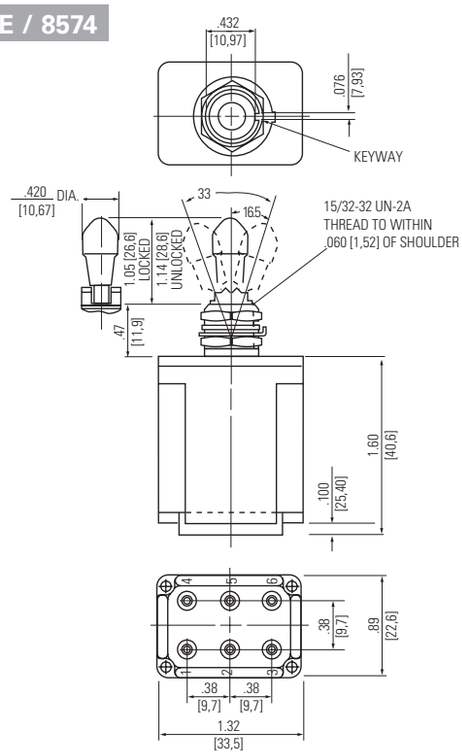
① Reference bushing styles on page A34.

MOUNTING DIMENSIONS - ONE POLE / 8573



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8574



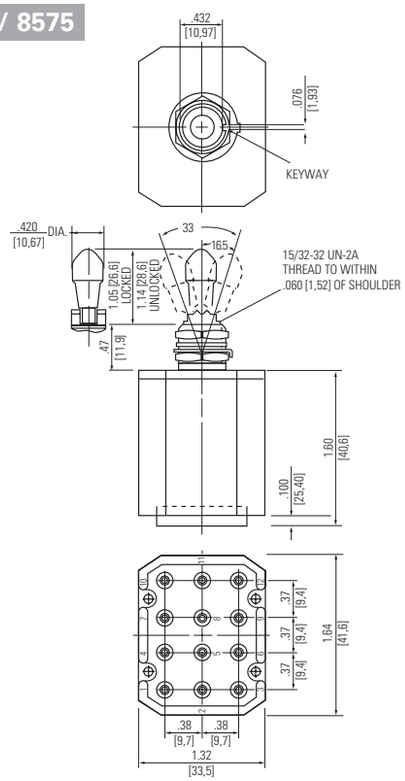
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MOUNTING DIMENSIONS - FOUR POLE / 8575



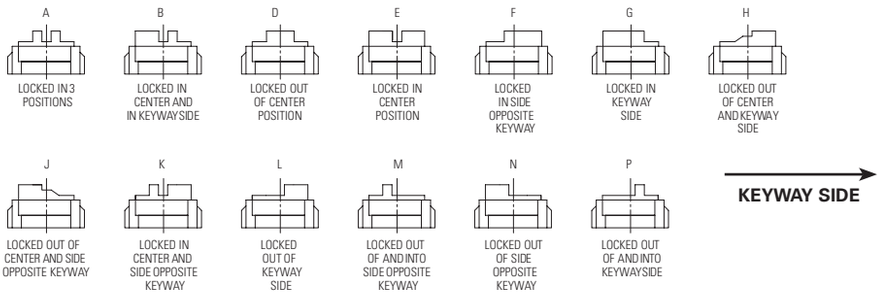
Terminal Identification

Non-functional terminals not supplied.

OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Special circuits
- Panel seal, part number 32-341 (See Accessories and Custom Components section)
- Special shaped caps available
- Custom wiring harnesses

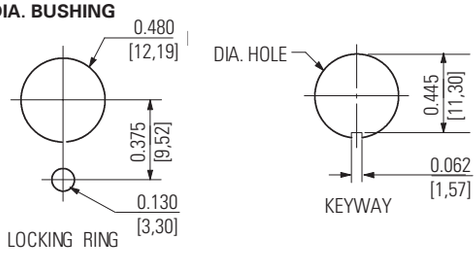
LEVER LOCK - BUSHING STYLES



Figures A thru P do not represent details of construction. They schematically illustrate locking function.

PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

FEATURES

- Two and three position
- Isolated circuitry multi-circuit, compact 2, 4, 6 or 8 poles
- Maintained and momentary action
- Lever locking configurations
- Stainless steel construction
- Double turret terminals

SPECIFICATIONS

- Ambient operating temperature: -40°F to +165°F (-40°C to +74°C)
- Operating force 1 to 6 pounds (.22 to 1.35N)
- Electrical life: 25,000 operations minimum
- Mechanical life: 100,000 operations minimum

CURRENT RATINGS

No. of Poles	Part Number	Basic Switches	28VDC				115VAC			
			Inrush① Load	Resistive Load	Inductive Load	Lamp Load	Inrush Load	Resistive Load	Inductive Load	Lamp Load
2	A3-212 to A3-213	STD	25	7	4	2.5	20	7	7	2
4	A3-200 to A3-201	STD	25	7	4	2.5	20	7	7	2
6	A3-202 to A3-203	STD	25	7	4	2.5	20	7	7	2
8	A3-204 to A3-205	STD	25	7	4	2.5	20	7	7	2
2	A3-214 to A3-215	Sealed	24	5	3	2.4	15	5	5	1.5
4	A3-206 to A3-207	Sealed	24	5	3	2.4	15	5	5	1.5
6	A3-208 to A3-209	Sealed	24	5	3	2.4	15	5	5	1.5
8	A3-210 to A3-211	Sealed	24	5	3	2.4	15	5	5	1.5

① 0.05 sec. duration.

SELECTION TABLE

TOGGLE POSITION & ACTION — WITH STANDARD BASIC SWITCHES

A3-213 A3-200

	Position #1 (D-Flat)	Position #2 (Center)	Position #3 (Opposite)	2 Poles	4 Poles	6 Poles	8 Poles	Lever Lock Options
STANDARD (NON-LOCKING) TOGGLES								
2 Position	On	None	On*	A3-212-07	A3-200-07	A3-202-07	A3-204-07	
	*On	None	On	-06	-06	-06	-06	
	On	None	On	-05	-05	-05	-05	
3 Position	*On	Off	On*	A3-212-04	A3-200-04	A3-202-04	A3-204-04	
	On	Off	On*	-03	-03	-03	-03	
	*On	Off	On	-02	-02	-02	-02	
	On	Off	On	-01	-01	-01	-01	
LEVER-LOCK TOGGLES (Complete by adding code letter from below after "slash")								
2 Position	On	None	On*	A3-213-07/	A3-201-07/	A3-203-07/	A3-205-07/	G
	*On	None	On	-06/	-06/	-06/	-06/	F
	On	None	On	-05/	-05/	-05/	-05/	D, F, G
3 Position	*On	Off	On*	A3-213-04/	A3-201-04/	A3-203-04/	A3-205-04/	E, L, N
	On	Off	On*	-03/	-03/	-03/	-03/	B, E, G, J, L, N, P
	*On	Off	On	-02/	-02/	-02/	-02/	E, F, H, K, L, M, N
	On	Off	On	-01/	-01/	-01/	-01/	A, B, D, E, F, G, H, J, K, L, M, N, P

TOGGLE POSITION & ACTION — WITH SEALED BASIC SWITCHES

A3-209 A3-210

	Position #1(D-Flat)	Position #2 (Center)	Position #3 (Opposite)	2 Poles	4 Poles	6 Poles	8 Poles	Lever Lock Options
Standard (Non-Locking Toggles)								
2 Position	On	None	On*	A3-214-07	A3-206-07	A3-208-07	A3-210-07	
	*On	None	On	-06	-06	-06	-06	
	On	None	On	-05	-05	-05	-05	
3 Position	*On	Off	On*	A3-214-04	A3-206-04	A3-208-04	A3-210-04	
	On	Off	On*	-03	-03	-03	-03	
	*On	Off	On	-02	-02	-02	-02	
	On	Off	On	-01	-01	-01	-01	
LEVER-LOCK TOGGLES (Complete by adding code letter from below after "slash")								
2 Position	On	None	On*	A3-215-07/	A3-207-07/	A3-209-07/	A3-211-07/	G
	*On	None	On	-06/	-06/	-06/	-06/	F
	On	None	On	-05/	-05/	-05/	-05/	D, F, G
3 Position	*On	Off	On*	A3-215-04/	A3-207-04/	A3-209-04/	A3-211-04/	E, L, N
	On	Off	On*	-03/	-03/	-03/	-03/	B, E, G, J, L, N, P
	*On	Off	On	-02/	-02/	-02/	-02/	E, F, H, K, L, M, N
	On	Off	On	-01/	-01/	-01/	-01/	A, B, D, E, F, G, H, J, K, L, M, N, P

*** Momentary contact.**
See page A71 for circuit diagrams.

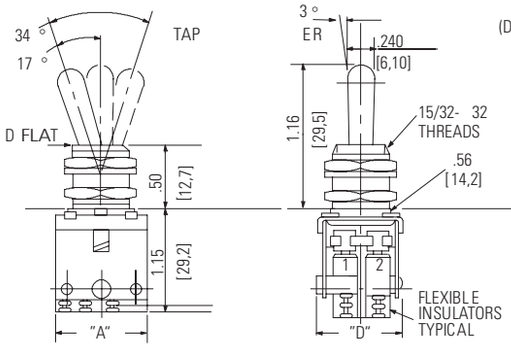
LEVER LOCKING CONFIGURATION SUFFIXES

A - Locked in three positions
B - Locked in center and extreme position ("D" flat side)
D - Locked out of center position
E - Locked in center position
F - Locked in extreme position (Opposite "D" flat)
G - Locked in extreme position ("D" flat side)
H - Locked out of center and extreme position ("D" flat side)
J - Locked out of center and extreme position Opposite "D" flat)
K - Locked in center and extreme position (Opposite "D" flat)
L - Locked out of extreme position ("D" flat side)
M - Locked out of and into extreme position (Opposite "D" flat)
N - Locked out of extreme position (Opposite "D" flat)
P - Locked out of and into extreme position ("D" flat side)

MULTI-CIRCUIT SWITCHES
Multi-Circuit Toggle Switches

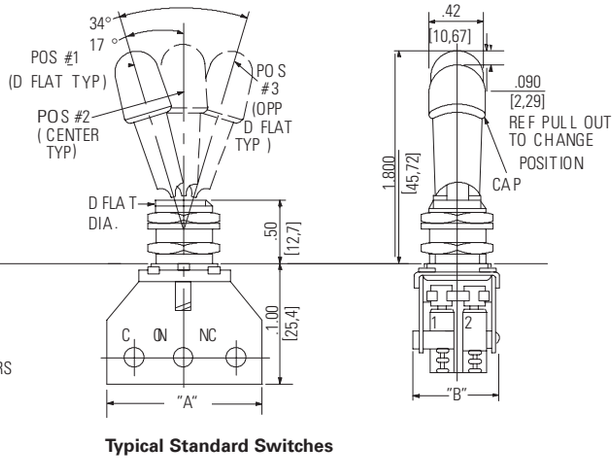
APPROXIMATE DIMENSIONS

Standard Lever Type

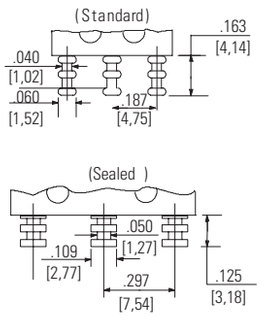


Typical Standard Switches

Lock Lever Type



Typical Standard Switches



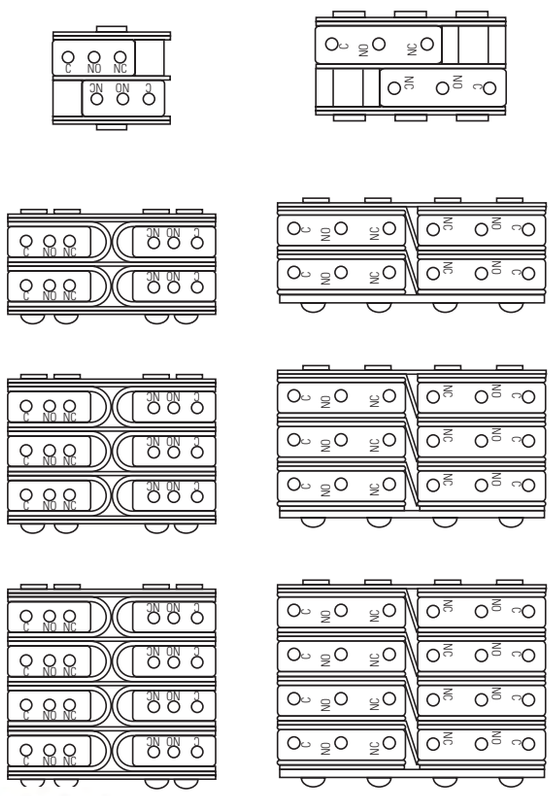
STANDARD				
Max. Dimension	**2 Pole**	**4 Pole**	**6 Pole**	**8 Pole**
"A"	0.72 in. (18.3 mm)	1.30 in. (33.0 mm)	1.30 in. (33.0 mm)	1.30 in. (33.0 mm)
"B"	0.67 in. (17.0 mm)	0.67 in. (17.0 mm)	0.93 in. (23.6 mm)	1.17 in. (29.7 mm)

SEALED				
Max. Dimension	**2 Pole**	**4 Pole**	**6 Pole**	**8 Pole**
"A"	1.22 in. (31.0 mm)	1.65 in. (41.9 mm)	1.65 in. (41.9 mm)	1.65 in. (41.9 mm)
"B"	0.67 in. (17.0 mm)	0.67 in. (17.0 mm)	0.93 in. (23.6 mm)	1.17 in. (29.7 mm)

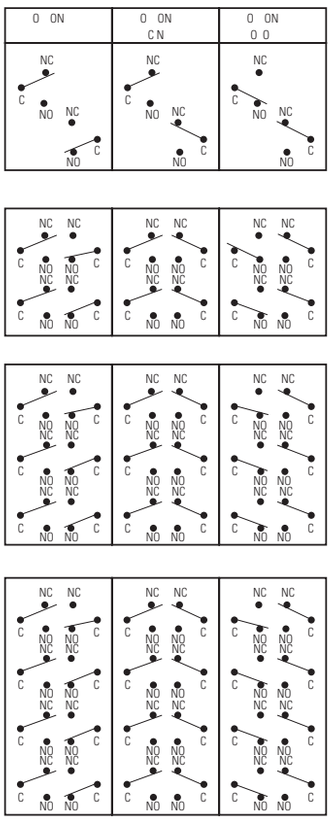
CROSS REFERENCE

MIL-PRF-8805	Safran Part Number
M8805/93-001	A3-212-1
M8805/93-002	A3-212-2
M8805/93-003	A3-212-3
M8805/93-004	A3-212-4
M8805/93-005	A3-212-5
M8805/93-006	A3-212-6
M8805/93-007	A3-212-7
M8805/93-008	A3-200-1
M8805/93-009	A3-200-2
M8805/93-010	A3-200-3
M8805/93-011	A3-200-4
M8805/93-012	A3-200-5
M8805/93-013	A3-200-6
M8805/93-014	A3-200-7
M8805/93-015	A3-202-1
M8805/93-016	A3-202-2
M8805/93-017	A3-202-3
M8805/93-018	A3-202-4
M8805/93-019	A3-202-5
M8805/93-020	A3-202-6
M8805/93-021	A3-202-7
M8805/93-022	A3-204-1
M8805/93-023	A3-204-2
M8805/93-024	A3-204-3
M8805/93-025	A3-204-4
M8805/93-026	A3-204-5
M8805/93-027	A3-204-6
M8805/93-028	A3-204-7

BACK CONFIGURATIONS



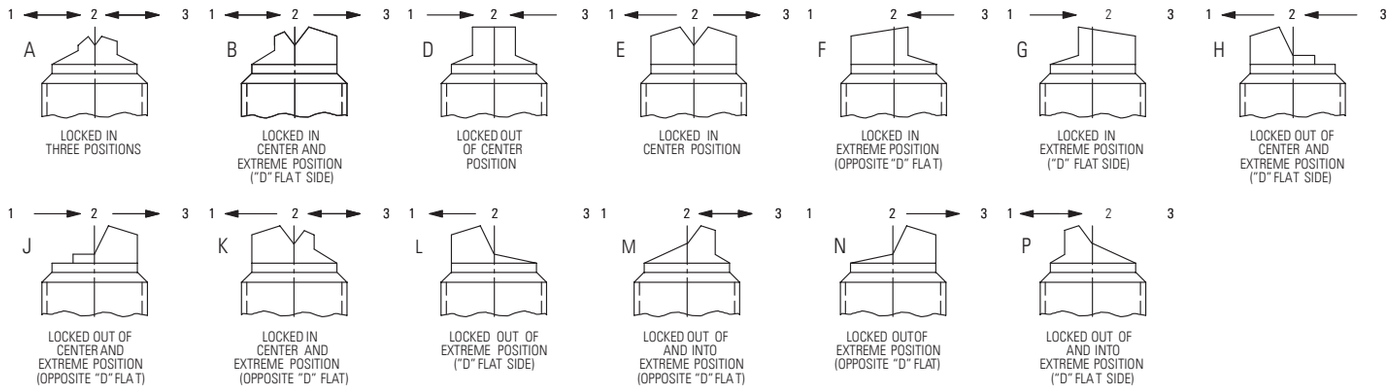
SCHEMATIC



ORDERING EXAMPLES

- Standard - A3-206-03 equals a 3-position (ON-OFF-MOM ON) 4-pole switch with sealed basics.
- Lever Lock - A3-213-04/E equals a 3-position (MOM ON-OFF-MOM ON) 2-pole switch with std. basics and E-lock.
- Available Locking Configurations (See table above. Add code letter after partial type number.)

LEVER LOCKING CONFIGURATION SUFFIXES - BUSHING STYLES



Notes: 1. Arrows (<>>) indicated lever must be unlocked to move against the arrow direction.

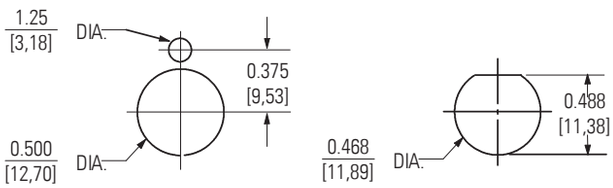
2. "D" flat is on the left side as viewed.

Figures A thru P do not represent details of construction. They schematically illustrate locking function.

OPTIONS/ACCESSORIES

- Low level circuitry
- Pin type termination
- Quick Connect terminals
- Lever seal
- Various color caps available

PANEL CUTOUT



Recommended Panel Mounting Dimensions

ENVIRONMENTALLY SEALED POSITIVE ACTION SWITCHES

Series-8836-8838 & 8843-8845 MIL-DTL-8834 Environmentally Sealed Positive Action Switches

FEATURES

- Environmentally sealed
- High electrical/ mechanical reliability
- Non-teasible mechanism
- Wiping action contacts
- Positive make and break action
- Molded-in terminal numbers
- One hole mounting for easy installation
- Terminal variations
- Toggle and lever lock Actuator
- Dry circuit (logic level loads) to power switching levels
- Solderable screw terminals
- 1, 2 and 4 pole circuitry

SPECIFICATIONS

- Environmentally sealed per MIL-DTL-8834
- MS approved and QPL'd per MIL-DTL-8834
- Two terminal variations
  - Screw 6-32 UNC-2B threads
  - Solder Lug .125 [3,17] dia. hole
- Temperature range: -67°F to +160°F (-55°C to +71°C)
- Life: 20,000 cycles at rated load 40,000 cycles mechanical life
- Positive action mechanism for high reliability and low contact bounce

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC (Amperes per pole)			115 VAC 400Hz			115VAC 60Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8836 & 8843	Maintained & Momentary	7	25	15	7	25	15	7	20	15
2	8837 & 8844	Maintained & Momentary	7	25	15	7	25	15	7	20	15
4	8838 & 8845	Maintained & Momentary	7	25	15	7	25	15	7	20	15

Minimum Rating: 10 milliamperes at 30 millivolts.

LEVER LOCK SELECTION TABLE


8836


8837


8838

CIRCUIT WITH LEVER IN . . .			CATALOG NUMBER			
Up Position	Center Position	Down Position (Keyway)	Screw Terminal		Solder Lug	
			MS Part Number	Catalog Number	MS Part Number	Catalog Number
ONE POLE						
ON	OFF	ON	MS25306-212	8836K1	MS14001-212	8836K91
ON	NONE	OFF	-222	K9	-222	K99
ON	NONE	ON	-232	K4	-232	K94
ON	OFF	NONE	-242	K6	-242	K96
ON	NONE	ON*	MS25306-262	8836K5	MS14001-262	8836K95
* ON	OFF	ON*	-272	K2	-272	K92
NONE	OFF	ON*	-282	K7	-282	K97
ON	NONE	OFF*	-292	K10	-292	K910
OFF	NONE	ON*	MS25306-302	8836K11	MS14001-302	8836K911
ON	OFF	ON*	-312	K13	-312	K93
TWO POLE						
ON	OFF	ON	MS25307-212	8837K1	MS14002-212	8837K91
ON	NONE	OFF	-222	K9	-222	K99
ON	NONE	ON	-232	K4	-232	K94
ON	OFF	NONE	-242	K6	-242	K96
ON	NONE	ON*	MS25307-262	8837K5	MS14002-262	8837K95
* ON	OFF	ON*	-272	K2	-272	K92
NONE	OFF	ON*	-282	K7	-282	K97
ON	NONE	OFF*	-292	K10	-292	K910
OFF	NONE	ON*	MS25307-302	8837K11	MS14002-302	8837K911
ON	OFF	ON*	-312	K3	-312	K93
FOUR POLE						
ON	OFF	ON	MS25308-212	8838K1	MS14003-212	8838K91
ON	NONE	OFF	-222	K9	-222	K99
ON	NONE	ON	-232	K4	-232	K94
ON	OFF	NONE	-242	K6	-242	K96
ON	NONE	ON*	MS25308-262	8838K5	MS14003-262	8838K95
* ON	OFF	ON*	-272	K2	-272	K92
NONE	OFF	ON*	-282	K7	-282	K97
ON	NONE	OFF*	-292	K10	-292	K910
OFF	NONE	ON*	MS25308-302	8838K11	MS14003-302	8838K911
ON	OFF	ON*	-312	K3	-312	K93

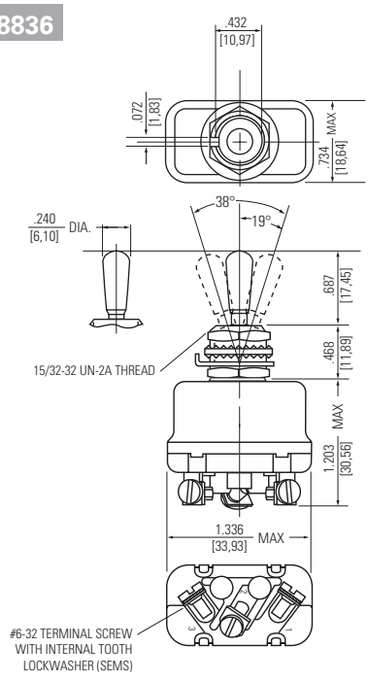
* **Momentary contact.**

See page A75 for special circuit diagrams.

Note: Screw terminal version shown.

MOUNTING DIMENSIONS - ONE POLE / 8836

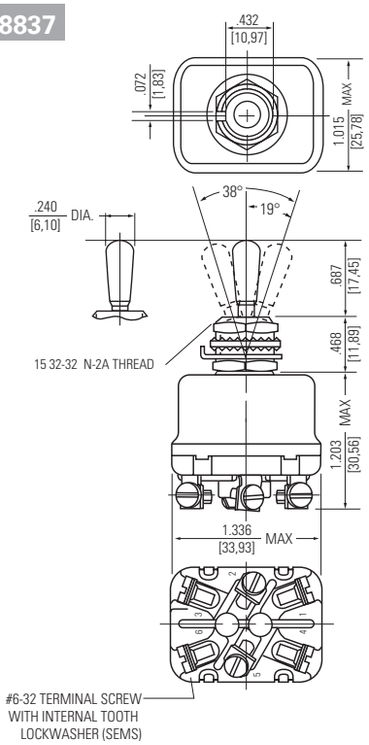
SCREW TERMINALS



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8837

SCREW TERMINALS



Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

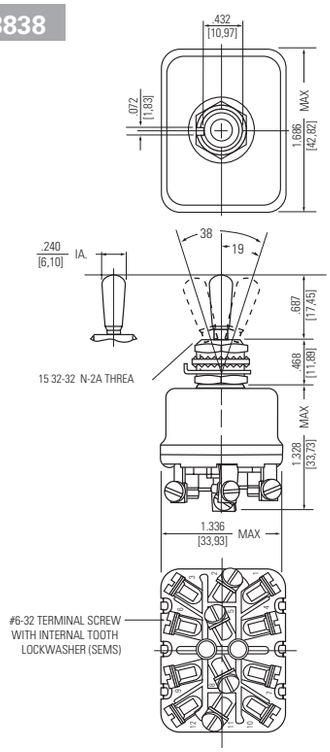
Non-functional terminals not supplied.

ENVIRONMENTALLY SEALED POSITIVE ACTION SWITCHES

Series-8836-8838 & 8843-8845 MIL-DTL-8834 Environmentally Sealed Positive Action Switches

MOUNTING DIMENSIONS - FOUR POLE / 8838

SCREW TERMINALS



Terminal Identification

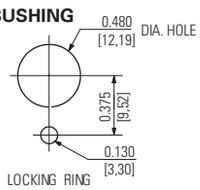
Non-functional terminals not supplied.

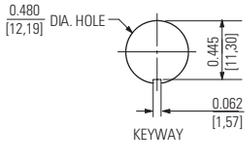
OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Panel seal, Part Number 32-341
- Terminal screws furnished assembled
- Terminal screws omitted
- Solder lug termination
- Substitute SEMS screws
- Special marking
- Special "3 Cateye" luminous lever attachment - 8836-8838 only
- Lever extensions and attachable tips (See Accessories and Custom Components section)
- Custom wiring harnesses

PANEL CUTOUT

15/32 DIA. BUSHING



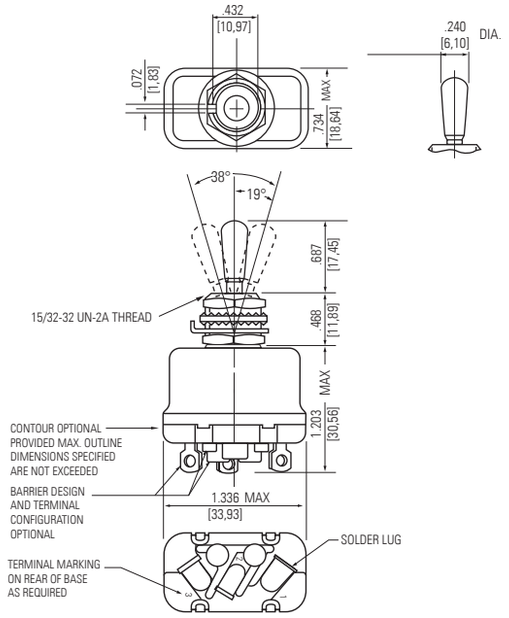


STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

MOUNTING DIMENSIONS - ONE POLE / 8836

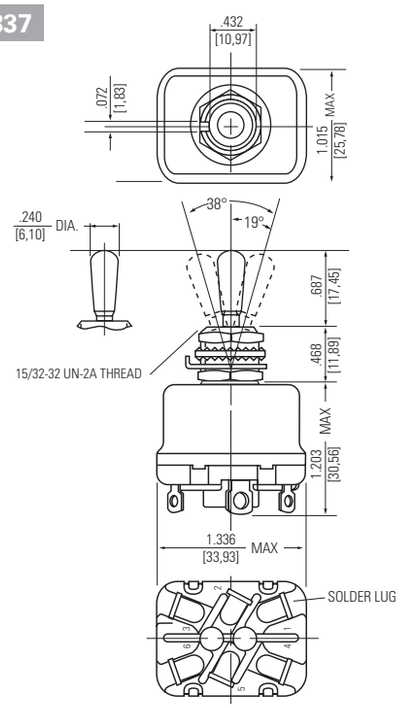
SOLDER LUG TERMINALS



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8837

SOLDER LUG TERMINALS



Terminal Identification

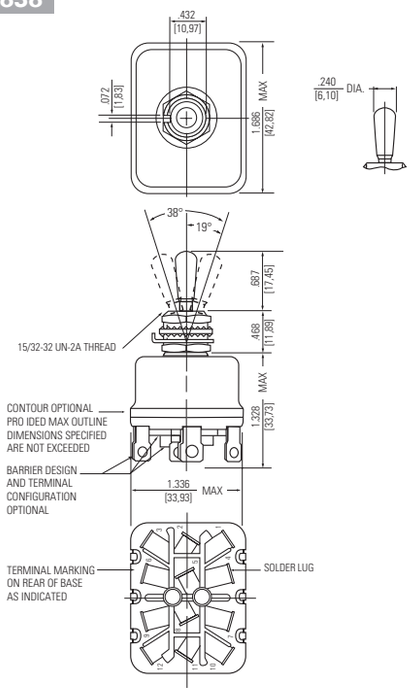
STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

ENVIRONMENTALLY SEALED POSITIVE ACTION SWITCHES
Series-8836-8838 & 8843-8845 MIL-DTL-8834 Environmentally Sealed Positive Action Switches

MOUNTING DIMENSIONS - FOUR POLE/ 8838
SOLDER LUG TERMINALS



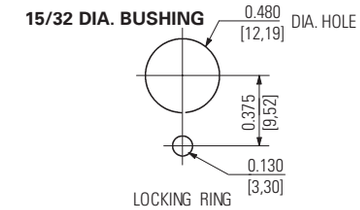
Terminal Identification

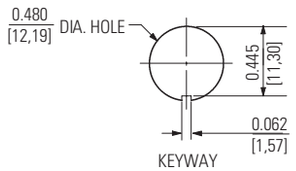
Non-functional terminals not supplied.

OPTIONS/ACCESSORIES

- Special mounting hardware
- Mounting hardware furnished assembled
- Panel seal, Part Number 32-341
- Terminal screws furnished assembled
- Terminal screws omitted
- Substitute sems screws
- Special marking
- Special "3 Cateye" luminous lever attachment - 8836-8838 only
- Lever extensions and attachable tips (See Accessories and Custom Components section)
- Custom wiring harnesses

PANEL CUTOUT DIMENSIONS





STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

ENVIRONMENTALLY SEALED POSITIVE ACTION SWITCHES
MIL-DTL-8834 Environmentally Sealed Positive Action Switches
Lever Lock

SELECTION TABLE

8843

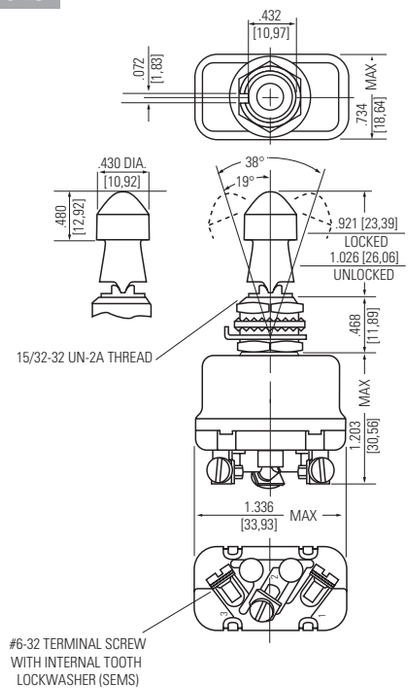
8844

8845

CIRCUIT WITH LEVER IN . . .					
Up Position	Center Position	Down Position (Keyway)	Lever ① Lock Bushing Style	MS Part Number	Catalog Number
ONE POLE					
ON →	← OFF →	← ON	A	MS24612-A212	8843K1
ON	← OFF →	ON	B	-B212	K2
ON	← OFF	NONE	B	-B242	K16
ON	OFF	← ON	C	-C212	K3
ON	NONE	← OFF	C	-C222	K9
ON	NONE	← ON	C	MS24612-C232	8843K7
ON	← OFF	ON	D	-D212	K4
ON →	OFF	← ON	E	-E212	K5
ON →	NONE	← OFF	E	-E222	K10
ON →	NONE	← ON	E	-E232	K6
* ON	← OFF →	ON*	F	MS24612-F272	8843K12
ON	OFF →	ON*	G	-G312	K13
* ON	← OFF	ON*	H	-H272	K14
ON →	← OFF	NONE	J	-J242	K11
NONE	OFF →	ON*	K	-K282	K15
ON	← OFF →	ON*	K	MS24612-K312	8843K18
ON →	NONE	ON*	L	-L262	K20
ON →	NONE	OFF*	L	-L292	K21
OFF →	NONE	ON*	L	-L302	K19
ON	← OFF	ON*	M	-M312	K8
ON →	← OFF	ON*	N	-N312	K17
TWO POLE					
ON →	← OFF →	← ON	A	MS24613-A212	8844K1
ON	← OFF →	ON	B	-B212	K2
ON	← OFF	NONE	B	-B242	K16
ON	OFF	← ON	C	-C212	K3
ON	NONE	← OFF	C	-C222	K9
ON	NONE	← ON	C	MS24613-C232	8844K7
ON	← OFF	ON	D	-D212	K4
ON →	OFF	← ON	E	-E212	K5
ON →	NONE	← OFF	E	-E222	K10
ON →	NONE	← ON	E	-E232	K6
* ON	← OFF →	ON*	F	MS24613-F272	8844K12
ON	OFF →	ON*	G	-G312	K13
* ON	← OFF	ON*	H	-H272	K14
ON →	← OFF	NONE	J	-J242	K11
NONE	OFF →	ON*	K	-K282	K15
ON	← OFF →	ON*	K	MS24613-K312	8844K18
ON →	NONE	ON*	L	-L262	K20
ON →	NONE	OFF*	L	-L292	K21
OFF →	NONE	ON*	L	-L302	K19
ON	← OFF	ON*	M	-M312	K8
ON →	← OFF	ON*	N	-N312	K17
FOUR POLE					
ON →	← OFF →	← ON	A	MS24614-A212	8845K1
ON	← OFF →	ON	B	-B212	K2
ON	← OFF	NONE	B	-B242	K16
ON	OFF	← ON	C	-C212	K3
ON	NONE	← OFF	C	-C222	K9
ON	NONE	← ON	C	MS24614-C232	8845K7
ON	← OFF	ON	D	-D212	K4
ON →	OFF	← ON	E	-E212	K5
ON →	NONE	← OFF	E	-E222	K10
ON →	NONE	← ON	E	-E232	K6
* ON	← OFF →	ON*	F	MS24614-F272	8845K12
ON	OFF →	ON*	G	-G312	K13
* ON	← OFF	ON*	H	-H272	K14
ON →	← OFF	NONE	J	-J242	K11
NONE	OFF →	ON*	K	-K282	K15
ON	← OFF →	ON*	K	MS24614-K312	8845K18
ON →	NONE	ON*	L	-L262	K20
ON →	NONE	OFF*	L	-L292	K21
OFF →	NONE	ON*	L	-L302	K19
ON	← OFF	ON*	M	-M312	K8
ON →	← OFF	ON*	N	-N312	K17

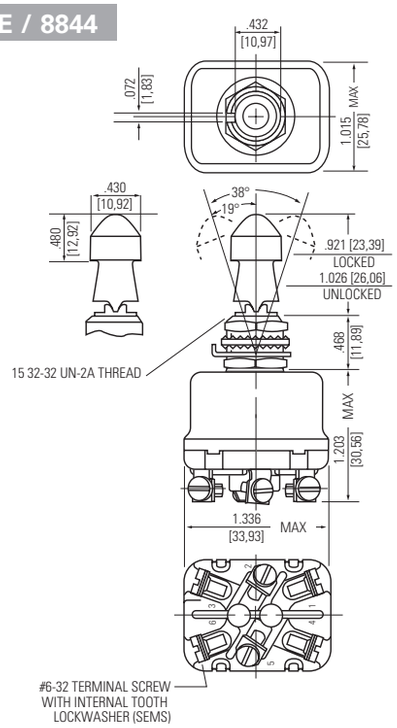
* **Momentary contact.**
→ Indicates direction against which lever is locked.
① Reference bushing styles on page A45.

MOUNTING DIMENSIONS - ONE POLE / 8843



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8844



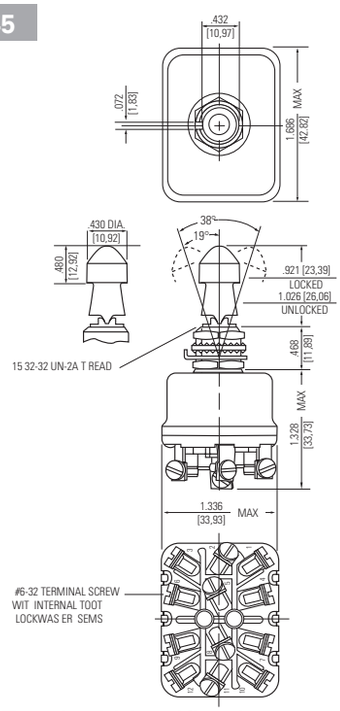
Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

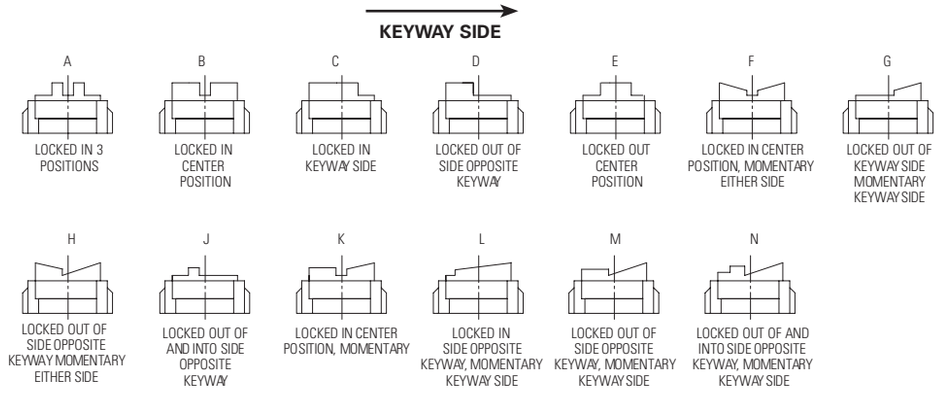
MOUNTING DIMENSIONS - FOUR POLE/ 8845



Terminal Identification

Non-functional terminals not supplied.

LEVER LOCK - BUSHING STYLES



Figures A thru N do not represent details of construction. They schematically illustrate locking function.

OPTIONS/ACCESSORIES

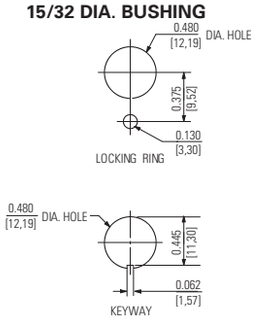
- Special mounting hardware
- Mounting hardware furnished assembled
- Panel seal, Part Number 32-341
- Terminal screws furnished assembled
- Terminal screws omitted
- Solder lug termination
- Substitute sems screws
- Special marking
- Special "3 Cateye" luminous lever attachment - 8836-8838 only
- Lever extensions and attachable tips (See Accessories and Custom Components section)
- Custom wiring harnesses

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING



ENVIRONMENTALLY SEALED POSITIVE ACTION SWITCHES

Series 8836KP-38KP Flush Mounted Environmentally Sealed Positive Action Switches

FEATURES

- Environmentally Sealed
- High electrical/mechanical reliability
- Non-teasible mechanism
- Wiping action contacts
- Positive make and break action
- Molded-in terminal numbers
- Three hole design for flush mounting
- Dry circuit (logic level loads) to Power Switching levels
- 1,2, and 4 pole circuitry

SPECIFICATIONS

- Environmentally sealed per MIL-DTL-8834
- Switch mechanism MS approved and QPL'd per MIL-DTL-8834
- Temperature Range: -67°F to 160°F (-55°C to +71°C)
- Life: 20,000 cycles at rated load, 40,000 cycles mechanical life
- Positive action mechanism for high reliability and low contact bounce

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC (Amperes per pole)			115VAC 400Hz(Amperes per pole)			115VAC 60Hz (Amperes per pole)		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8836KP	Maintained & Momentary	7	25	15	7	25	15	7	20	15
2	8837KP	Maintained & Momentary	7	25	15	7	25	15	7	20	15
4	8838KP	Maintained & Momentary	7	25	15	7	25	15	7	20	15

Minimum Rating: 10 microamperes at 30 millivolts.

LEVER LOCK SELECTION TABLE

8836KP

8837KP

8838KP

CIRCUIT WITH LEVER IN . . .				
Up Position	Center Position	Down Position (Keyway)	Screw Terminal Catalog Number	① Toggle Lever Style Figure Number
ONE POLE				
ON	OFF	ON	8836KP1	1
ON	NONE	OFF	8836KP9	1
ON	NONE	ON	8836KP4	1
ON	NONE	ON*	8836KP5	1
ON	OFF	ON*	8836KP3	1
ON*	OFF	ON*	8836KP2	1
ON	OFF	ON	8836KP1T	2
ON	NONE	OFF	8836KP9T	2
TWO POLE				
ON	OFF	ON	8837KP1	1
ON	NONE	OFF	8837KP9	1
ON	NONE	ON	8837KP4	1
ON	NONE	OFF*	8837KP10	1
ON*	OFF	ON*	8837KP2	1
ON	OFF	NONE	8837KP6	1
ON	OFF	ON*	8837KP3	1
ON	NONE	ON	8837KP4T	2
ON	OFF	ON	8837KP1T	2
FOUR POLE				
ON	OFF	ON	8838KP31	1
ON	NONE	ON	8838KP34	1
ON	OFF	NONE	8838KP36	1
ON	OFF	ON	8838KP1	1
ON	NONE	ON	8838KP4	1
ON	OFF	ON*	8838KP3	1
ON*	OFF	ON*	8838KP2	1
ON	OFF	NONE	8838KP6	1
ON	NONE	ON*	8838KP5	1

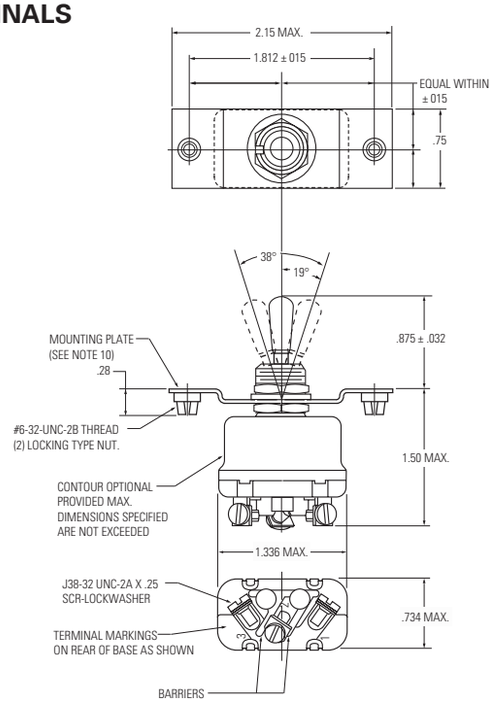
*** Momentary contact.**

Note: Additional circuit arrangements available.

① Refer to page A47.

MOUNTING DIMENSIONS - ONE POLE / 8836 KP

SCREW TERMINALS



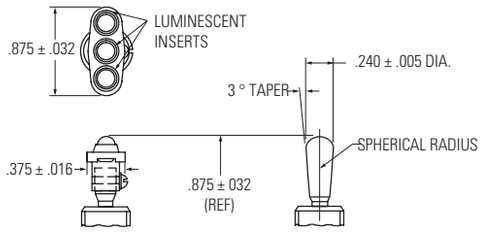
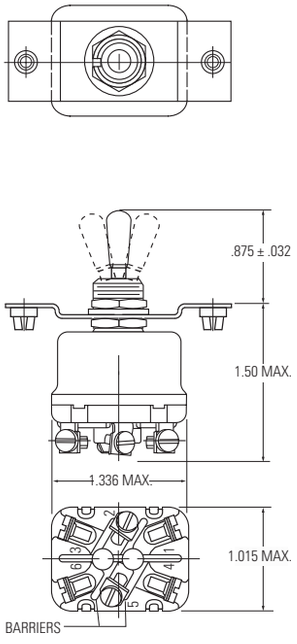


Figure 2 **Figure 1**

Terminal Identification

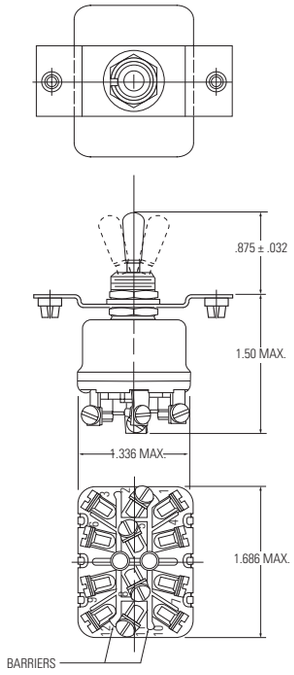
MOUNTING DIMENSIONS - TWO POLE / 8837 KP

SCREW TERMINALS



MOUNTING DIMENSIONS - FOUR POLE / 8838 KP

SCREW TERMINALS



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MINIATURE POSITIVE ACTION SWITCHES

Series - 8866-8869 MIL-DTL-8834 Miniature Positive Action Switches Solder Lug Terminals

FEATURES

- Sealed bushing
- Current rating versatility
- 1 and 2 pole circuitry
- Non-teasible mechanism for all but center "ON" circuits
- Dry circuit (logic level loads) to power switching levels
- Wiping action contacts
- Positive make and break action
- Small and large size bushings and Actuator
- Solder lug terminals
- Also available with locking Actuator, integrated wire termination and printed circuit board terminals.

SPECIFICATIONS

- Bushing seal or bonded seal per MIL-DTL-8834
- MS approved and QPL'd to MIL-DTL-8834
- Temperature range: -67°F to +160°F (-55°C to +71°C)
- Life: 20,000 operations at rated load 40,000 operations mechanical life
- "O" ring panel seal on ¼" - 40 type bushing size
- Solder lug terminals .050 [1,27] dia. hole

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC (Amperes per pole)		115VAC 60Hz and 400Hz (Amperes per pole)			
			Resistive Load	Inductive Load	Resistive Load		Inductive Load	
			28VDC	28VDC	60Hz	400Hz	60Hz	400Hz
1	8866 8868	Maintained and Momentary	5	1	2	3	1	2
2	8867 8869	Maintained and Momentary	5	1	2	3	1	2

Minimum Rating: 25 microamperes at 5 millivolts.

SELECTION TABLE

8866

8867

CIRCUIT WITH LEVER IN . . .				
Up Position	Center Position	Down Position (Keyway)	Military Part Number	Catalog Number ②
ONE POLE				
ON	OFF	ON	MS24655-211	8866K1
ON	NONE	OFF	-221	K7
ON	NONE	ON	-231	K4
ON	OFF	NONE	-241	K5
* ON	OFF	ON*	MS24655-271	8866K2
NONE	OFF	ON*	-281	K6
ON	OFF	ON*	-311	K3
NONE	ON	ON*	321	K8①
TWO POLE				
ON	OFF	ON	MS24656-211	8867K1
ON	NONE	OFF	-221	K7
ON	NONE	ON	-231	K4
ON	OFF	NONE	-241	K5
* ON	OFF	ON*	MS24656-271	8867K2
NONE	OFF	ON*	-281	K6
ON	OFF	ON*	-311	K3
NONE	ON	ON*	MS24656-321	8867K8 ①
ON	ON	ON	-331	K9 ①
ON	ON	ON*	-351	K10①
* ON	ON	ON*	-341	K11①

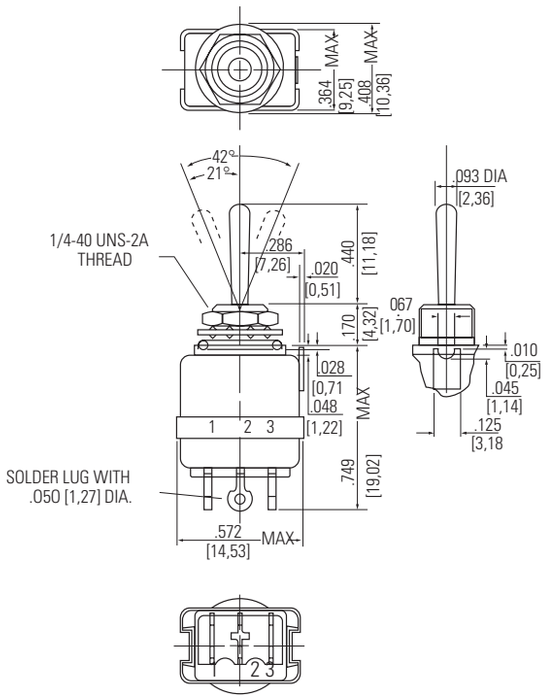
*** Momentary contact.**

See page A75 for special circuit diagrams.

① Dielectric per MIL-DTL-8834 except limited to 1250 volts. Delayed action of the switch toggle lever may cause circuit to close or open before snap action mechanism trips.

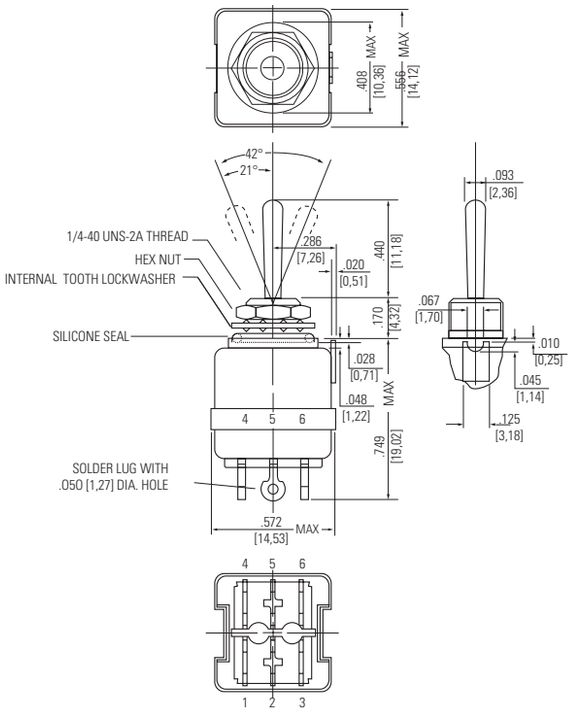
② Caution should be exercised during soldering and flux removal. See page A56 for details.

MOUNTING DIMENSIONS - ONE POLE / 8866



Terminal Identification

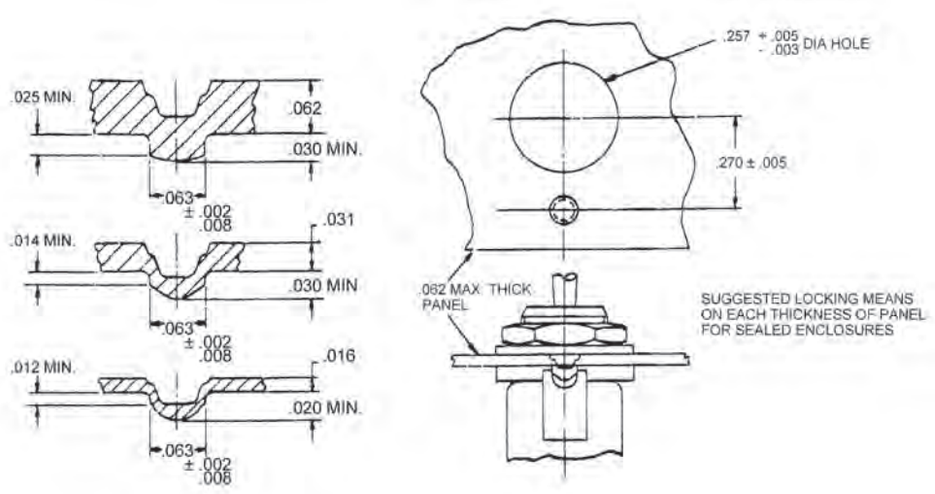
MOUNTING DIMENSIONS - TWO POLE / 8867



Terminal Identification

Non-functional terminals not supplied.

PANEL CUTOUT DIMENSIONS



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

MIL-DTL-8834 Miniature Positive Action Switches
Solder Lug Terminals

SELECTION TABLE

CIRCUIT WITH LEVER IN . . .							
Up Position	Center Position	Down Position (Keyway)	MS Part Number	Catalog Number ②	MS Part Number ③	Catalog Number ②
ONE POLE						
ON	OFF	ON	MS90310-211	8868K1	Feature Not Available	
ON	NONE	OFF	-221	K7	in Single Pole Switches	
ON	NONE	ON	-231	K4	—	—
ON	OFF	NONE	-241	K5	—	—
* ON	OFF	ON*	MS90310-271	8868K2	—	—
NONE	OFF	ON*	-281	K6	—	—
ON	OFF	ON*	-311	K3	—	—
NONE	ON	ON*	MS21351-321	K8①	—	—
TWO POLE						
ON	OFF	ON	MS90311-211	8869K1	MS90311-711	8869K1X
ON	NONE	OFF	-221	K7	-721	K7X
ON	NONE	ON	-231	K4	-731	K4X
ON	OFF	NONE	-241	K5	-741	K5X
* ON	OFF	ON*	MS90311-271	8869K2	MS90311-771	8869K2X
NONE	OFF	ON*	-281	K6	-781	K6X
ON	OFF	ON*	-311	K3	-811	K3X
NONE	ON	ON*	MS21353-321	8869K8 ①	MS21353-821	8869K8X①
ON	ON	ON	-331	K9 ①	-831	K9X①
ON	ON	ON*	-351	K10 ①	-851	K10X①
* ON	ON	ON*	-341	K11 ①	-841	K11X①

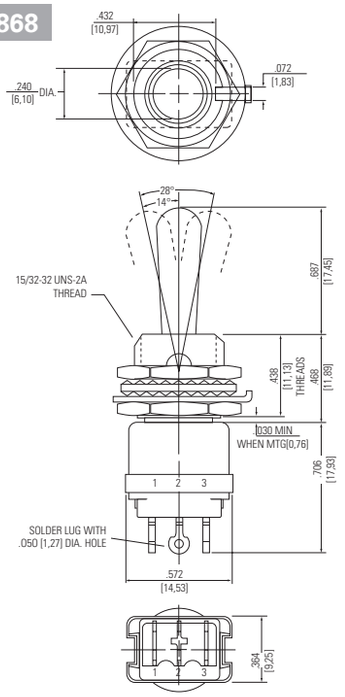
*** Momentary contact.**

① Dielectric per MIL-DTL-8834 except limited to 1250 volts. Delayed action of the switch toggle lever may cause circuit to close or open before snap action mechanism trips.

② Caution should be exercised during soldering and flux removal. See page A56 for details.

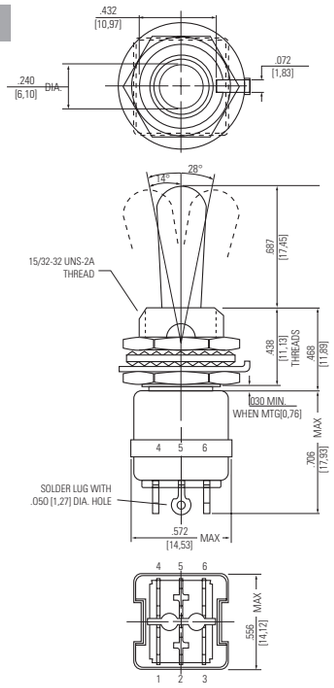
③ Furnished with Bonded Seal Feature. (Meets 15' water sealing level requirements.)

MOUNTING DIMENSIONS - ONE POLE / 8868



Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8869



Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

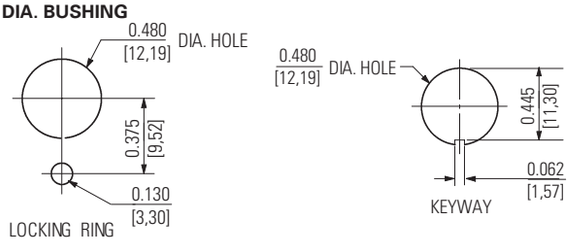
MIL-DTL-8834 Miniature Positive Action Switches
Solder Lug Terminals

OPTIONS/ACCESSORIES

- Special mounting hardware
- Special marking
- Mounting hardware furnished assembled
- Panel seal, Part Number 32-341
- Lever extensions and attachable tips
- Special circuits
- Special bushing and lever plating
- Mounting adapter nuts
- Custom wire harnesses
- EMI/RFI capability on two pole (large bushing)
- Gold plated contacts

PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

See page A56 for soldering and cleaning recommendations.

Series - 8866, 8867, 8868, 8869

MINIATURE POSITIVE ACTION SWITCHES
MIL-DTL-8834 Miniature Positive Action Switches
Printed Circuit Terminals

FEATURES

- Sealed bushing
- Dry circuit (logic level loads) to power switching levels
- Two bushing and toggle lever sizes
- 1 and 2 pole circuitry
- Non-teasible mechanism for all but center "ON" circuits
- Wiping action contacts
- Positive make and break action
- Small and large size bushings and Actuator
- Printed circuit board termination
- Two types of printed circuit board terminals:
  - Straight
  - Formed (Right Angle)

SPECIFICATIONS

- Bushing seal or bonded seal per MIL-DTL 8834
- MS approved and QPL'd to MIL-DTL-8834
- Temperature range: -67°F to +160°F (-55°C to +71°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life
- "O" ring panel seal on ¼" - 40 type bushing size

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC (Amperes per pole)		115VAC 60Hz and 400Hz (Amperes per pole)			
			Resistive Load	Inductive Load	Resistive Load		Inductive Load	
			28VDC	28VDC	60Hz	400Hz	60Hz	400Hz
1	8866 8868	Maintained and Momentary	5	1	2	3	1	2
2	8867 8869	Maintained and Momentary	5	1	2	3	1	2

Minimum Rating: 25 microamperes at 5 millivolts.

SELECTION TABLE

CIRCUIT WITH LEVER IN . . .			Small Lever With Straight Mount PC Terminals		Small Lever With Formed Mount PC Terminals		Large Lever With Straight Mount PC Terminals			
Up Position	Center Position	Down Position (Keyway)	MS Part Number	Catalog② Number	MS Part Number	Catalog② Number	MS Part Number	Catalog② Number	MS Part③ Number	Catalog② Number
One Pole										
ON	OFF	ON	MS21354-211	8866K61	MS21433-211	8866KA61	MS21356-211	8868K61	Feature Not Available in	
ON	NONE	OFF	-221	K67	-221	KA67	-221	K67	Single Pole Switches	
ON	NONE	ON	-231	K64	-231	KA64	-231	K64		
ON	OFF	NONE	-241	K65	-241	KA65	-241	K65		
* ON	OFF	ON*	MS21354-271	8866K62	MS21433-271	8866KA62	MS21356-271	8868K62		
NONE	OFF	ON*	-281	K66	-281	KA66	-281	K66		
ON	OFF	ON*	-311	K63	-311	KA63	-311	K63		
NONE	ON	ON*	-321	K68①	-321	KA68①	-321	K68①		
Two Pole										
ON	OFF	ON	MS21355-211	8867K61	MS21434-211	8867KA61	MS21357-211	8869K61	MS21357-711	8869K61X
ON	NONE	OFF	-221	K67	-221	KA67	-221	K67	-721	K67X
ON	NONE	ON	-231	K64	-231	KA64	-231	K64	-731	K64X
ON	OFF	NONE	-241	K65	-241	KA65	-241	K65	-741	K65X
* ON	OFF	ON*	MS21355-271	8867K62	MS21434-271	8867KA62	MS21357-271	8869K62	MS21357-771	8869K62X
NONE	OFF	ON*	-281	K66	-281	KA66	-281	K66	-781	K66X
ON	OFF	ON*	-311	K63	-311	KA63	-311	K63	-811	K63X
NONE	ON	ON*	MS21355-321	8867K68 ①	MS21434-321	8867KA68①	MS21357-321	8869K68 ①	MS21357-821	8869K68X ①
ON	ON	ON	-331	K69 ①	-331	KA69①	-331	K69 ①	-831	K69X ①
ON	ON	ON*	-351	K610①	-351	KA610①	-351	K610①	-851	K610X①
* ON	ON	ON*	-341	K611①	-341	KA611①	-341	K611 ①	-841	K611X①

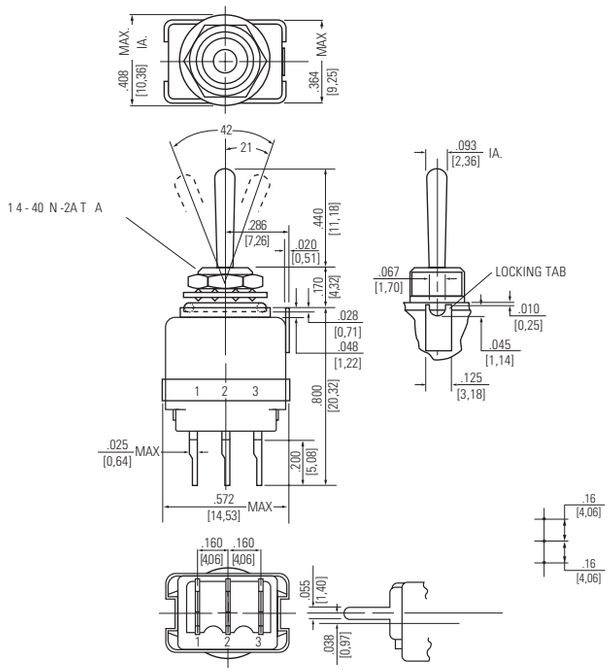
* **Momentary contact.**
See page A75 for special circuit diagrams.

① Dielectric per MIL-DTL-8834 except limited to 1250 volts. Delayed action of the switch toggle lever may cause circuit to close or open before snap action mechanism trips.

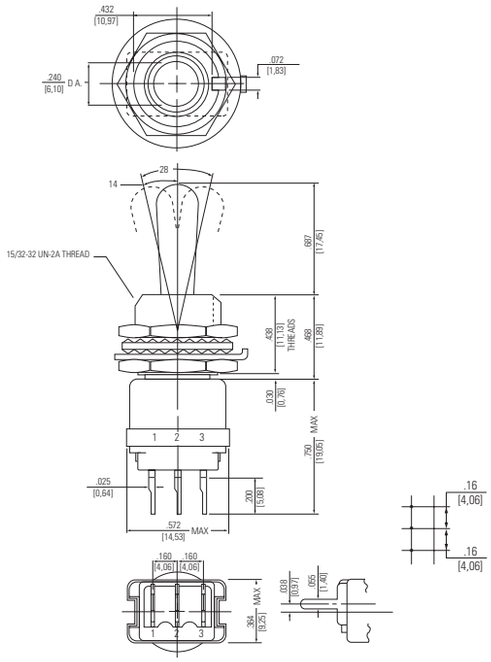
② Caution should be exercised during soldering and flux removal. See page A56 for details.

③ Furnished with Bonded Seal Feature. (Meets 15' water sealing level requirement.)

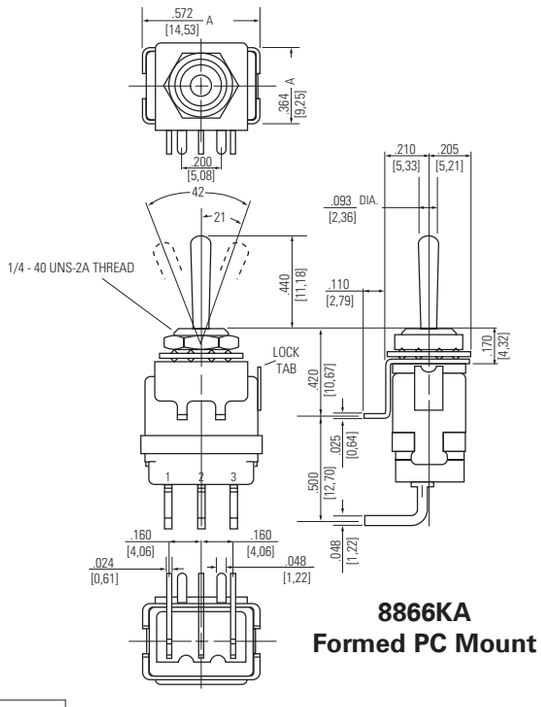
MOUNTING DIMENSIONS - ONE POLE



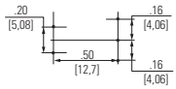
8866
Straight PC Mount



8868
Straight PC Mount



8866KA
Formed PC Mount



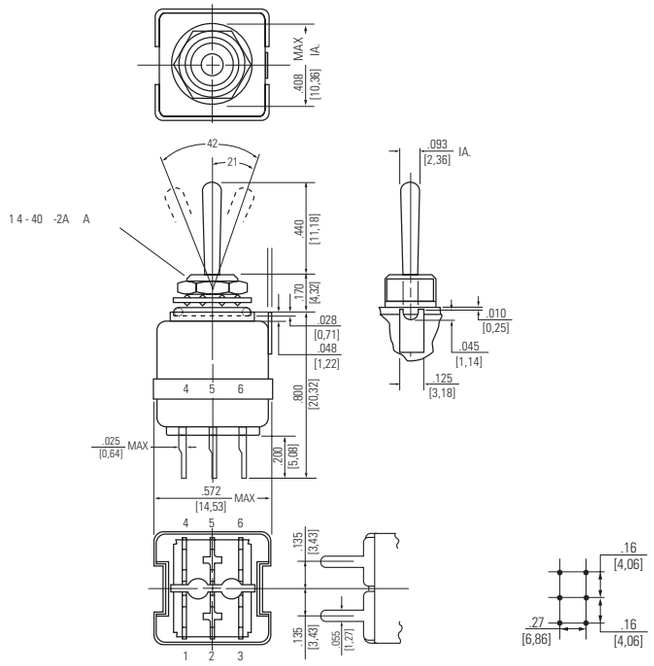
STANDARD
0.00 = inches
[0,0] = mm

Terminal Identification

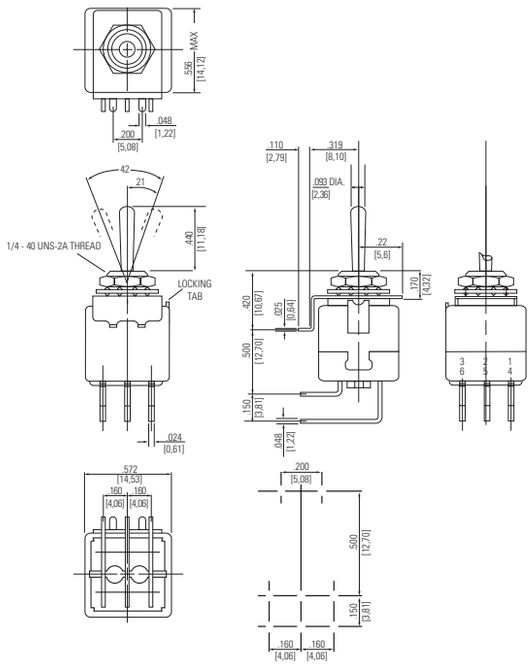
Mounting dimensions for reference only.

Non-functional terminals not supplied.

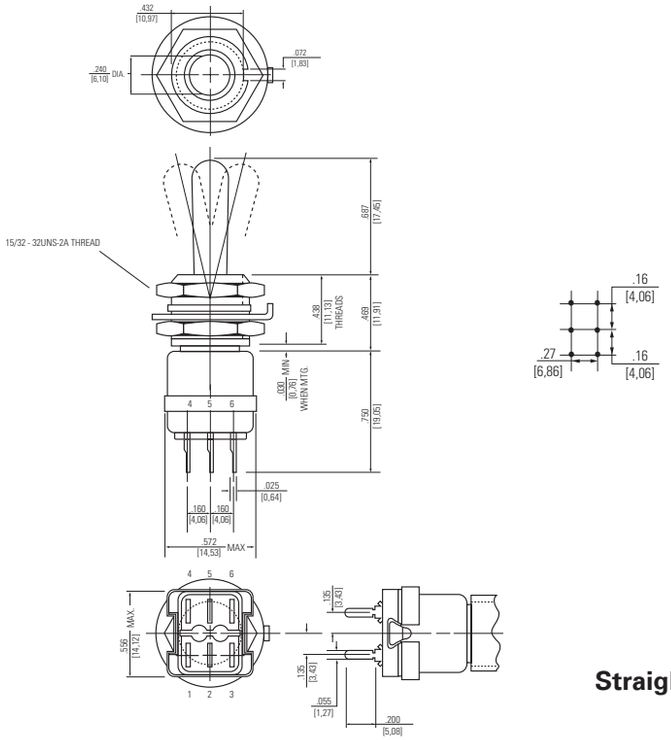
MOUNTING DIMENSIONS - TWO POLE



8867
Straight PC Mount



8867KA
Formed PC Mount



8869
Straight PC Mount

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Terminal Identification

Non-functional terminals not supplied

CAUTION AND RECOMMENDATION FOR CLEANING AND SOLDERING

Contamination of the contacts of miniature switches is the most common cause of problems in low energy circuits, resulting in the inability of current to flow through the increased resistance of the switch contacts. As most contamination occurs during the installation and cleaning of the switch, proper care when installing the switch can reduce problems in this area. The following procedures should be followed to reduce the possibility of switch contact contamination.

Hand Solder

1. Use rosin core solder .030"-.040" diameter.
2. A small soldering iron in the 30 to 40 watt range should be used.
3. The solder joint should not be overheated.
4. Do not position switch with terminations straight up.
5. No clean up should be necessary. However, if used, do not allow solvents to enter non-sealed areas of switches.

Wave Solder - Miniature Switches

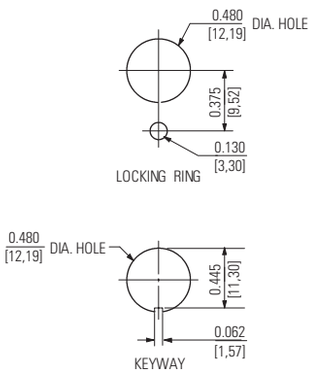
Do not immerse or spray with solvents to remove flux except for switches designed for this type of cleaning. The use of wave solder oil is not advised.

OPTIONS/ACCESSORIES

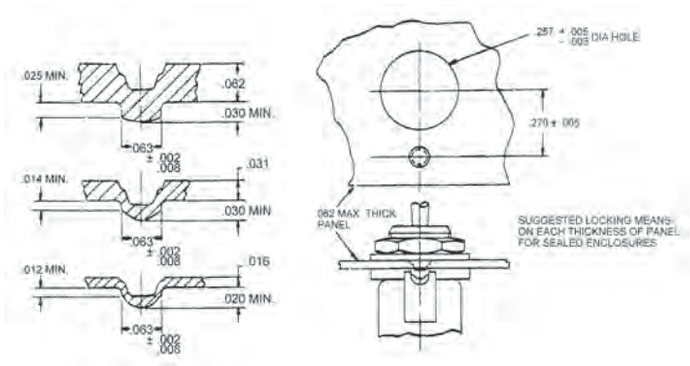
- Special mounting hardware
- Special marking
- Mounting hardware furnished assembled
- Panel seal, Part Number 32-341 (15/32" - 32 bushing only)
- Special circuits
- Special bushing and lever plating
- Mounting adapter nut
- Custom wire harnesses
- EMI/RFI capability on two pole (15/32" - 32 bushing only)
- Gold plated contacts

PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING



1/4 - 40 DIA. BUSHING



MINIATURE POSITIVE ACTION SWITCHES
MIL-DTL-8834 Miniature Positive Action Switches
Lever Lock/Solder Lug Terminals

FEATURES

- Sealed bushing
- Dry circuit (logic level loads) to power switching levels
- 1 and 2 pole circuitry
- Non-teasible mechanism for all but center "ON" circuits
- High electrical/ mechanical reliability
- Two styles of lever lock Actuator
- Locking actuator for safety
- Wiping action contacts
- Positive make and break action
- Solder lug termination

SPECIFICATIONS

- Bushing seal or bonded seal per MIL-DTL-8834
- MS approved and QPL'd to MIL-DTL-8834
- Temperature Range: -67°F to +160°F (-55°C to +71°C)
- Life: 20,000 operations at rated load 40,000 operations mechanical life
- Solder lug terminal .050 [1,27] dia.hole

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28 and 50VDC (Amperes per pole)		115VAC 60Hz and 400Hz (Amperes per pole)			
			Resistive Load	Inductive Load	Resistive Load		Inductive Load	
			28VDC	28VDC	60Hz	400Hz	60Hz	400Hz
1	8855	Maintained and Momentary	5	1	2	3	1	2
2	8866	Maintained and Momentary	5	1	2	3	1	2

Minimum Rating: 25 microamperes at 5 millivolts.

STANDARD CAP STYLE | MUSHROOM CAP STYLE


8855


8856


8855


8856

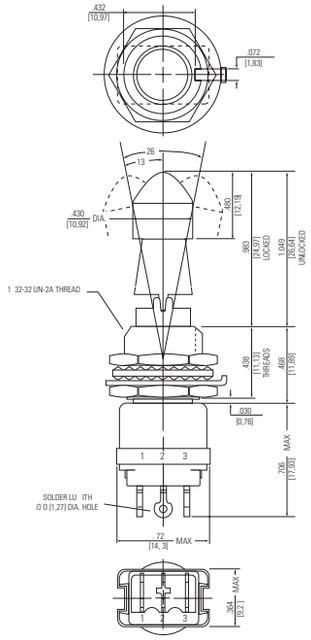
SELECTION TABLE

CIRCUIT WITH LEVER IN . . .

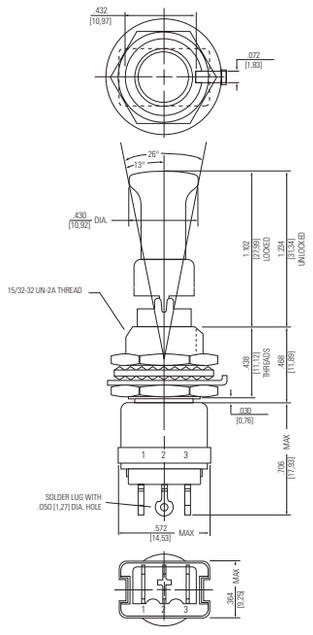
Up Position	Center Position	Down Position (Keyway)	Lever Lock④ Bushing Style	MS Part Number	Catalog Number	MS③ Part Number	Catalog② Number	MS Part Number	Catalog Number	MS Part③ Number	Catalog② Number
ONE POLE											
ON →	← OFF →	← ON	A	MS21026-A211	8855K4	Feature Not Available in Single Pole Switches		MS21436-A211	8855K74	Feature Not Available in Single Pole Switches	
ON	← OFF →	ON	B	-B211	K5			-B211	K75		
ON	← OFF	NONE	B	-B241	K19			-B241	K719		
ON	NONE	← OFF	C	-C221	K13			-C221	K713		
ON	NONE	← ON	C	-C231	K7			-C231	K77		
ON	← OFF	ON	D	MS21026-D211	8855K10			MS21436-D211	8855K710		
ON →	NONE	← OFF	E	-E221	K14			-E221	K714		
ON →	NONE	← ON	E	-E231	K8			-E231	K78		
* ON	← OFF →	ON*	F	-F271	K15			-F271	K715		
ON	OFF →	ON*	G	-G311	K16			-G311	K716		
* ON	← OFF	ON*	H	MS21026-H271	8855K17			MS21436-H271	8855K717		
ON →	← OFF	NONE	J	-J241	K9			-J241	K79		
NONE	OFF →	ON*	K	-K281	K18			-K281	K718		
ON	← OFF →	ON*	K	-K311	K20			-K311	K720		
ON	← OFF	ON*	L	-L311	K12			-L311	K712		
TWO POLE											
ON→	← OFF→	← ON	A	MS21027-A211	8856K4	MS21027-A711	8856K4X	MS21437-A211	8856K74	MS21437-A711	8856K74X
ON	← OFF→	ON	B	-B211	K5	-B711	K5X	-B211	K75	-B711	K75X
ON	← OFF	NONE	B	-B241	K19	-B741	K19X	-B241	K719	-B741	K719X
ON	NONE	← OFF	C	-C221	K13	-C721	K13X	-C221	K713	-C721	K713X
ON	NONE	← ON	C	-C231	K7	-C731	K7X	-C231	K77	-C731	K77X
ON	← OFF	ON	D	MS21027-D211	8856K10	MS21027-D711	8856K10X	MS21437-D211	8856K710	MS21437-D711	8856K710X
ON→	NONE	← OFF	E	-E221	K14	-E721	K14X	-E221	K714	-E721	K714X
ON→	NONE	← ON	E	-E231	K8	-E731	K8X	-E231	K78	-E731	K78X
* ON	← OFF→	ON*	F	-F371	K27	-F871	K27X	-F371	K727	-F871	K727X
ON	OFF→	ON*	G	-G311	K16	-G811	K16X	-G311	K716	-G811	K716X
* ON	← OFF	ON*	H	MS21027-H371	8856K29	MS21027-H871	8856K29X	MS21437-H371	8856K729	MS21437-H871	8856K729X
ON→	← OFF	NONE	J	-J241	K9	-J741	K9X	-J241	K79	-J741	K79X
NONE	OFF→	ON*	K	-K381	K28	-K881	K28X	-K381	K728	-K881	K728X
ON	← OFF→	ON*	K	-K311	K20	-K811	K20X	-K311	K720	-K811	K720X
ON	← OFF	ON*	L	-L311	K12	-L811	K12X	-L311	K712	-L811	K712X
ON→	← ON →	← ON	A	MS21027-A331	8856K21①	MS21027-A831	8856K21X①	MS21437-A331	8856K721①	MS21437-A831	8856K721X①
ON	← ON →	ON	B	-B331	K30①	-B831	K30X①	-B331	K730①	-B831	K730X①
ON	ON	← ON	C	-C331	K31①	-C831	K31X①	-C331	K731①	-C831	K731X①
ON	← ON	ON	D	-D331	K32①	-D831	K32X①	-D331	K732①	-D831	K732X①
* ON	← ON →	ON*	F	-F341	K22①	-F841	K22X①	-F341	K722①	-F841	K722X①
* ON	← ON	ON*	H	MS21027-H341	8856K34①	MS21027-H841	8856K34X①	MS21437-H341	8856K734①	MS21437-H841	8856K734X①
NONE	ON →	ON*	K	-K321	K24①	-K821	K24X①	-K321	K7241①	-K821	K724X①
ON	ON →	ON*	G	-G351	K35①	-G851	K35X①	-G351	K735①	-G851	K735X①
ON	← ON →	ON*	K	-K351	K23①	-K851	K23X①	-K351	K723①	-K851	K723X①
ON	← ON	ON	L	-L351	K36①	-L851	K36X①	-L351	K736①	-L851	K736X①

MIL-DTL-8834 Miniature Positive Action Switches
Lever Lock/Solder Lug Terminals

MOUNTING DIMENSIONS - ONE POLE / 8855



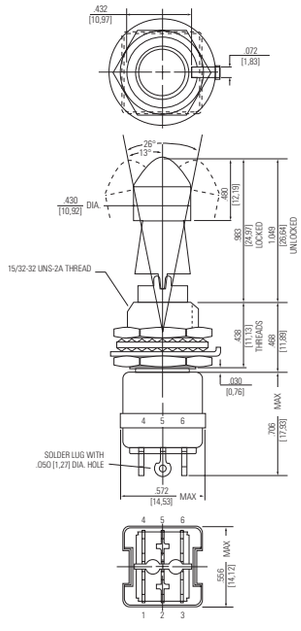
Standard Cap Style



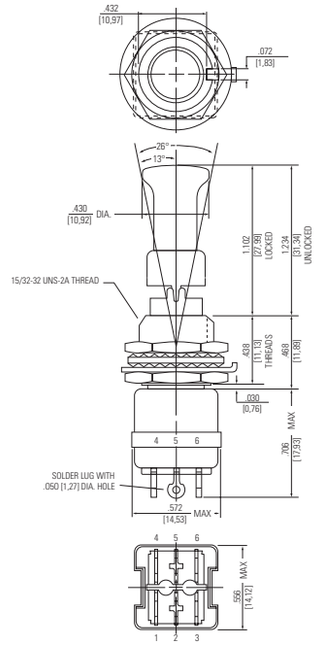
Mushroom Cap Style

Terminal Identification

MOUNTING DIMENSIONS - TWO POLE / 8856



Standard Cap Style



Mushroom Cap Style

Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

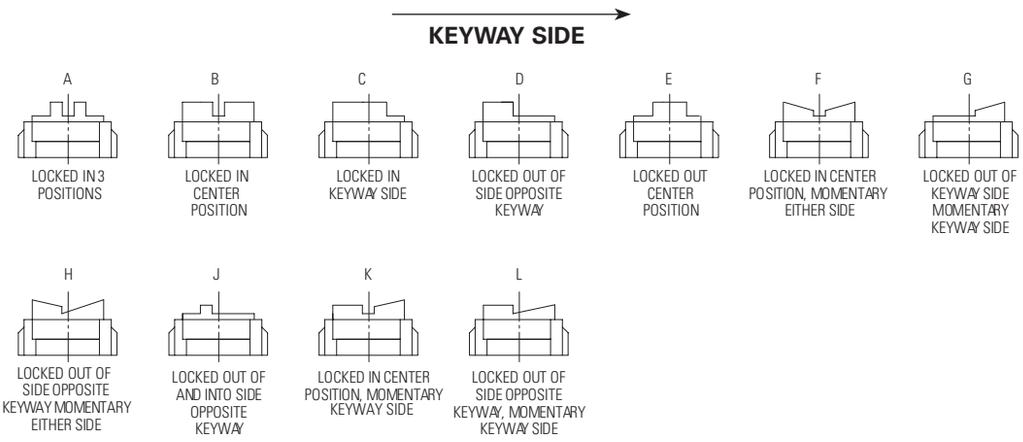
Non-functional terminals not supplied.

MINIATURE POSITIVE ACTION SWITCHES
MIL-DTL-8834 Miniature Positive Action Switches
Lever Lock/Solder Lug Terminals

OPTIONS/ACCESSORIES

- Special mounting hardware
- Special marking
- Mounting hardware furnished assembled
- Special locking configurations
- Panel seal, Part Number 32-341
- Special circuits
- Special locking cap style
- Custom wire harnesses
- EMI/RFI capability on two pole

LEVER LOCK - BUSHING STYLES



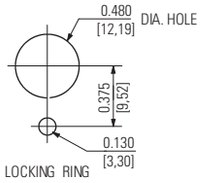
Figures A thru L do not represent details of construction. They schematically illustrate locking function.

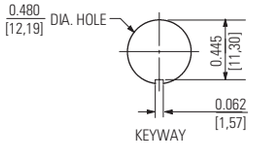
OPTIONS/ACCESSORIES

- Special mounting hardware
- Special marking
- Mounting hardware furnished assembled
- Special locking configurations
- Panel seal, Part Number 32-341
- Special circuits
- Special locking cap style
- Custom wire harnesses
- EMI/RFI capability on two pole
- Gold plated contacts

PANEL CUTOUT DIMENSIONS

15/32 DIA. BUSHING





MINIATURE POSITIVE ACTION SWITCHES
Series - 8855, 8856, 8866-69

MIL-DTL-8834 Miniature Positive Action Switches
Toggle and Lever Lock/IWTS Terminals

FEATURES

- Sealed bushing
- Dry circuit (logic level loads) to power switching levels
- 1 and 2 pole circuitry
- Non-teasible mechanism for all but center "ON" circuit
- Small and large size bushings and Actuator
- Toggle and lever lock Actuator
- Wiping action contacts
- Positive make and break action
- Integrated Wire Termination System (IWTS)

SPECIFICATIONS

- Bushing seal or bonded seal per MIL-DTL-8834
- MS approved and QPL listed to MIL-DTL-8834
- Temperature Range: -67°F to +160°F (-55°C to +71°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life
- Bushing thread sizes:
  Small Toggle: ¼" - 40 thread
  Large Toggle and Lever Lock:
  15/32" - 32 thread
- Accepts SAE-AS39029/1-101 Pins (pins not included)

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC (Amperes per pole)		115VAC 60Hz and 400Hz (Amperes per pole)			
			Resistive Load	Inductive Load	Resistive Load		Inductive Load	
			28VDC	28VDC	60Hz	400Hz	60Hz	400Hz
1	8855 8866 8868	Maintained and Momentary	5	1	2	3	1	2
2	8856 8867 8869	Maintained and Momentary	5	1	2	3	1	2

Minimum Rating: 25 microamperes at 5 millivolts.

SELECTION TABLE

8868 Large Lever — 8866 Small Lever

8869 Large Lever — 8867 Small Lever

CIRCUIT WITH LEVER IN . . .			ONE POLE				TWO POLE					
Up Position	Center Position	Down Position (Keyway)	MS Part Number	Catalog Number Large Lever	MS Part Number	Catalog Number Small Lever	MS Part Number	Catalog Number Large Lever	MS Part Number	Catalog Number Small Lever	MS Part Number	Catalog② Number
ON	OFF	ON	MS21346-211	8868K51	MS24655-211W	8866K51	MS21347-211	8869K51	MS24656-211W	8867K51	MS21347-711	8869K51X
ON	NONE	OFF	-221	K57	-221W	K57	-221	K57	-221W	K57	-721	K57X
ON	NONE	ON	-231	K54	-231W	K54	-231	K54	-231W	K54	-731	K54X
ON	OFF	NONE	-241	K55	-241W	K55	-241	K55	-241W	K55	-741	K55X
*ON	OFF	ON*	MS21346-271	8868K52	-271W	8866K52	MS21347-271	8869K52	-271W	8867K52	MS21347-771	8869K52X
NONE	OFF	ON*	-281	K56	-281W	K56	-281	K56	-281W	K56	-781	K56X
ON	OFF	ON*	-311	K53	-311W	K53	-311	K53	-311W	K53	-811	K53X
NONE	ON	ON*	MS21346-321	K58①	-321W	K58①	MS21347-321	8869K58①	-321W	8867K58①	MS21347-821	8869K58X①
ON	ON	ON	-	-	-331W	-	-331	K59①	-331W	K59①	-831	K59X①
ON	ON	ON*	-	-	-351W	-	-351	K510①	-351W	K510①	-851	K510X①
*ON	ON	ON*	-	-	-341W	-	-341	K511①	-341W	K511①	-841	K511X①

*** Momentary contact.**

① Dielectric per MIL-DTL-8834 except limited to 1250 volts. Delayed action of the switch toggle lever may cause circuit to close or open before snap action mechanism trips.

② Furnished with Bonded Seal feature. (Meets 15' head of water level requirement.)

SELECTION TABLE

8855

8856

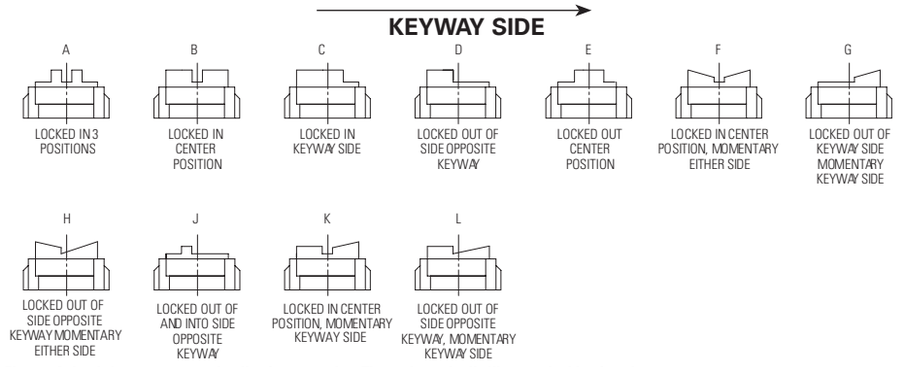
CIRCUIT WITH LEVER IN . . .				ONE POLE		TWO POLE	
Up Position	Center Position	Down Position (Keyway)	Lever Lock Bushing Style	MS Part Number	Catalog Number	MS Part Number	Catalog Number
ON→	← OFF→	← ON	A	MS21346-A211	8855K54	MS21347-A211	8856K54
ON	← OFF→	ON	B	-B211	K55	-B211	K55
ON	← OFF	NONE	B	-B241	K519	-B241	K519
ON	NONE	← OFF	C	-C221	K513	-C221	K513
ON	NONE	← ON	C	-C231	K57	-C231	K57
ON	← OFF	ON	D	MS21346-D211	8855K510	MS21347-D211	8856K510
ON→	NONE	← OFF	E	-E221	K514	-E221	K514
ON→	NONE	← ON	E	-E231	K58	-E231	K58
*ON	← OFF→	ON*	F	-F271	K515	-F271	K515
ON	OFF→	ON*	G	-G311	K516	-G311	K516
*ON	← OFF	ON*	H	MS21346-H271	8855K517	MS21347-H271	8856K517
ON→	← OFF	NONE	J	-J241	K59	-J241	K59
NONE	OFF→	ON*	K	-K281	K518	-K281	K518
ON	← OFF→	ON*	K	-K311	K520	-K311	K520
ON	← OFF	ON*	L	-L311	K512	-L311	L512

*** Momentary contact.**
→Indicates direction against which lever is locked.
See page A75 for special circuit diagrams.

OPTIONS/ACCESSORIES

- Special mounting hardware
- Special marking
- Mounting hardware furnished assembled
- Panel seal, Part Number 32-341 (15/32" - 32 bushing only)
- Special circuits
- Special bushing and lever finish
- Special locking cap style on lever lock switches
- EMI/RFI capability on two pole (15/32" - 32 bushing only)

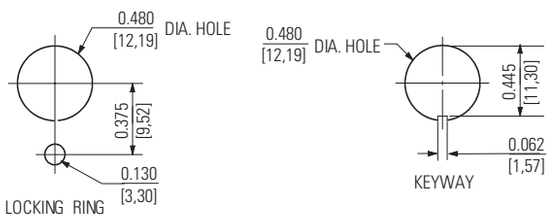
LEVER LOCK - BUSHING STYLES



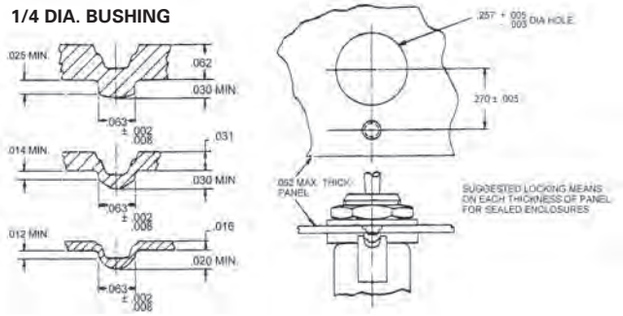
Figures A thru L do not represent details of construction. They schematically illustrate locking function.

PANEL CUTOUT DIMENSIONS

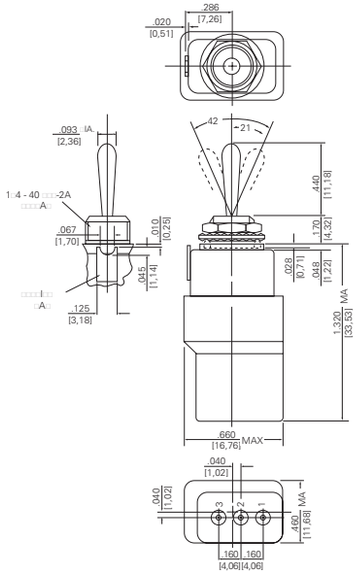
15/32 DIA. BUSHING



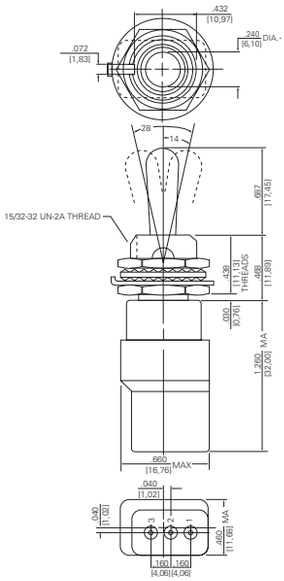
1/4 DIA. BUSHING



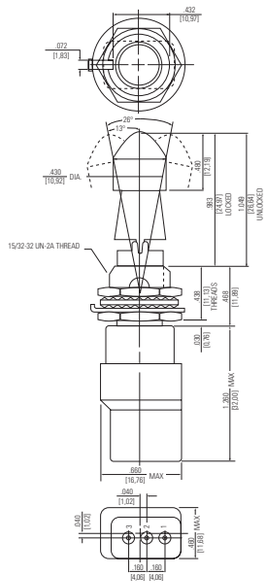
MOUNTING DIMENSIONS - ONE POLE / 8855, 8866, 8868



Small Toggle

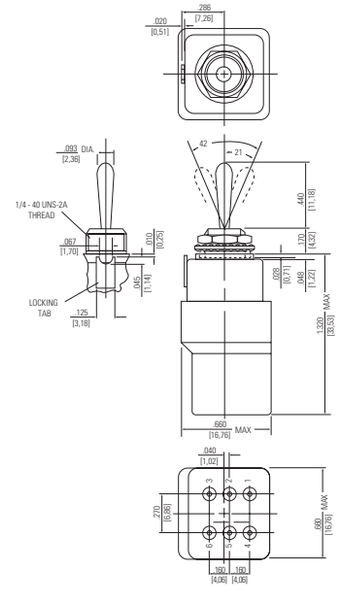


Large Toggle/ Terminal Identification

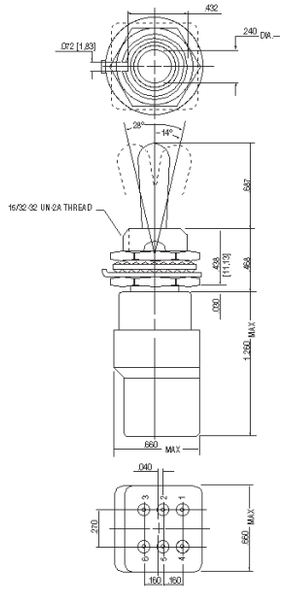


Lever Lock

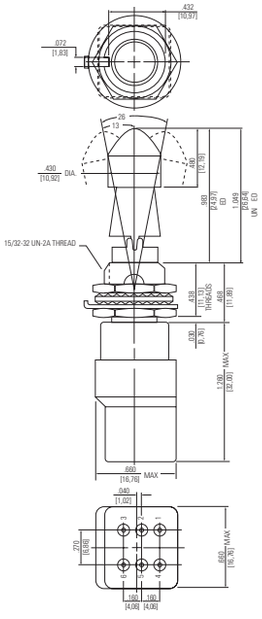
MOUNTING DIMENSIONS - TWO POLE / 8856, 8867, 8869



Small Toggle



Large Toggle/ Terminal Identification



Lever Lock

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

MINIATURE POSITIVE ACTION SWITCHES
4-Pole Miniature Positive Action Switch Series

FEATURES

- Made to MIL-DTL-8834 Requirements
- Sealed bushing
- Current rating versatility
- 4 pole circuitry (Maintained & Momentary variations)
- Non-teasible mechanism for all but center "on" position
- Dry circuit (logic loads loads) to power switching levels
- Wiping action contacts
- Positive make and break action
- 11/16" Lever Length & 15/32" bushing dia.
- Solder-lug terminals

SPECIFICATIONS

- Bushing seal per MIL-DTL-8834
- Meets 0.5" Head of Water
- Temperature Range: -22°F to +149°F
  -30°C to +65°C
- Electrical Life: 20,000 Operations at rated load
- Mechanical Life: 40,000 Operations

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC (Amperes per pole)		115VAC 60Hz and 400Hz (Amperes per pole)			
			Resistive Load	Inductive Load	Resistive Load		Inductive Load	
			28VDC	28VDC	60Hz	400Hz	60Hz	400Hz
4	8854	Maintained and Momentary	5	1	2	3	1	2

Minimum Rating: 25 microamperes at 5 millivolts.

SELECTION TABLE

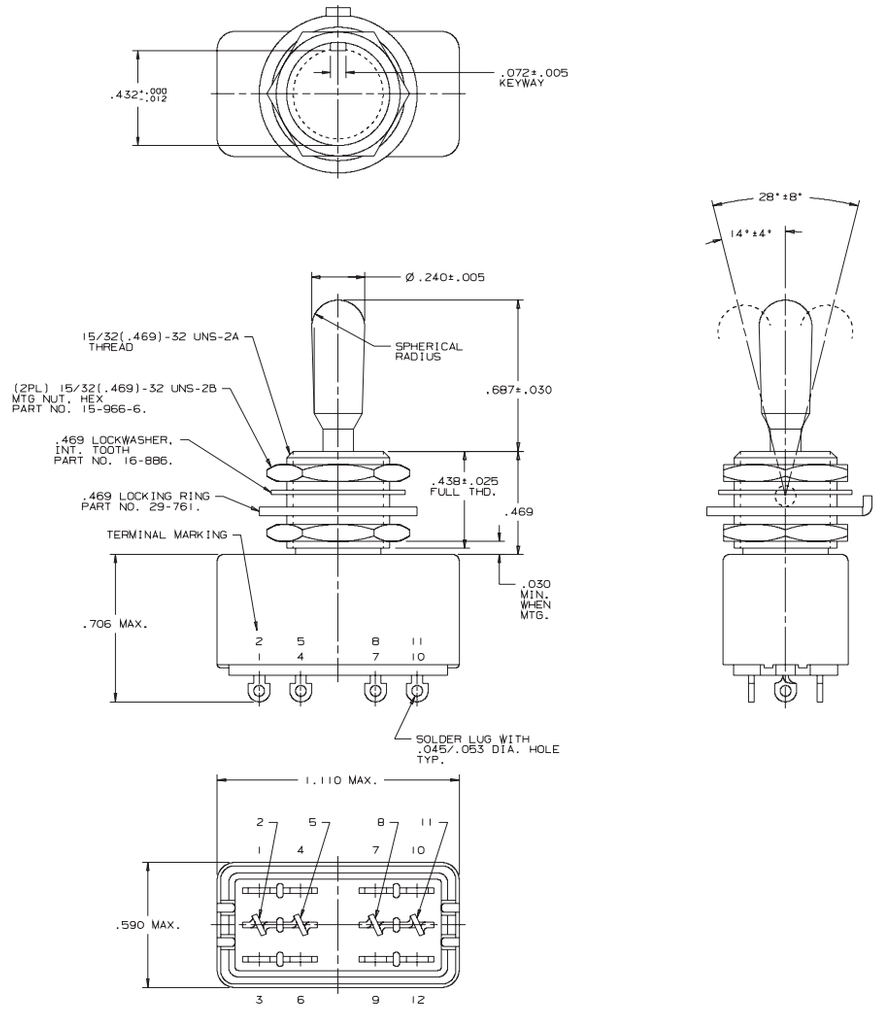
CIRCUIT WITH LEVER IN . . .			
Up Position	Center Position	Down Position (Keyway)	Catalog Number ②
FOUR POLE			
ON	OFF	ON	8854K1
ON	NONE	OFF	K7
ON	NONE	ON	K4
ON	OFF	NONE	K5
ON *	OFF	ON *	K2
NONE	OFF	ON *	K6
ON	OFF	ON *	K3
NONE	ON	ON *	K8 ①
ON	ON	ON	K9 ①
ON	ON	ON *	K10①
ON *	ON	ON *	K11①

*** Momentary contact.**

① Dielectric per MIL-DTL-8834 except limited to 1250 Volts. Delayed action of the switch toggle lever may cause circuit to close or open before snap action mechanism trips.

② Caution should be exercised during soldering and flux removal. See page A56 for details.

MOUNTING DIMENSIONS - FOUR POLE / 8854



Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

MINIATURE POSITIVE ACTION SWITCHES
4-Pole Miniature Positive Action Switch Series

FEATURES

- Made to MIL-DTL-8834 Requirements
- Sealed bushing
- Current rating versatility
- 4 pole circuitry (Maintained & Momentary variations)
- Non-teasible mechanism for all but center "on" position
- Dry circuit (logic loads loads) to power switching levels
- Wiping action contacts
- Positive make and break action
- Bullet and Mushroom Lever lock Actuator styles
- 12 Lever Locking configurations
- 15/32" bushing Dia.
- Solder-lug terminals ± Ø

SPECIFICATIONS

- Bushing seal per MIL-DTL-8834
- Meets 0.5" Head of Water
- Temperature Range: -22°F to +149°F
  -30°C to +65°C
- Electrical Life: 20,000 Operations at rated load
- Mechanical Life: 40,000 Operations

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC (Amperes per pole)		115VAC 60Hz and 400Hz (Amperes per pole)			
			Resistive Load	Inductive Load	Resistive Load		Inductive Load	
			28VDC	28VDC	60Hz	400Hz	60Hz	400Hz
4	8879	Maintained and Momentary	5	1	2	3	1	2

Minimum Rating: 25 microamperes at 5 millivolts or less.

SELECTION TABLE

CIRCUIT WITH LEVER IN . . . FOUR POLE

Mushroom Style Cap

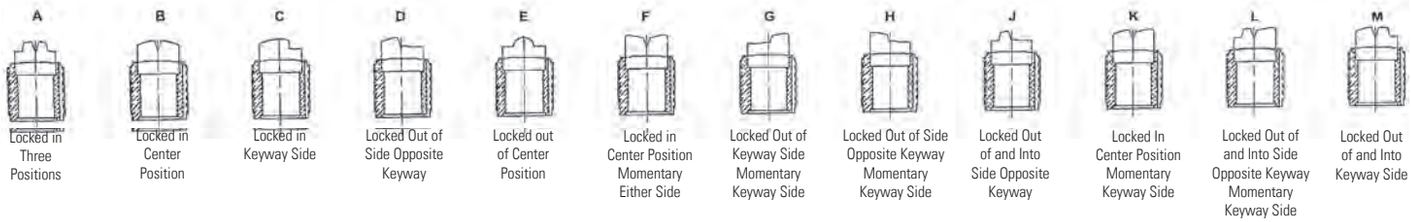
Up Position	Center Position	Down Position (Keyway)	Mushroom Style Cap Catalog② Number	Mushroom Style Cap Locking Designation	Bullet Style Cap Catalog② Number	Bullet Style Cap Locking Designation
ON	OFF	ON	8879K74	A	8879K4	A
ON	OFF	ON	K75	B	K5	B
ON	NONE	ON	K77	C	K7	C
ON	NONE	ON	K78	E	K8	E
ON	OFF	NONE	K79	J	K9	J
ON	OFF	ON	K710	D	K10	D
ON	OFF	ON *	K712	L	K12	L
ON	NONE	OFF	K713	C	K13	C
ON	NONE	OFF	K714	E	K14	E
ON	OFF	ON *	K716	G	K16	G
ON	OFF	NONE	K719	B	K19	B
ON	OFF	ON *	K720	K	K20	K
ON	ON	ON	K721 ①	A	K21 ①	A
ON *	ON	ON *	K722 ①	F	K22 ①	F
ON	ON	ON *	K723 ①	K	K23 ①	K
NONE	ON	ON *	K724 ①	K	K24 ①	K
ON *	OFF	ON *	K727	F	K27	F
NONE	OFF	ON *	K728	K	K28	K
ON *	OFF	ON *	K729	H	K29	H
ON	ON	ON	K730 ①	B	K30 ①	B
ON	ON	ON	K731 ①	C	K31 ①	C
ON	ON	ON	K732 ①	D	K32 ①	D
ON *	ON	ON *	K734 ①	H	K34 ①	H
ON	ON	ON *	K735 ①	G	K35 ①	G
ON	ON	ON *	K736 ①	L	K36 ①	L

*** Momentary contact.**

① Dielectric per MIL-DTL-8834 except limited to 1250 Volts. Delayed action of the switch toggle lever may cause circuit to close or open before snap action mechanism trips.

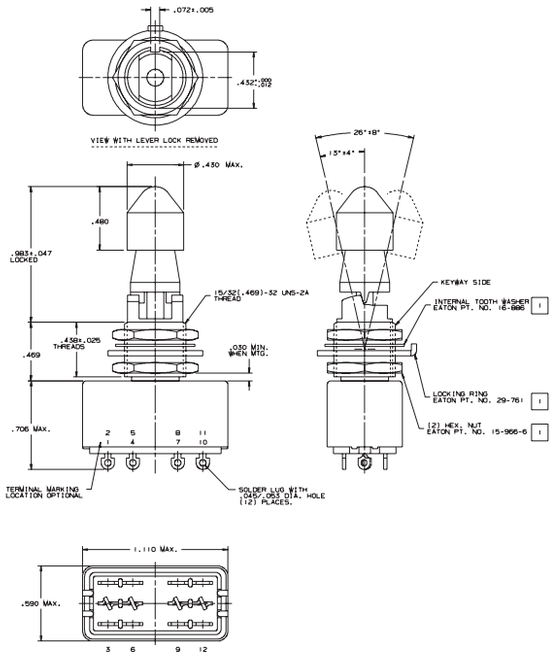
② Caution should be exercised during soldering and flux removal. See page A56 for details.

Locking Designations

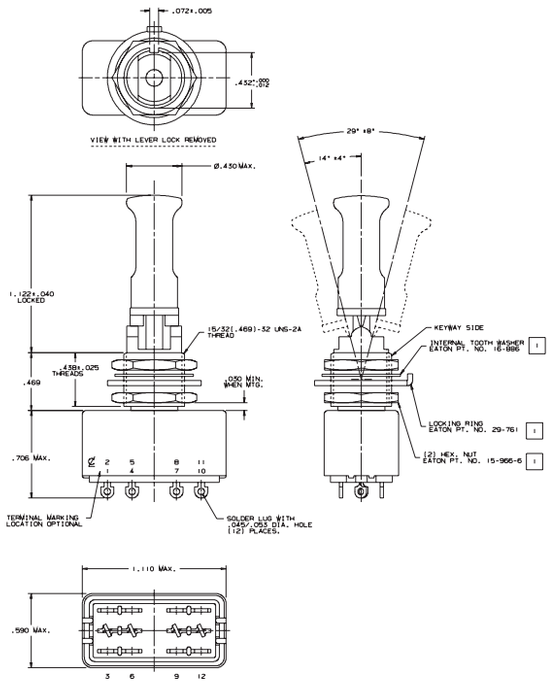


Figures A thru M do not represent details of construction. They schematically illustrate locking function.

MOUNTING DIMENSIONS - FOUR POLE / 8879



MOUNTING DIMENSIONS - FOUR POLE / 8879



STANDARD
0.00 = inches
[0,0] = mm

Terminal Identification

Mounting dimensions for reference only.

Non-functional terminals not supplied.

Series T

SPECIFICATIONS

- Seal: Dust resistant
- Type of Operation: Maintained
- Electrical Life: 10,000 operations at 28VDC or 115VAC
- Mechanical Life: 20,000 operations
- Operating Temp. Range: -85°F to +160°F (-65°C to +71°C)

CURRENT RATINGS

Catalog Number	Poles and Throw	28VDC			115VAC		
		Lamp Load (Amps)	Resistive Load (Amps)	Inductive Load (Amps)	Lamp Load (Amps)	Resistive Load (Amps)	Inductive Load (Amps) (.75 pf)
T1002	1 P.S.T.	5	20	15	3	10	10
T1003	1 P.D.T.	5	20	15	3	10	10
T2106	1 P.D.T.*	—	10	5	—	10	5
T2114	1 P.D.T.*	—	10	5	—	10	5
T2150	2 P.D.T.	—	3	1	—	3	1
T2153	2 P.D.T.	—	3	1	—	3	1
T3103	1 P.D.T.	—	5	3	—	5	3
T3113	1 P.D.T.	—	5	3	—	5	3

*Two Circuit

T2114

T2153

T3113

Series TW (Sealed)

SPECIFICATIONS

- Seal: Dust proof (per MIL-S-83731)
- Type of Operation: Maintained
- Electrical Life: 20,000 operations at 28VDC or 115VAC
- Mechanical Life: 40,000 operations
- Operating Temp. Range: -40°F to +160°F (-40°C to +71°C)

CURRENT RATINGS

Catalog Number	MS Number①	Poles and Throw	28VDC			115VAC		
			Lamp Load (Amps)	Resistive Load (Amps)	Inductive Load (Amps)	Lamp Load (Amps)	Resistive Load (Amps)	Inductive Load (Amps) (.75 pf)
TW1002	—	1 P.S.T.	5	20	15	3	10	10
TW1003	—	1 P.D.T.	5	20	15	3	10	10
TW20000	—	2 P.D.T.	.5*	2	.5*	.1	.1	.1
TW20001	—	1 P.D.T.*	.5	2	.5	.5	.1	.1
TW20002	MS18151-1	1 P.D.T.	.5	1	.5	.1	.1	.1

① Qualified to MIL-DTL-83731

*Two Circuit

TW20000

TW20002

TW20001

TW1003

NOTE: For specific drawing dimensions, contact factory at 1-800-955-7354.

HIGH CAPACITY SWITCHES Series - 8780-82, 8790 & 8792

High Capacity Flush Mounted Switches

FEATURES

- 1 and 3 pole circuitry
- Flush mounted (5 holes required)
- High capacity ratings
- Terminal stud termination

SPECIFICATIONS

- Designed and built to AN3230 and E1663 specifications
- Current ratings up to 175 Amp on AN3230 type and 80 Amp on E1663 type
- Temperature Range: -67°F to +160°F (-55°C to +71°C)
- Life: 10,000 operations at rated load
  20,000 operations mechanical life
- Power studs have .250" [6,35] -20 threads

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Lamp Load	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load
1	8780K11 8781K11 8782K11	Maintained	35	175	45	11	55	45
3	8790K4 8792K3	Maintained	12	80	30	7.5	30	20

SELECTION TABLE

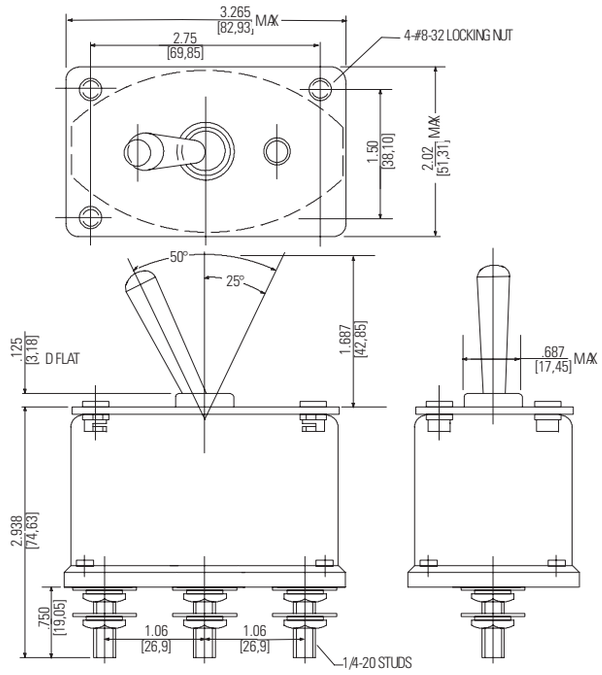
8780

8790

CIRCUIT WITH LEVER IN . . .					
Up Position	Center Position	Down Position (Keyway)	① MS or Government Drawing Number	① AN Part Number	Catalog Number
One Pole - High Capacity					
ON	OFF	ON	—	AN3230-1	8780K11
ON	NONE	OFF	—	-2	8781K11
ON	NONE	ON	—	-3	8782K11
Three Pole - High Capacity					
ON	OFF	ON	E1663-1	—	8790K4
ON	NONE	ON	-3	—	8792K3

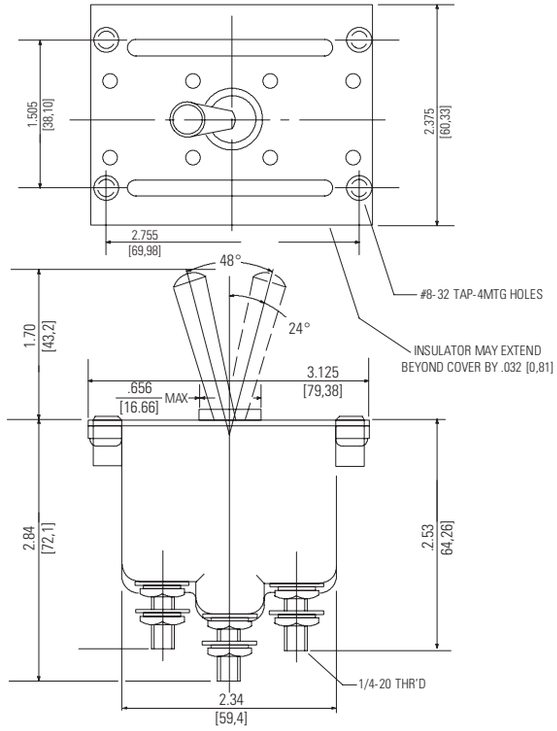
① Reference only cancelled government numbers

MOUNTING DIMENSIONS - ONE POLE / 8780, 8781, 8782



Terminal Identification

MOUNTING DIMENSIONS - THREE POLE / 8790, 8792



Terminal Identification

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

Non-functional terminals not supplied.

NOMINAL RATINGS AND CIRCUIT DIAGRAMS

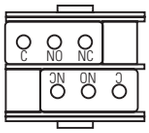
UL AND CSA NOMINAL RATINGS

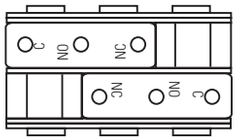
	Amperes		Maximum Horsepower		
			1 Phase		3 Phase
Catalog Number	125VAC	250VAC	125VAC	250VAC	125/250VAC
8520K1, K4, K9	18	9	1/4	1/2	-
8521K1, K4, K9	18	9	1/2	1	-
8522K1, K4, K9	18	9	1/2	1	1
8526K2, K3, K5	18	9	-	-	-
8527K2, K3, K5	18	9	-	-	-
8528K2, K3, K5	18	9	-	-	-
8530K1-13,K31-313,K91-913	18	9	1/4	1/2	-
8531K1-16,K31-316,K91-916	18	9	1/2	1	-
8532K1-17,K31-317,K91-917	18	9	1/2	1	1
8533K1-13,K31-313,K91-913	18	9	1/4	1/2	-
8534K1-13,K31-316,K91-916	18	9	1/2	1	-
8535K1-17,K31-317,K91-917	18	9	1/2	1	1
8536K1-13,K31-313,K91-913	18	9	1/4	1/2	-
8537K1-16,K31-316,K91-916	18	9	1/2	1	-
8538K1-17,K31-317,K91-917	18	9	1/2	1	1

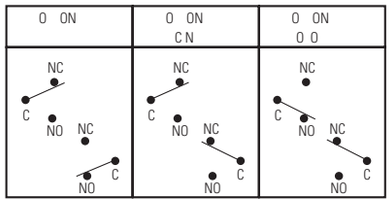
BASIC SWITCH CIRCUITS — BACK CONFIGURATIONS — SCHEMATIC DIAGRAMS

Standard **Sealed**

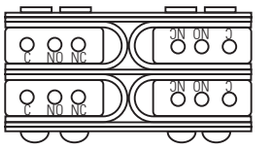
2 Pole

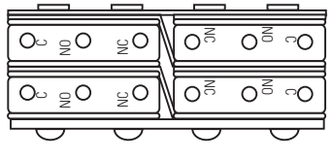


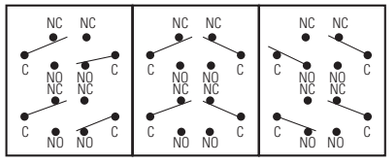




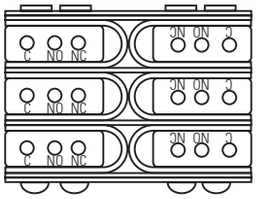
4 Pole

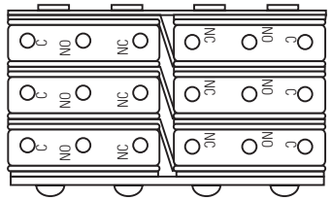


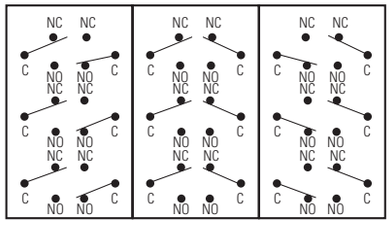




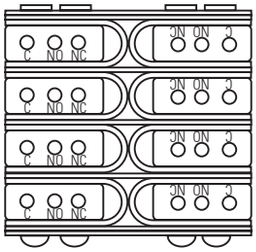
6 Pole

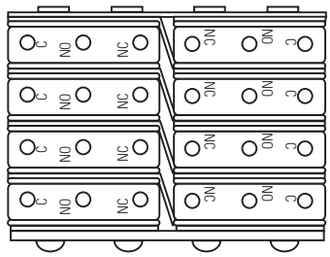


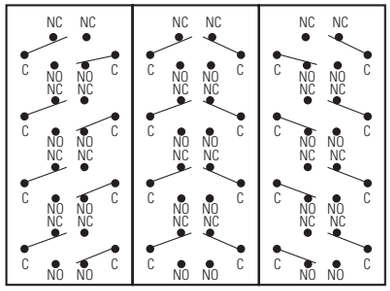


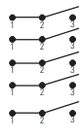
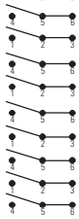
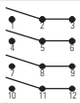
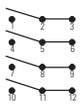


8 Pole

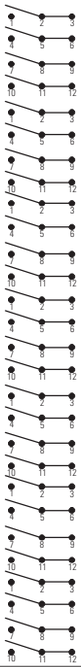
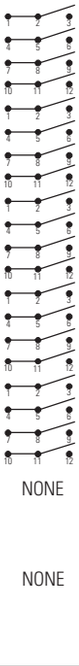
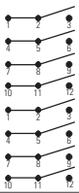






		CIRCUIT WITH LEVER IN . . .		
Number of Poles and Throws	**Switch Circuit①**	**Up Position**	**Center Position**	**Down Position (Keyway)**
1PST	ON-NONE-OFF		NONE	OFF
	ON-OFF-NONE		OFF	NONE
	ON-OFF*-NONE		OFF(MOM.)	NONE
	NONE-OFF-ON*	NONE	OFF	
	ON-NONE-OFF*		NONE	OFF(MOM.)
	OFF-NONE-ON*	OFF	NONE	
1PDT	ON-OFF-ON			
	ON-NONE-ON			
	ON-NONE-ON*			
	ON-OFF-ON			
	ON-OFF-ON*			
	*ON-ON-NONE			
	ON-ON-NONE			
2PST	ON-NONE-OFF		NONE	OFF
	ON-OFF-NONE		OFF	NONE
	ON-OFF*-NONE		OFF(MOM.)	NONE
	NONE-OFF-ON*	NONE	OFF	
	ON-NONE-OFF*		NONE	OFF(MOM.)
	OFF-NONE-ON*	OFF	NONE	
2PDT	ON-OFF-ON			
	ON-NONE-ON		NONE	
	ON-NONE-ON*		NONE	
	ON-OFF-ON			
	ON-OFF-ON*			
	*ON-ON-NONE			NONE
	ON-ON-NONE			NONE
4PST	ON-NONE-OFF		NONE	OFF
	ON-OFF-NONE		OFF	NONE
	ON-OFF*-NONE		OFF(MOM.)	NONE
	NONE-OFF-ON*	NONE	OFF	
	ON-NONE-OFF*		NONE	OFF(MOM.)
	OFF-NONE-ON*	OFF	NONE	

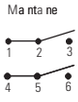
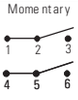
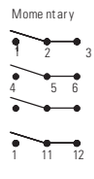
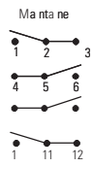
*** Momentary Contact**

		CIRCUIT WITH LEVER IN . . .		
Number of Poles and Throws	Switch Circuit①	Up Position	Center Position	Down Position (Keyway)
4PDT	ON-OFF-ON		OFF	
	ON-NONE-ON		NONE	
	ON-NONE-ON*		NONE	
	ON-OFF-ON		OFF	
	ON-OFF-ON*		OFF	
	*ON-ON-NONE			NONE
	ON-ON-NONE			NONE

① See page A75 for ON-ON-ON and special circuits.

*** Momentary contact.**

TOGGLE SWITCHES - ENVIRONMENTALLY SEALED SWITCHES
Special ON-ON-ON Circuit Arrangements for Two and Four Pole Switches
Industrial, Econoswitch and MIL-DTL-3950 Series

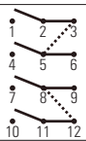
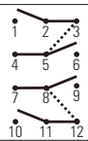
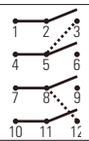
Number of Poles	Circuit with Lever in . . . Up Position	Center Position	Down Position (Keyway)	Catalog Part Number
TWO POLE				
2				8501K14, 8504K43-K55, 8511K14 8531K14, 8531K914, 8531K314 8534K14, 8534K914, 8534K314 8537K14, 8537K914, 8537K314, 8567K14
2				8501K15, 8504K56-K61, 8511K15 8531K15, 8531K915, 8531K315 8534K15, 8534K915, 8534K315 8537K15, 8537K915, 8537K315, 8567K15
2				8501K16, 8504K62-K64, 8511K16 8531K16, 8531K916, 8531K316 8534K16, 8534K916, 8534K316 8537K16, 8537K916, 8537K316, 8567K16
2				8501K17, 8504K65-K77, 8511K17 8531K17, 8531K917, 8531K317 8567K17, 8571K17-16, 8571K17-20 8574K65-16 - 8574K77-16 8574K65-20 - 8574K77-20
2				8501K18, 8504K78-K83, 8511K18 8531K18, 8531K918, 8531K318 8567K18, 8571K18-16, 8571K18-20 8574K78-16 - 8574K83-16 8574K78-20 - 8574K83-20
2				8501K19, 8504K84-K87, 8511K19 8531K19, 8531K919, 8531K319 8567K19, 8571K19-16, 8571K19-20 8574K84-16, 8574K86-16 8574K84-20, 8574K86-20
FOUR POLE				
4				8502K15, 8512K15 8532K15, 8532K915, 8532K315 8535K15, 8535K915, 8535K315 8538K15, 8538K915, 8538K315 8568K15 8575K43-16 - 8575K55-16 8575K43-20 - 8575K55-20
4				8502K16, 8512K16 8532K16, 8532K916, 8532K316 8535K16, 8535K916, 8535K316 8538K16, 8538K916, 8538K316 8568K16 8575K56-16 - 8575K61-16 8575K56-20 - 8575K61-20
4				8502K17, 8512K17 8532K17, 8532K917, 8532K317 8535K17, 8535K917, 8535K317 8538K17, 8538K917, 8538K317 8568K17 8575K62-16 - 8575K64-16 8575K62-20 - 8575K64-20

TOGGLE SWITCHES - ENVIRONMENTALLY SEALED SWITCHES
Special Circuit Arrangements for Two and Four Pole Switches
Industrial, Econoswitch and MIL-DTL-3950 Series

SPECIAL "ON-ON-ON" CIRCUIT ARRANGEMENTS

"Three Independent" ON-ON-ON Circuit Diagram
For switch modified with "Three Independent" ON-ON-ON Special Circuit.
External Jumpers are required. User to connect wiring per instructions given below.

Connection Points	Single Pole①	Double Pole②
Connect Common to Terminals	2	2 and 11
Connect Circuit "A" to Terminals	6	6 and 9
Connect Circuit "B" to Terminals	4	4 and 7
Connect Circuit "C" to Terminals	1	1 and 10

Circuit Poles	No. of Poles	"A" Up Position	"B" Center Position	"C" Down Position (Keyway)
Circuit for Single Pole (Jumper between Terminals #3 & #5)	1			
Circuit for Double Pole (Jumpers between Terminals #3 & #5 #8 & #12)	2			

① Requires using a two pole switch to accomplish single pole independent "on-on-on" circuit.
② Requires using a four pole switch to accomplish a double pole independent "on-on-on" circuit.
Note: Basic circuit same as offered with part numbers 8501K14, 8501K15 or 8501K16 for two pole devices and part numbers 8502K15, 8502K16 or 8502K17 for four pole devices.

SPECIAL CIRCUIT (OFF-ON-ON)

Circuit Note: Requires two poles to achieve a single pole device or four poles to achieve a double pole device.	No. of Poles	OFF Up Position	ON Center Maintained Position	ON Down Position (Keyway)	Circuit Being Made . . .	Terminal Numbers Making the Circuit
Circuit for Single Pole (Jumper between terminals #2 & #4). Common terminal #5. Non-functional terminal #6	2	(OFF) 	(ON) 	(ON) 	UP (OFF) CENTER (ON) DOWN (ON)	— #3 & #5 #1 & #5
Circuit for Double Pole (Jumpers between terminals #2 & #4 and #7 & #11). Common terminals #5 & #8. Non-functional terminals #6	4	(OFF) 	(ON) 	(ON) 	UP (OFF) CENTER (ON) DOWN (ON)	— #3 & #5 #8 & #12 #1 & #5 #8 & #10

SPECIAL PROJECTOR CIRCUIT (2 ON- 1 ON - OFF)

Circuit Note: Requires two poles to achieve a single pole device or four poles to achieve a double pole device.	No. of Poles	ON Up Position	ON Center Maintained Position	OFF Down Position (Keyway)	Circuit Being Made . . .	Terminal Numbers Making the Circuit
Circuit for Single Pole (Jumper between terminals #2 & #5). Common terminal #5. Non-functional terminal #1 & #4.	2	(TWO ON) 	(ONE ON) 	(OFF) 	UP (ON) CENTER (ON) DOWN (OFF)	#2 & #3 #5 & #6 #5 & #3 —
Circuit for Double Pole (Jumpers between terminals #2 & #5 and #8 & #11). Common terminals #5 & #8. Non-functional terminals #1, #4 #7 & #10.	4	(FO ON) 	(TWO ON) 	(OFF) 	UP (ON) CENTER (ON) DOWN (OFF)	#5 & #3 #5 & #6 #8 & #12 #8 & #9 #3 & #5 #8 & #12 —

SPECIAL ON-ON-ON CIRCUITS FOR Miniature POSITIVE ACTION SWITCHES
Circuit Arrangements

CIRCUIT WITH LEVER IN . . .				
Number of Poles	**Up Position**	**Center Position**	**Down Position (Keyway)**	**Catalog Part Number**
Two Pole				
2	Maintained 	Maintained 	Maintained 	8856K21, K30, K31, K32 8856K21X, K30X, K31X, K32X 8856K721, K730, K731, K732 8867K9, 8867K69, 8867KA69 8869K9, 8869K9X, 8869K69, 8869K69X
2	Maintained 	Maintained 	Momentary 	8856K23, K35, K36 8856K23X, K35X, K36X 8856K723, K735, K736 8867K10, 8867K610, 8867KA610 8869K10, 8869K10X, 8869K610, 8869K610X
2	Momentary 	Maintained 	Momentary 	8856K22, K34 8856K22X, K34X 8856K722, K734 8867K11, 8867K611, 8867KA611 8869K11, 8869K11X, 8869K611, 8869K611X

SPECIAL "ON-ON-ON" CIRCUIT ARRANGEMENTS

"Three Independent " ON-ON-ON Circuit Diagram
For switch modified with "Three Independent" ON-ON-ON Special Circuit.
External Jumpers are required. User to connect wiring per instructions given below.

Connection Points	Single Pole①
Connect Common to Terminals	2
Connect Circuit "A" to Terminals	6
Connect Circuit "B" to Terminals	4
Connect Circuit "C" to Terminals	1

Circuit Poles	No. of Poles	Up Position	Center Maintained Position	Down Position (Keyway)
Circuit for Single Pole (Jumper between Terminals #3 & #5)	1			

①Requires using a two pole switch to accomplish single pole Independent "ON-ON-ON" circuit.

NOTES

NOTES

NOTES

SECTION B
Pushbutton Switches Index

**Many part numbers listed in this catalog are standard products and may be available in distributor Inventory. Contact Safran Electrical & Power Customer Service at 800-955-7354 for a list of authorized distributors.*

PUSHBUTTON SWITCHES
Series - D200 Heavy Duty

Momentary Snap Action Pushbutton Switches

FEATURES

- High current carrying capability
- Heavy duty pushbutton
- Snap action mechanism
- Minimal arcing and contact wear
- Fast double break action
- Variety of case styles and colors
- Protective shields can be ordered separately to prevent accidental actuation on "W" case model
- Black pushbutton supplied as standard

SPECIFICATIONS

- Operating force: 2.5 lbs ± .5 lb (11N ± 2.2N) D201 thru D205
  4 lbs. ± 1 lb. (17.79N ± 4.45N) D207
- Electrical life: 25,000 operations minimum at rated load
- Total plunger travel (Approx.):
  0.085 IN. (2.16mm),
  0.438 IN. (11.12mm) with "L" Adapter
- Operating temperature: -40°F to +160°F (-40°C to +71°C)
- Momentary snap action
- Terminals: End Screw (Center Terminal Solder D207)
- Weight: "W" case 0.040 lb. (18g)
  "P" case 0.050 lb (23g)
  "L" case 0.045/ 0.055 lb (20g/25g)

CURRENT RATINGS

Part Number	Number of Poles	Operation	28VDC Resistive Load	28VDC Inductive Load	115VAC Resistive Load	115VAC Inductive Load①
D201	1	Momentary	35	20	35	20
D202	1	Momentary	35	20	35	20
D203	1	Momentary	35	20	35	20
D204	1	Momentary	15	—	15	—
D205	1	Momentary	15	—	15	—
D207	1	Momentary	10②	—	10②	—

① p.f.=.75

② 3 amps max. through center terminal.

WHEN ORDERING SPECIFY...

- **Catalog number of base switch** - followed by suffix letters and numbers for type and color of case and pushbutton

Order Example:

D201 (Base Catalog Number) + LB (Case Type and Color) + 5R (Pushbutton Style and Color) = D201LB5R (Complete Number)

SELECTION TABLE

SERIES AND TYPE

D200 Series

D201L5 With Type "L" Case

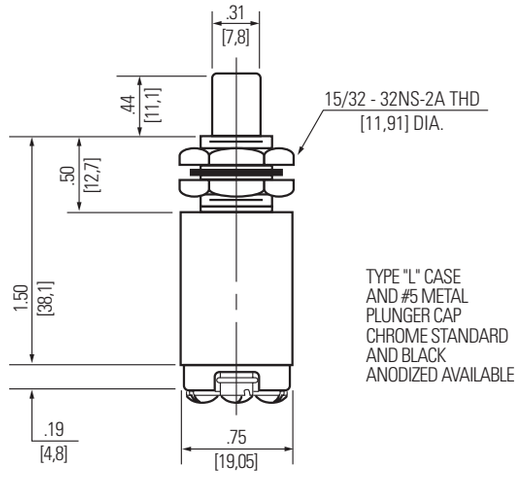
D201P3 With Type "P" Case

D201W3 With Type "W" Case

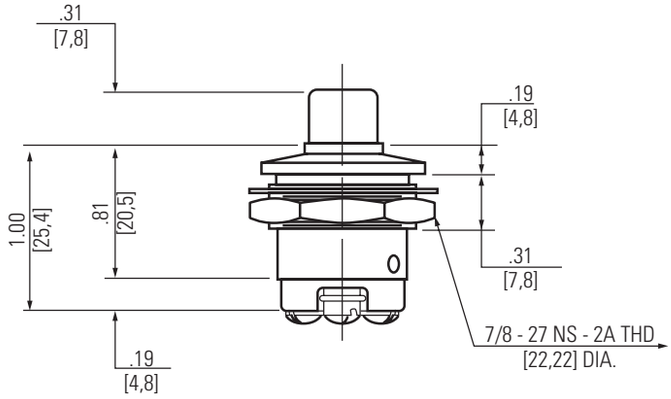
Base Catalog Number	Circuit	Case and Type and Color	Code Suffiix	Pushbutton Style and Color: Button Style	Pushbutton Style and Color: Color	Code Suffiix
D201	1 P.S.T.-NO Dbl. Brk.	Type "L"		NO. 5 (.44 [11,13]) 5/16 Diameter Typical	Chrome	5
D202	1 P.S.T.-NC Dbl. Brk.	Black	LB		Black	5B
D203	1 P.D.T.-2 Ckt	Clear	L			
D204	S.P.-NO 3 Terminal	Type "P"		NO. 2 (.31 [7,87])	Red	2R
D205	S.P.-NC 3 Terminal	Black	PB		White	2W
		Clear	P		Black	2
				NO. 3 (.31 [7,87]) 3/8 Diameter Typical	Red	3R
					White	3W
					Black	3
D207	S.P.-NO 4 Terminal	Type "W"		NO. 2 (.25 [6,35])	Red	2R
		Black	WB		White	2W
		Clear	W		Black	2
				NO. 3 (.25 [6,35]) 3/8 Diameter Typical	Red	3R
					White	3W
					Black	3

Series - D200 Heavy Duty

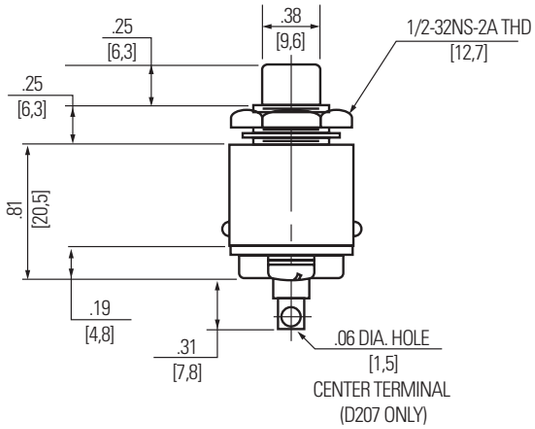
APPROXIMATE DIMENSIONS - D200 "L" CASE



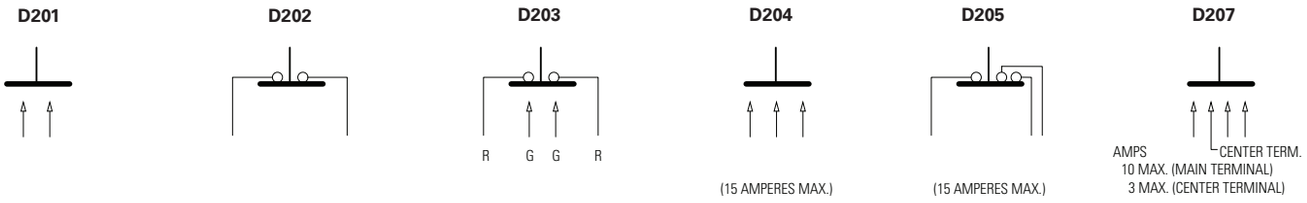
APPROXIMATE DIMENSIONS - D200 "P" CASE



APPROXIMATE DIMENSIONS - D200 "W" CASE



BASIC SWITCH AND SCHEMATIC DIAGRAM



STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

PUSHBUTTON SWITCHES
Series - H2200 Double Pole

Momentary Snap Action Pushbutton Switches

FEATURES

- Double pole
- Optional mounting adapters
- Various styles and colors of pushbuttons
- Solder terminals
- Momentary snap action
- Protective shields can be ordered separately to prevent accidental actuation on "W" case model
- Black pushbutton supplied as standard
- Other colors available

SPECIFICATIONS

- Operating force: 5.5 ± 1.5 lbs (24.2N ± 6.6N)
- Release force: 1 lb. minimum (.45g)
- Electrical life: 25,000 operations minimum at rated load
- Terminals: Solder
- Weight approx.: .05 lb. (.023g)

CURRENT RATINGS

Catalog Number	Number of Poles	Type of Operation	28VDC Inductive	120VAC Inductive①
H2211	2	Momentary	10	10
H2222	2	Momentary	10	10
H2266	2	Momentary	10	10

① p.f.=.75

SELECTION TABLE

SERIES AND TYPE

H2211PB3 With "P" Adapter

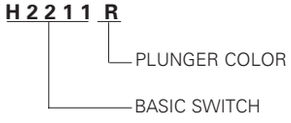
H2266 Without Mounting Adapter

Part Number	Circuit	Adapter Type① and Color③ Type	Color	Code Suffix	Pushbutton Type and Color Type②	Color	Code Suffiix
H2211	2 P.S.T.-NO Double Break	TYPE P	Black	PB	NO. 2	Red	2R
			Clear	P		Black	2
H2222	2 P.S.T.-NC Double Break						
H2266	2 P.D.T. Double Break	TYPE PA	Black	PAB	NO. 3	Red	3R
			Clear	PA		Black	3
		TYPE U	Black	UB			
			Clear	U			
		TYPE W	Black	WB	NO. 4	Red	4R
			Clear	W		Black	4

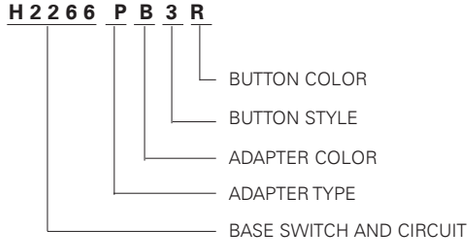
① Clear anodized aluminum is standard. All threads are 1/2"-32 NS-2B internal: 5/8"-24 NEF-2A external except as noted.
② The different pushbutton types are only available when using with one of the 4 different adapters.
③ When used with any of these adapters the switch can be used as part of the UPA group of switches on pages B16 and B17.

WHEN ORDERING SPECIFY...

- **For switch with pushbutton only** - specify catalog number of base switch followed by code for pushbutton color. Use code R for red and leave blank if black button is desired. Examples:

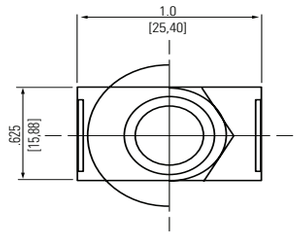


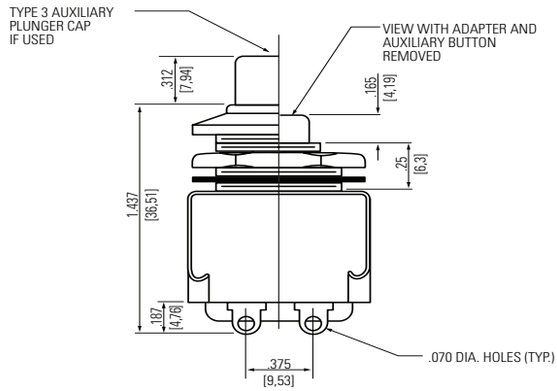
- **For switch with mounting adapter** - specify catalog number of base switch followed by suffix letters and numbers for type and color of adapter and pushbutton. Example:

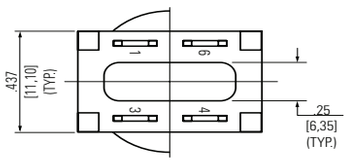


Series - H2200 Double Pole

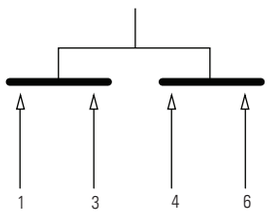
APPROXIMATE DIMENSIONS - H2200



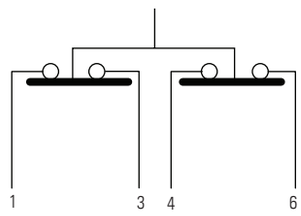




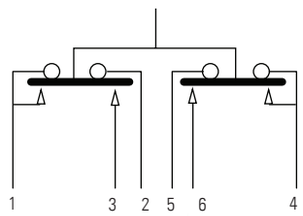
BASIC SWITCH AND SCHEMATIC DIAGRAM



D.P.S.T. NORMALLY OPEN
H2211



D.P.S.T. NORMALLY CLOSED
H2222



D.P.D.T.
H2266

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

PUSHBUTTON SWITCHES
Series - J300

Alternate Action Moisture Proof Pushbutton Switches

FEATURES

- Alternate action push-push
- Moisture proof
- Snap action contact design
- Seven adapter styles
- Four button colors
- EMI/RFI version (J334)

SPECIFICATIONS

- DPDT (J333, J334) and two circuit (J313)
- EMI/RFI shielded (J334P6)
- Seal level 2 per MIL-PRF-8805
- Operating force: 2.75 ± 1 lb (12 IN. ± 4.4N)
- Electrical life: 25,000 operations minimum
- Operating temperature: -40°F to +185°F (-40°C to +85°C)
- Total plunger travel: 0.200 in. (5.1mm) approx.
- Weight (approx.): 0.035 lbs (15.9g)
- Available in number 6 button style only

CURRENT RATINGS

Part Number	Number of Poles	Type of Operation	28VDC Resistive Load	28VDC Inductive Load	28VDC Lamp Load	120VAC Resistive Load	120VAC Inductive Load①	120VAC Lamp Load
J313	1	Alternate	10	5	1	10	5	1
J333	2	Alternate	1	—	1	1	—	1
J334②	2	Alternate	1	—	—	1	—	—

① p.f.=.75

②EMI/RFI shielded

ORDERING INFORMATION

J 3 1 3 W 6

- 6 — BUTTON STYLE
- W — CLEAR "W" ADAPTER
- J313 — 2 CIR. SWITCH TYPE

J 3 3 3 P B 6 R

- R — RED BUTTON
- 6 — BUTTON STYLE
- PB — BLACK "P" ADAPTER
- J333 — DPDT SWITCH TYPE

J 3 3 4 P 6 R

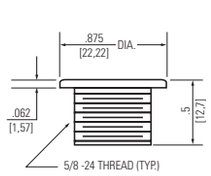
- R — RED BUTTON
- J334P6 — DPDT EMI/RFI SHIELDED SWITCH

SPECIFY ADAPTER

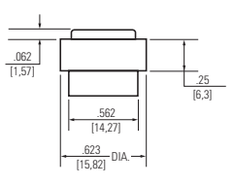
- Seven Adapter Styles
  Specify Black: B, Clear: No letter
- Plunger Color, Specify:
  Black: No letter
  Red: R
  White: W
  Gray: GY
- DPDT J333 and Two Circuit J313
- J334 only available as J334P6 or J334P6R

ADAPTER STYLES

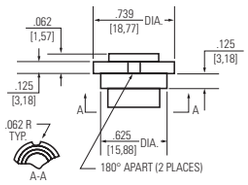
TYPE HA



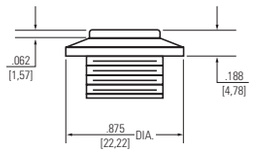
TYPE M



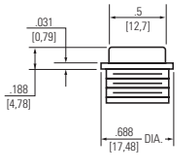
TYPE N



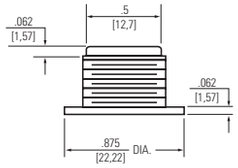
TYPE P



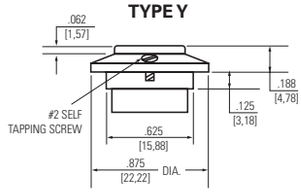
TYPE PA



TYPE W



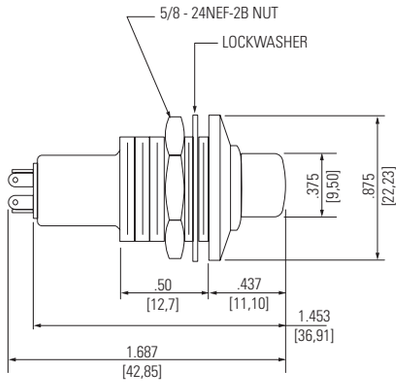
TYPE Y



STANDARD
0.00 = inches
[0,0] = mm

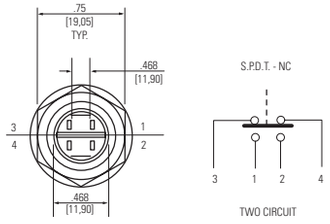
Dimensions for reference only.

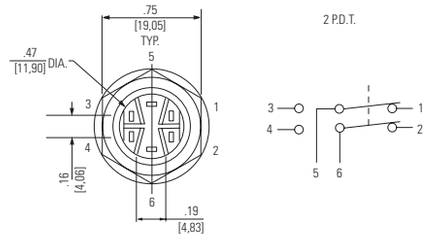
DIMENSIONS - J300



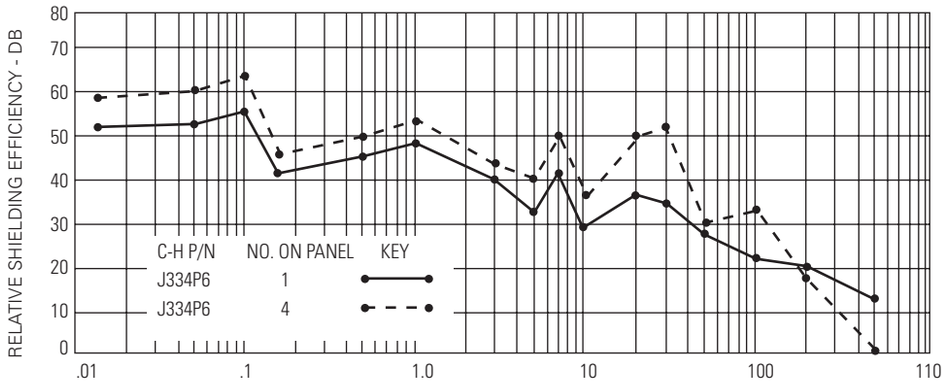
SCHEMATIC DIAGRAMS J313 TYPE J333 AND J334 TYPE

TWO CIRCUIT





"W" J334P6 - EMI/RFI SHIELDING



Graphic illustration defines relative shielding efficiency of RFI shielded component/ components over unshielded device.

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

PUSHBUTTON SWITCHES
Series - C20050

Momentary Snap Action Pushbutton Switches

FEATURES

- Snap action pushbutton
- Compact size
- Black or red buttons available
- Momentary

SPECIFICATIONS

- Meets MIL-PRF-8805/20
- Operating force: 3.5 ± 1 lb (2.48kg ± .68kg)
- Electrical life: 40,000 operations minimum at rated load
- Mechanical life: 50,000 operations minimum
- Terminal strength: 5 lbs (2.25kg)
- Single pole, two circuit
- Weight approx.: .02 lb (9g)

CURRENT RATINGS

Part Number	Number of Poles	Type of Operation	120VAC①	120VDC	230VDC②
C20050	1	Momentary	15	1	0.05

① p.f.=.50

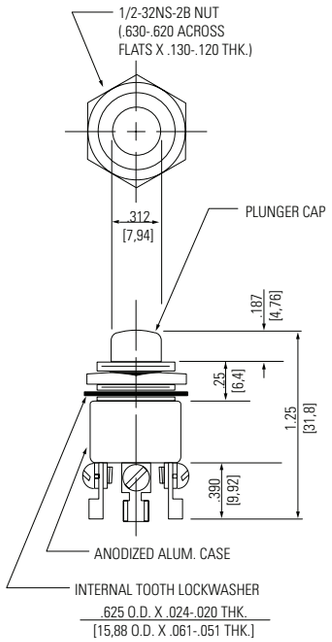
②5,000 operations

SELECTION TABLE

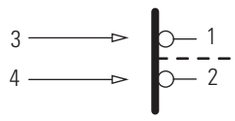
C20050

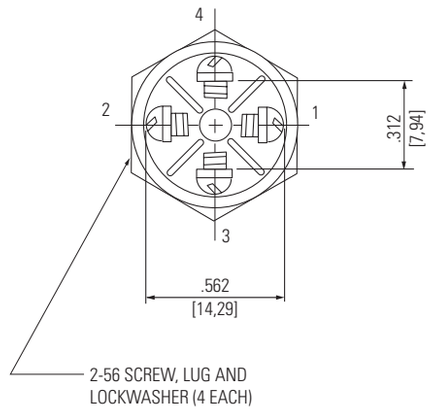
Circuit	Operation	Case Color	Button Color	Catalog Number	Military Part Number
1 P.-2 Ckt.	Momentary	Clear	Black	C20050	MS16712-1
1 P.-2 Ckt.	Momentary	Clear	Red	C20050R	MS16712-2

APPROXIMATE DIMENSIONS - C20050



BASIC SWITCH SCHEMATIC DIAGRAM





Mounting and terminal hardware supplied unassembled.

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

Series - J4004 Alternate Action

FEATURES

- Alternate action
- Snap action mechanism
- Single piece case construction
- Two case and four button colors available

SPECIFICATIONS

- Single pole, two circuit
- Operating force: 2 ± 0.75 lb (8.8N ± 3.3N)
- Mechanical life: 50,000 operations minimum
- Total plunger travel: 0.172in. (4.37mm) approx.
- Weight (approx.): 0.32 lbs (15g)
- Solder lug terminals

CURRENT RATINGS

Part Number	Number of Poles	Type of Operation	28VDC		125VAC	
			Resistive Load	Inductive Load	Resistive Load	Inductive Load①
J4004	1	Alternate	10	5	10	5

① p.f.=.75

WHEN ORDERING SPECIFY…

• **Catalog number of base switch -** followed by suffix letters for color of case and pushbutton

Order Example

J4004 (Base Catalog Number) B (Case Color) R (Pushbutton Color) = J4004BR (Complete Number)

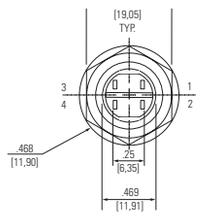
SELECTION TABLE

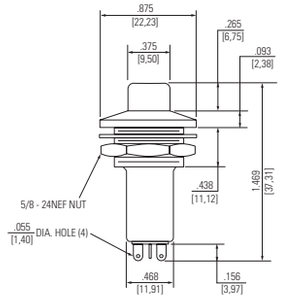
SERIES AND TYPE

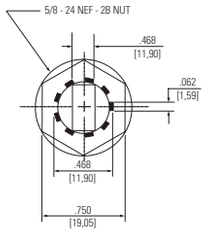
J4004 Series

Base Catalog Number	Circuit	Case Color		Plunger Color	
		Color	Code Suffix	Color	Code Suffix
J4004	1 P.-2 Ckt.	Black	B	Gray	GY
				White	W
		Clear	None	Red	R
				Black	None

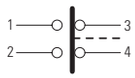
APPROXIMATE DIMENSIONS







SCHEMATIC DIAGRAM



STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

PUSHBUTTON SWITCHES
Series - J100 Alternate Action

High Current Pushbutton Switches

FEATURES

- Alternate action
- Snap action mechanism
- Single piece case construction
- Compact cylindrical size
- Black button standard
- Other colors available

SPECIFICATIONS

- Rated up to 40 amps DC or AC
- Operating force: 4 ± 2 lbs (1.8kg ± 0.9kg)
- Total plunger travel: 0.25 in.(0.635mm) approx.
- Weight (approx.): 1 oz. approx. (28.3g)

CURRENT RATINGS

Part Number	Number of Poles	Type of Operation	28VDC				115VAC			
			Continuous	Resistive	Inductive	Lamp	Continuous	Resistive	Inductive	Lamp
J100	1	Alternate	40	20	15	5	40	10	10	3
J103	1	Alternate	40	20	15	5	40	10	10	3

SELECTION TABLE

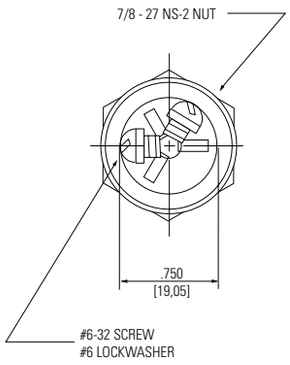
J100

Series and Type	Circuit	Catalog Number
J100	1 P.S.T.-NO.	J100
J103	1 P.D.T.-ON-ON	J103

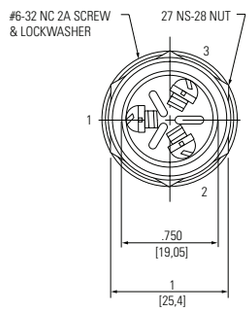
APPROXIMATE DIMENSIONS - J100 AND

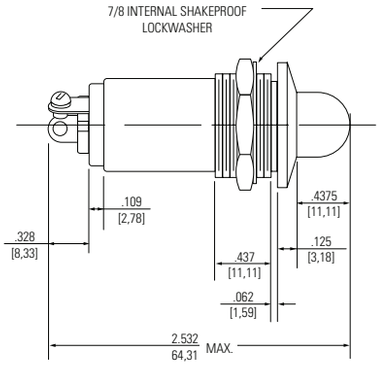
Rear Terminal View

J100



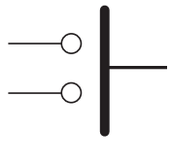
J103



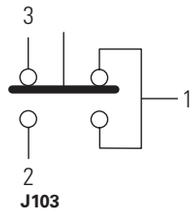


- J103 has three terminals

SCHEMATIC DIAGRAMS



J100



J103

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

Mounting and terminal hardware supplied unassembled.

Series - W300

FEATURES

- Moisture-proof
- Momentary snap action
- Black plunger (as standard)
- Various color adapters available

SPECIFICATIONS

- Electrical life: 25,000 operations minimum at rated current
- Temperature range:-67°F to +185°F (-55°C to +85C°)
- Exceeds MIL-PRF-8805 Seal Level 2
- Operating force: 5 ± 1 lb (22N ± 4.4N)
- Total plunger travel: 0.085 in. (2.2mm) approx.
- Weight with adapter: 0.025 lbs approx.

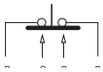
CURRENT RATINGS

Part Number	Number of Poles	Type of Operation	28VDC Resistive	28VDC Inductive	28VDC Lamp	125VAC① Resistive	125VAC① Inductive
W300	1	Momentary	10	5	3		15

① .75 PF

SELECTION TABLE

W300

Series and Type	Operation	Circuit Catalog Schematic	Catalog Number
W300	Momentary Snap Action	1 P.S.T.-NO 	W301
		1 P.S.T.- NC 	W302
		1 P.-2 Circuit 	W303

WHEN ORDERING SPECIFY...

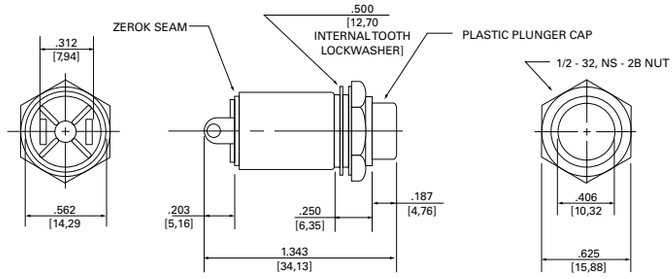
W 3 0 1 R

- R → PLUNGER CAP COLOR
- W 3 0 1 → BASIC SWITCH NO.

•Plunger Color:
Gray: GY
White: W
Red: R
Black: No Letter

APPROXIMATE DIMENSIONS - W300

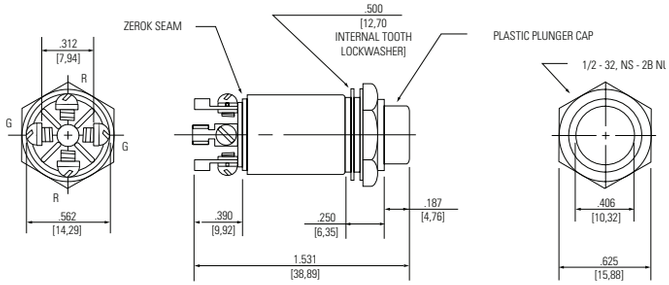
W301, W302



SUPPLIED WITH TWO TERMINAL SCREWS, LOCK WASHERS AND LUGS.

W300 SERIES W/SOLDER TERMINALS

W303



SUPPLIED WITH FOUR TERMINAL SCREWS, LOCK WASHERS AND LUGS.

W300 SERIES W/SOLDER LUG TERMINALS

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

Mounting and terminal hardware supplied unassembled.

PUSHBUTTON SWITCHES
Series - W9000

Swivel Action Pushbutton Switches

FEATURES

- Swivel action allows operation from any angle
- Large button
- Splash proof
- Momentary snap action
- Solder lug terminals
- Variety of adapter and button colors

SPECIFICATIONS

- Meets MIL-PRF-8805 seal level 6 (splash proof)
- Electrical life: 25,000 operations minimum at rated load
- Mechanical life: 200,000 operations (50,000 operations for 3 terminal design)
- Operating force: 4 ± 1 lb (17.6N ± 4.4N)
- Total plunger travel: 0.085 in. (0.22mm) approx.
- Weight with adapter: 0.088 lbs approx.

CURRENT RATINGS

Part Number	Number of Poles	Type of Operation	28VDC② Resistive	28VDC② Inductive	28VDC② Lamp	120VAC Resistive	120VAC Inductive①
W9000	1	Momentary	10	5	3		15

① p.f.=.75

② 3 amps max. through center terminal.

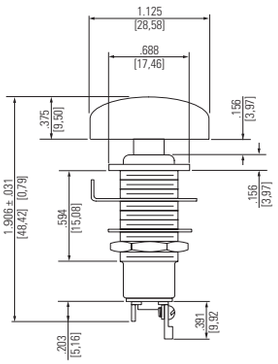
SELECTION TABLE

SERIES AND TYPE

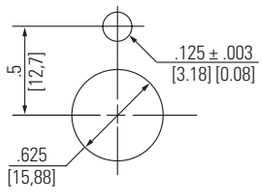
W9000

Base Catalog Number	Operation	Circuit and Schematic	Code Suffixes - Add to Cat. No. Adapter Color	Adapter Code Suffix	Pushbutton Color	Pushbutton Code Suffix
W9001	Momentary Snap Action	1 P.S.T.-N.O.	Black	None	Red	R
W9002		1 P.S.T.-N.C.				
W9003		1 P-2 Circuit				
W9004		1 P.S.T. 3 Terminal N.O.	Clear	C	Black Gray	B None
W9005		1 P.S.T. 3 Terminal N.C.				
W9006		1 P.D.T.-N.O.-N.C.				

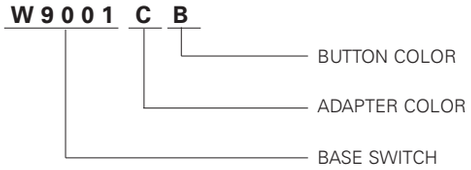
DIMENSIONS - W9000



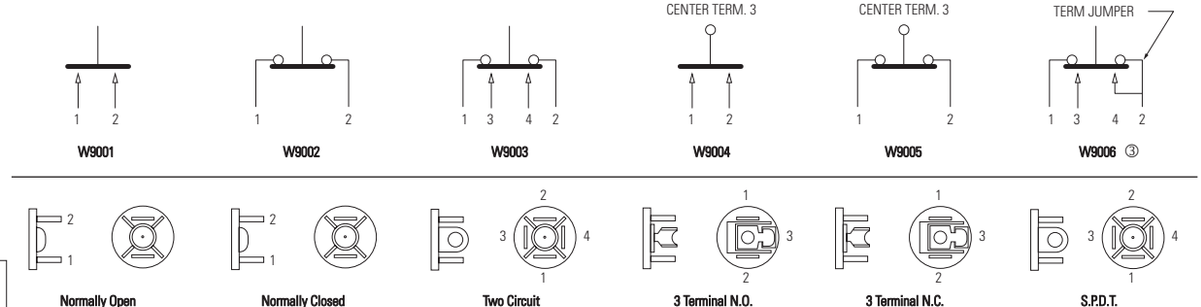
PANEL CUTOUT



WHEN ORDERING SPECIFY...



BASIC SWITCH & SCHEMATIC DIAGRAM



STANDARD
0.00 = inches
[0,0] = mm

③For W9006 or SPDT circuit, mount terminal jumper to terminals #2 and #4.

Dimensions for reference only.

Mounting and terminal hardware supplied unassembled.

Series - W9600

Wide Button Moisture-Proof Pushbutton Switches

FEATURES

- Splash-proof
- Wide diameter button
- Variety of button colors available
- Momentary snap action
- Solder lug terminals
- RFI shielded version (W9623)

SPECIFICATIONS

- Meets MIL-PRF-8805 seal level 6 (splash-proof)
- Electrical life: 25,000 operations minimum at rated current
- Mechanical life: 200,000 operations (50,000 operations for 3 terminal design)
- Operating force: 4 ± 1 lbs (17.6N ± 4.4N)
- Total plunger travel: 0.080 in. ± .015 (0.21mm ± .003) approx.
- Vibration: 10-2000Hz 15g.
- Shock: 100g. 6 Ms sawtooth
- Weight with adapter: 0.048 lbs approx.
- EMI/RFI shielded (W9623 only)

CURRENT RATINGS

Part Number	Number of Poles	Type of Operation	28VDC② Resistive	28VDC② Inductive	28VDC② Lamp	125VAC Resistive	125VAC Inductive①
W9600 Series	1	Momentary	10	5	3		15
W9623 Series	2 Circuit	Momentary	10	5	3	—	—

① p.f.=.75

② 3 amps max. through center terminal.

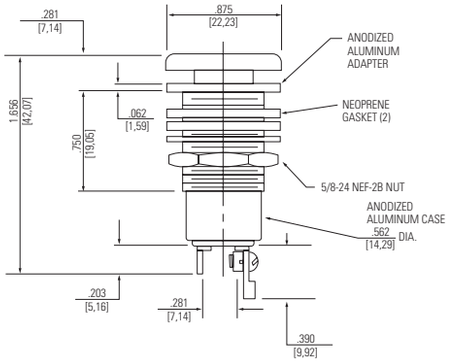
SELECTION TABLE

SERIES AND TYPE

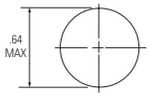
W9600

Base Catalog Number	Operation	Circuit and Schematic	Code Suffixes - Add to Cat. No. Adapter Color	Adapter Color Code Suffix	Pushbutton Color	Pushbutton Color Code Suffix
W9601	Momentary Snap Action	1 P.S.T.-N.O.	Black	B	Red	R
W9602		1 P.S.T.-N.C.				
W9603		1 P.-2 Circuit				
W9604		1 P.S.T. 3 Terminal N.O.	Clear	None	Black	B
W9605		1 P.S.T. 3 Terminal N.C.				
W9606		1 P.D.T.-N.O.-N.C.				

DIMENSIONS - W9600



PANEL CUTOUT



WHEN ORDERING SPECIFY…

W 9 6 0 1 B R

- BUTTON COLOR
- ADAPTER COLOR
- BASIC SWITCH

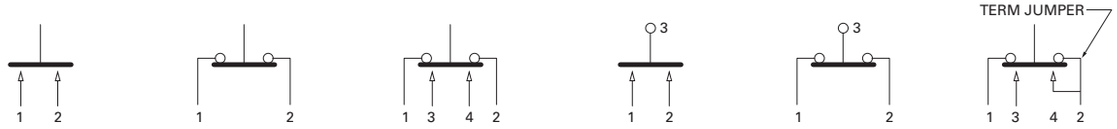
STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

PUSHBUTTON SWITCHES
Series - W9600

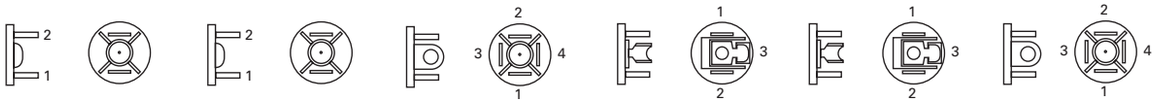
Wide Button Moisture-Proof Pushbutton Switches

BASIC SWITCH & SCHEMATIC DIAGRAM



W9601 **W9602** **W9603** **W9604 Center Term 3** **W9605 Center Term 3** **W9606①**

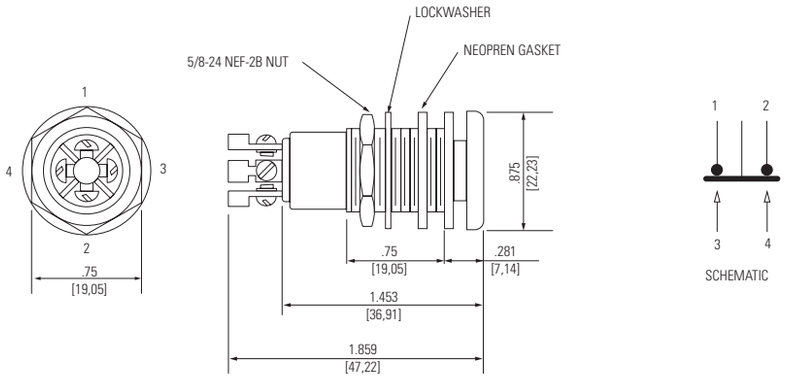
① For W9606 or SPDT circuit, mount terminal jumper to terminal #2 and #4.

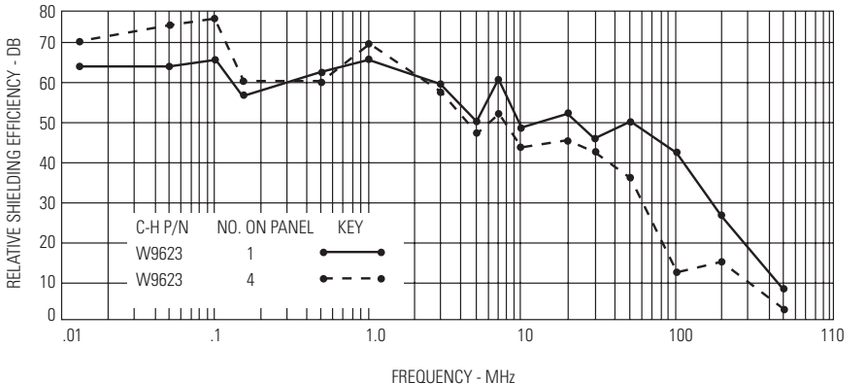


Normally Open **Normally Closed** **Two Circuit** **3 Terminal N.O.** **3 Terminal N.C.** **S.P.D.T.**

TWO CIRCUIT MODEL W9623 EMI/RMI SHIELDED

W9623





Graphic illustration defines relative shielding efficiency of RFI shielded component/ components over unshielded device.

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

Series - C100, W100, WC150

FEATURES

- Low level switching capability
- Moisture-proof
- Momentary action (except #7 button)
- Push-Pull action (#7 button only)
- Up to 1 million mechanical cycles
- EMI/RFI shielding available
- Tease resistant, snap action
- Six circuit arrangements available
- Various adapter, button styles and colors
- High contact pressure
- Compact size
- Corrosion resistant case and adapters

SPECIFICATIONS

- MS27903 (WC150 series only)
- Operating temperature: -40°F to +158°F (-40°C to +70°C)
- Electrical life: 25,000 cycles at rated load
- Operating force:
  Approx. 2.5-5 lbs (Momentary)
  Approx. 1.5-2.5 lbs (Push-Pull)
- Total plunger travel:
  0.085 in. (2.16mm) approx.
- W100 and WC150 exceeds seal level 2 per MIL-PRF-8805
- C100 series unsealed

CURRENT RATINGS

	28VDC			125VAC 60/400 HZ		
Part Number	Resistive Load	Inductive Load	Lamp	Resistive Load	Inductive Load③	Lamp
C100 Series	10①	5	3	10①	5	3
W100 Series	10②	5	3	10②	5	3
WC1500 Series	—	2	—	—	—	—
W403 P6 (R)④	10	5	—	—	—	—

①3 amps max. through center terminal of A800 and A11200
② 3 amps max. through center terminal of W104 and W105
③p.f. = .75
④EMI/RFI shielded

SELECTION TABLE

SERIES AND TYPE

C100

W100

WC150

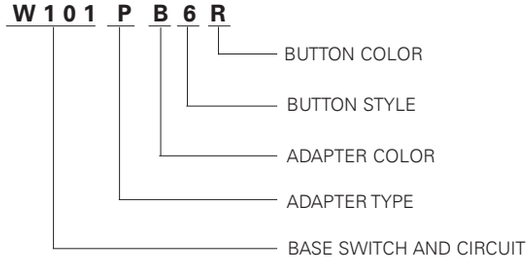
	Base Switch - Catalog Number				Options - Suffix Number			
	Solder Lug Terminals				Mounting Adapters		Auxiliary Buttons	
	Non-Sealed		Sealed					
Circuit	Normal Force	Light Op. Force (2 +/- .5 lb.)	Normal Force	Light Op. Force (2 +/- 1 lb.)	Type	Color	Style	Color
SP-NO	C100	C111	-	-	Standard: N, P, PA, W, L (with #5 button only) Optional: D, E, HA, J, M, PL, U, Y	B=Black R=Red No Alpha=Clear	2, 6, or 7 on switch without adapter	No Alpha= Black R=Red W=White
SP-NC	C3100	C112	-	-				
1 P.D.T.-2 Ckt.	C200	C113	-	-				
SP-NO 3 Term.	A800	C114	-	-				
SP-NC 3 Term.	A11200	C115	-	-				
1 P.D.T. Dbl Brk	C4100	C116	-	-			2, 3, 4 or 7 on switches with adapter	
SP-NO	-	-	W101	W111			2, 3, 4, 6 or 7	
SP-NC	-	-	W102	W112				
1 P.D.T.-2 Ckt.	-	-	W103	W113				
SP-NO 3 Term.	-	-	W104	W114				
SP-NC 3 Term.	-	-	W105	W115				
1 P.D.T. Dbl Brk	-	-	W106	W116				
2 P.D.T. 4 Ckt. May be Jumpered for 2 P.D.T.	-	-	WC150	-			2, 3, 4, 6 or 7	

WHEN ORDERING SPECIFY…

• **Catalog number of base switch -** followed by suffix numbers of options (when required) as selected from Selection Table.

Order Example:

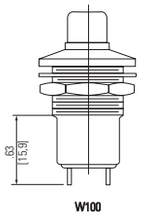
C100	HA	6	C100HA6
C100	None	7R	C1007R
↓	↓	↓	↓
Base Switch Catalog Number	Mtg. Adapter and Color	Button Style and Color	Complete Number



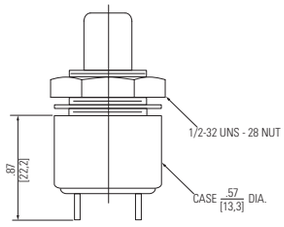
STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

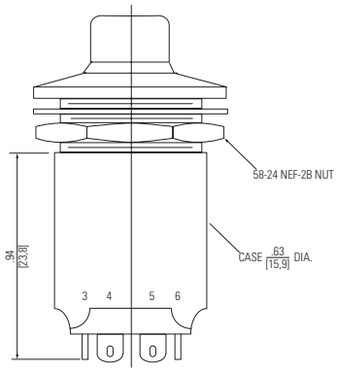
APPROXIMATE DIMENSIONS - PUSHBUTTON SWITCHES



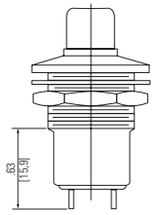
W100



C100 Without Adapter

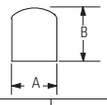
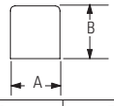
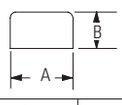
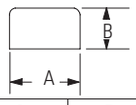
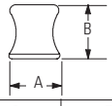


WC150
(RF1 Versions Slightly Larger)

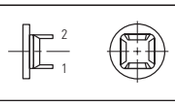


C100 With Adapter

APPROXIMATE DIMENSIONS - AUXILIARY BUTTONS

	Style Number 2		Style Number 3		Style Number 4		Style Number 6		Style Number 7	
										
	A	B	A	B	A	B	A	B	A	B
Series Number	mm. in.	mm. in.	mm. in.	mm. in.	mm. in.	mm. in.	mm. in.	mm. in.	mm. in.	mm. in.
Series C100										
Without Adapter	7.9 .31	7.9 .31	- -	- -	- -	- -	7.9 .31	4.8 .19	7.9 .31	11.9 .47
With Adapter	9.5 .37	7.9 .31	9.5 .37	7.9 .31	9.5 .37	4.8 .19	- -	- -	7.9 .31	5.6 .22
Series W100 & WC150										
With Adapter	9.5 .37	7.9 .31	9.5 .37	7.9 .31	9.5 .37	4.8 .19	9.5 .37	6.4 .25	9.5 .37	9.5 .38
Without Adapter	.37	.34	.37	.34	.37	.22	.37	.38	.37	.41

SCHEMATIC DIAGRAMS

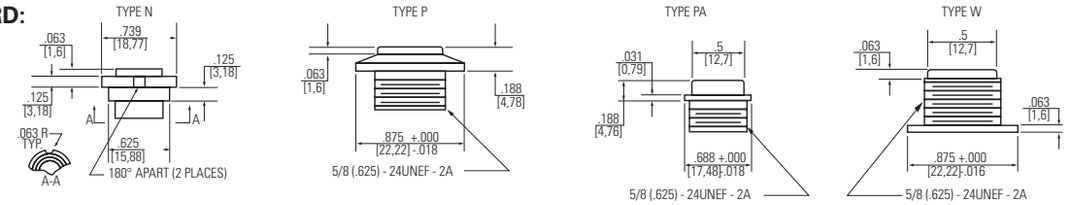
SINGLE POLE NORMALLY OPEN	SINGLE POLE NORMALLY CLOSED	SINGLE POLE DOUBLE THROW 2 CIRCUITS	SINGLE POLE NORMALLY OPEN 3 TERMINALS	SINGLE POLE NORMALLY CLOSED 3 TERMINALS	SINGLE POLE DOUBLE THROW (TERMINAL JUMPER SUPPLIED UNINSTALLED)
					
					

STANDARD
0.00 = inches
[0,0] = mm

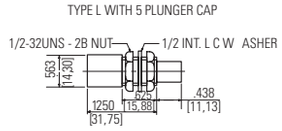
Dimensions for reference only.

APPROXIMATE DIMENSIONS - MOUNTING ADAPTERS

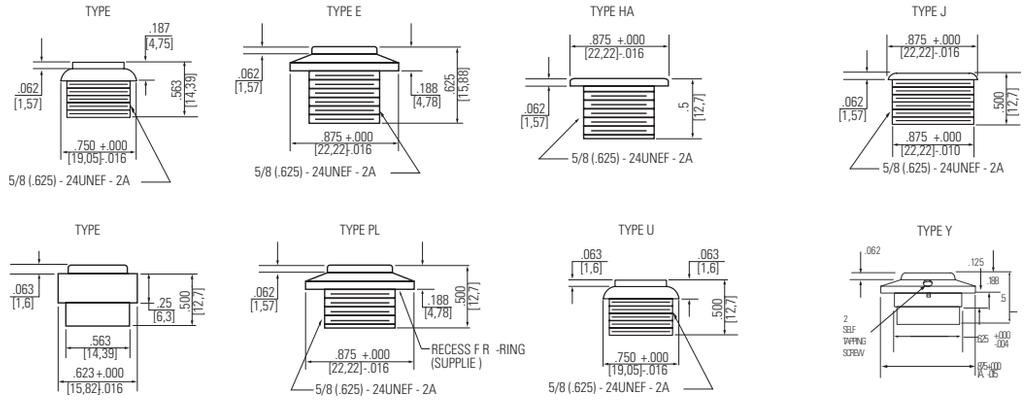
STANDARD:



PLUNGER CAP COLORS:
CHROME: NO LETTER
RED: R
BLACK: B
TOTAL PLGR TRAVEL: .438 APPROX.
OVERTRAVEL: .313 APPROX.



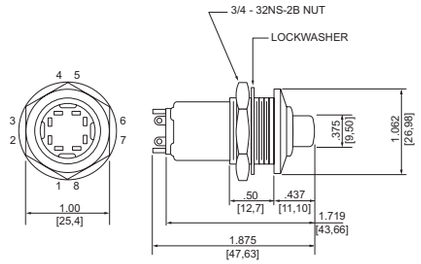
OPTIONAL:

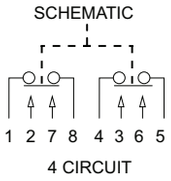


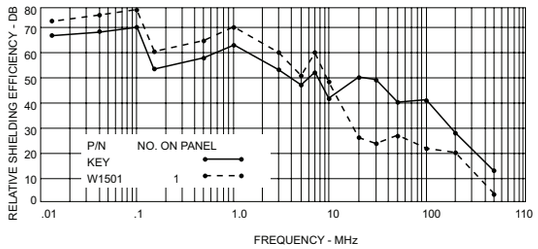
NOTE: INTERNAL THREADS 1/2 - 32 UNS-2B

EMI/RFI SHIELDED

W1501

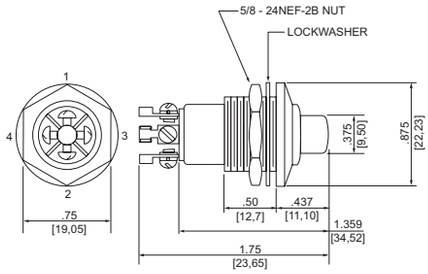


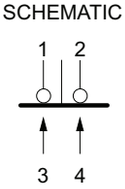


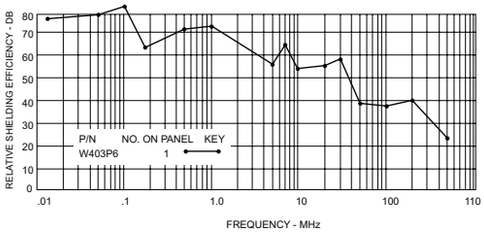


Graphic Illustration defines relative shielding efficiency of RFI shielded component/ components over unshielded device.

W403P6







Graphic Illustration defines relative shielding efficiency of RFI shielded component/ components over unshielded device.

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

PUSHBUTTON SWITCHES
Sub-Miniature Pushbutton Switches

FEATURES

- Sealed or unsealed versions
- Low operating force
- Momentary snap action
- EMI/RFI version (BR7070)
- Black or red adapter colors available
- Clear or black case colors available
- Compact, space saving design

SPECIFICATIONS

- MIL-PRF-8805 approved
- Total plunger travel:
  .08/0.093 in. (0.236 mm) minimum
- Electrical life: 25,000 operations minimum at de-rated current
  10,000 operations minimum at rated current
- Operating force:
  B9000 1.5 (6.66N) ± .5 lb (2.22N)
  BW9000, B9020 & BW9020 1.75 (7.77N) ± .5 lb (2.22N)
  B7070 1.5 (6.66N) ± .75 lb (3.33N)
  BR7070 2.0 (8.88N) ± .75 lb (3.33N)
- Weight approx.:
  B9000 & B9020 0.01 lb (4.5g) Max.
  BW9000 & BW9020 0.01 lb (4.5g) Max.
  B7070 0.02 lb (9.1g) Approx.
  BR7070 0.02 lb (9.1g) Max.
- EMI/RFI shielded (BR7070 only)

CURRENT RATINGS

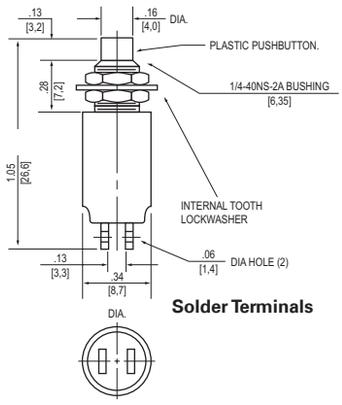
Part Number	Number of Poles	Type of Operation	28VDC Resistive Load	28VDC Inductive Load	125VAC Resistive Load	125VAC Inductive Load①
B9001	1	Momentary	7	4	7	4
B9002	1	Momentary	7	4	7	4
BW9001	1	Momentary	7	4	7	4
BW9002	1	Momentary	7	4	7	4
B9021	1	Momentary	7	4	7	4
B9022	1	Momentary	7	4	7	4
BW9021	1	Momentary	7	4	7	4
BW9022	1	Momentary	7	4	7	4
B7070	2	Momentary	1	1	1	1
BR7070②	2	Momentary	1	1	1	1

① p.f.=.75

②EMI/RFI shielded

APPROXIMATE DIMENSIONS

B9001, 2
Single Pole

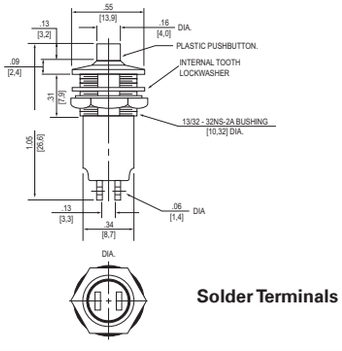


Solder Terminals

SELECTION TABLES

Catalog Number	Military Part Numbers M8805/96	Button Color	Circuit	Case Color	Enclosure Design
B9001R	-001	Red	SPST-NO	Clear	(unsealed)
B9001B	-002	Black	SPST-NO	Clear	(unsealed)
B9002R	-003	Red	SPST-NC	Clear	(unsealed)
B9002B	-004	Black	SPST-NC	Clear	(unsealed)
B9001BR	-005	Red	SPST-NO	Black	(unsealed)
B9001BB	-006	Black	SPST-NO	Black	(unsealed)
B9002BR	-007	Red	SPST-NC	Black	(unsealed)
B9002BB	-008	Black	SPST-NC	Black	(unsealed)
BW9001R	-009	Red	SPST-NO	Clear	(dust tight)
BW9001B	-010	Black	SPST-NO	Clear	(dust tight)
BW9002R	-011	Red	SPST-NC	Clear	(dust tight)
BW9002B	-012	Black	SPST-NC	Clear	(dust tight)
BW9001BR	-013	Red	SPST-NO	Black	(dust tight)
BW9001BB	-014	Black	SPST-NO	Black	(dust tight)
BW9002BR	-015	Red	SPST-NC	Black	(dust tight)
BW9002BB	-016	Black	SPST-NC	Black	(dust tight)

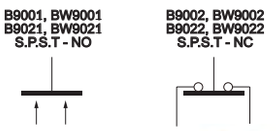
B9021, 22
Single Pole



Solder Terminals

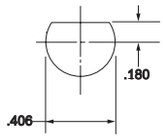
Catalog Number Standard	Catalog Number DustTight	Circuit	Case Color	Button Color
B9021CB	BW9021CB	SP-NO	Clear	Black
B9021CR	BW9021CR		Clear	Red
B9021BB	BW9021BB		Black	Black
B9021BR	BW9021BR		Black	Red
B9022CB	BW9022CB	SP-NC	Clear	Black
B9022CR	BW9022CR		Clear	Red
B9022BB	BW9022BB		Black	Black
B9022BR	BW9022BR		Black	Red

SCHEMATIC DIAGRAMS - B AND BW SERIES



PANEL CUT-OUT

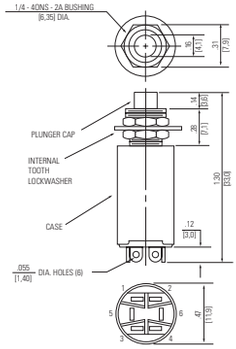
PANEL CUT-OUT



SERIES TYPE

B7070
Two Pole

APPROXIMATE DIMENSIONS

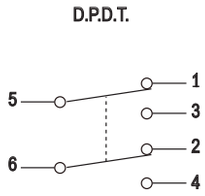


Solder Terminals

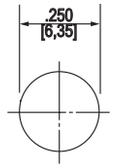
SELECTION TABLES

Catalog Number	Military Part Number	Case Color	Button Color
B7070	M8805/95-001	Clear	Black
B7070R	M8805/95-002	Clear	Red
B7070B	M8805/95-003	Black	Black
B7070BR	M8805/95-004	Black	Red

SCHEMATIC DIAGRAMS - BR7070



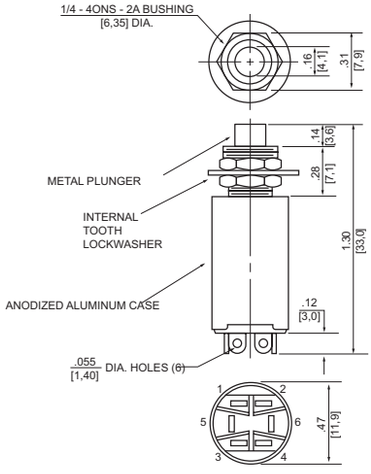
PANEL CUT-OUT



PANEL MTG HOLE DIMENSIONS

BR7070*
Two Pole

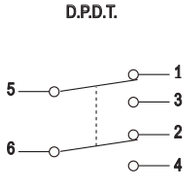
*EMI/RFI shielded



Solder Terminals

Catalog Number	Case Color	Button Color
BR7070*	Clear	Clear

SCHEMATIC DIAGRAMS - BR7070*



PANEL CUT-OUT

PANEL MTG HOLE DIMENSIONS

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

PUSHBUTTON SWITCHES
Series - A20000 Momentary Snap Action
J20000 Push-Push (Alternate) Action

Illuminated Switches

FEATURES

- Moisture resistant
- Flame retardant back material
- Low operating force
- Independent lamp circuit
- Rugged case
- A20000 Series Momentary Snap Action
- J20000 Series Alternate Action

SPECIFICATIONS

- Drip-proof enclosure design level 2
- Per MIL-PRF-22885/18
- Temperature Range: -67°F to +185°F (-55°C to +85°C)
- Operating Force: 2 ± 1 lb (8.88N)
- Plunger travel: 0.160 in. (4.06mm) approx.
- Uses either M22885/19 screw type or snap-in type lenses per MIL-PRF-22885/99.
- Uses T-1-3/4 Midget Flange Base, Incandescent Lamp

CURRENT RATINGS

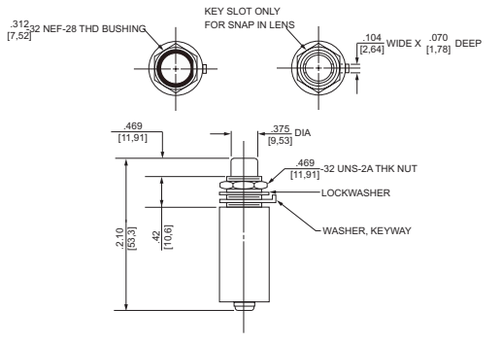
Part Number	Number of Poles	Type of Operation	28VDC Resistive	28VDC Inductive	28VDC Lamp	115VAC 60/400 Hz Resistive	115VAC 60/400 Hz Inductive	115VAC 60/400 Hz Lamp
J20000	2	Alternate	2	1.5	0.5	2	1.5	0.5
A20000	2	Momentary	2	1.5	0.5	2	1.5	0.5

SELECTION TABLE

APPROXIMATE DIMENSIONS

A20000*

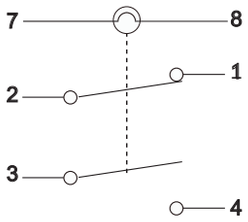
J20000



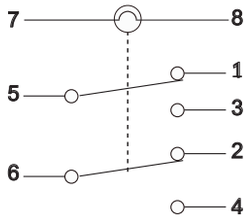
Catalog Number	Circuit	Lens Type	Detail Spec. Sheet
Alternate Action			
J20145	2 P.D.T.	Screw-in	M22885/18-02
J20149	2 Circuit		-04
J20152	2 P.D.T.	Snap-in	M22885/18-06
J20153	2 Circuit		-08
Momentary Action			
A20267	2 P.D.T.	Screw-in	M22885/18-01
A20271	2 Circuit		-03
A20272	2 P.D.T.	Snap-in	M22885/18-05
A20273	2 Circuit		-07

*NOTE: Catalog number does not include lens shown above.

SCHEMATIC DIAGRAMS - A20000 AND J20000

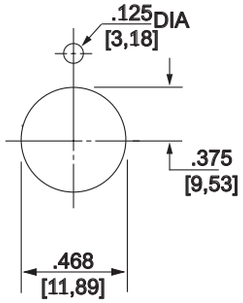


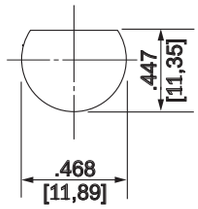
2 CIRCUIT



D.P.D.T.

RECOMMENDED PANEL MOUNTING HOLE DIMENSIONS





STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

Series - 8895-8897, 8899

FEATURES

- High strength handles and caps
- Control stick mounted on hand-held grips
- Trigger-operated pushbutton switches in handle
- Positive action, double break trigger switch
- Auxiliary switch in cap on 8895K1
- Catalog part numbers 8895 and 8896 mount to control stick
- Catalog part number 8897 features a hand strap for multi-task capability

SPECIFICATIONS

- High impact Thermoset molding materials used in handles and caps
- Temperature Range: -67°F to +150°F (-55°C to +65°C)
- Life: 10,000 operations at rated load
  10,000 operations mechanical life

CURRENT RATINGS

Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
		Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
8895K1	Trigger PB sw	40	35	5	30	20	3
	Auxiliary PB sw	20	15	1.5	11	11	1
8896K1	Trigger PB sw	40	35	5	30	20	3
8897K1	Trigger PB sw	40	35	5	30	20	3
8899K①	Pushbutton sw	10	5	3	—	—	—

①Contact Customer Service for product information

SELECTION TABLE

8896K1

8895K1

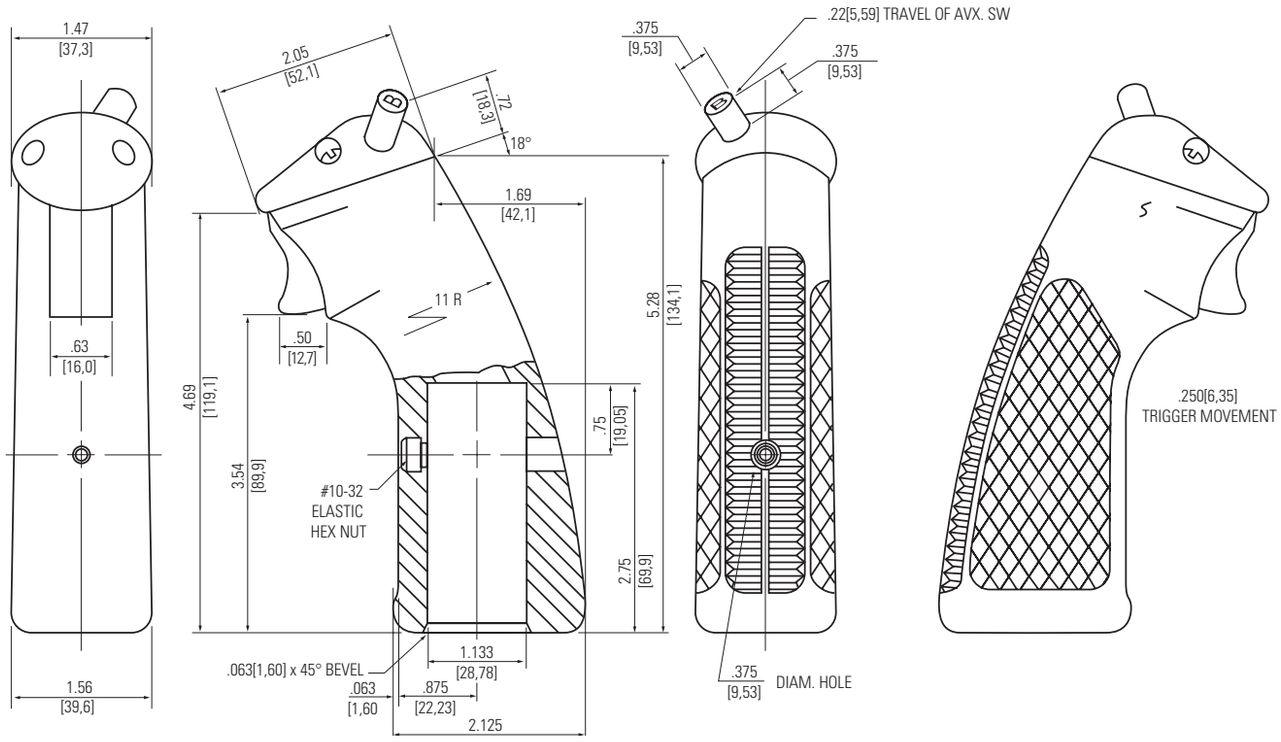
8897K1

8899

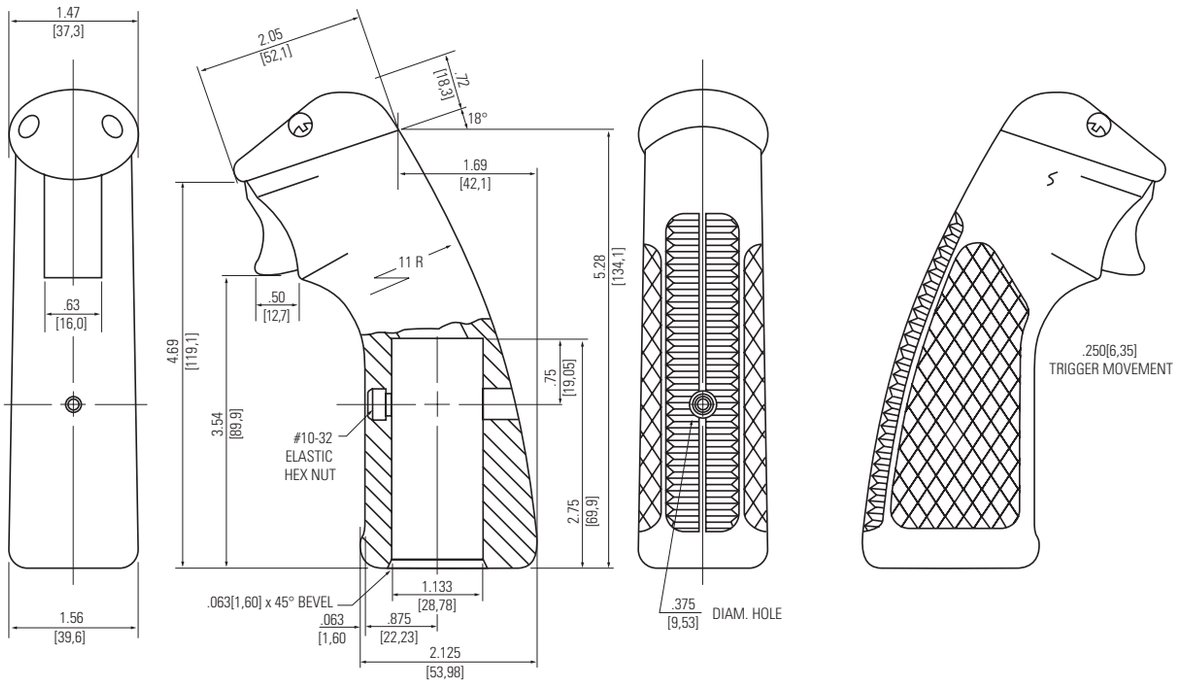
Type	Poles and Throw	Circuit Arrangement		Features	Government Drawing Number	Catalog Number
		Normal	Depressed			
Pistol Grip	1 P.S.T.	OFF	ON*	-	NAF1173-1	8896K1
				With Auxiliary Switch	NAF1173-2	8895K1
				With Hand Strap	NAF1174-1	8897K1

*Momentary Contact

APPROXIMATE DIMENSIONS - 8895K1



APPROXIMATE DIMENSIONS - 8896K1

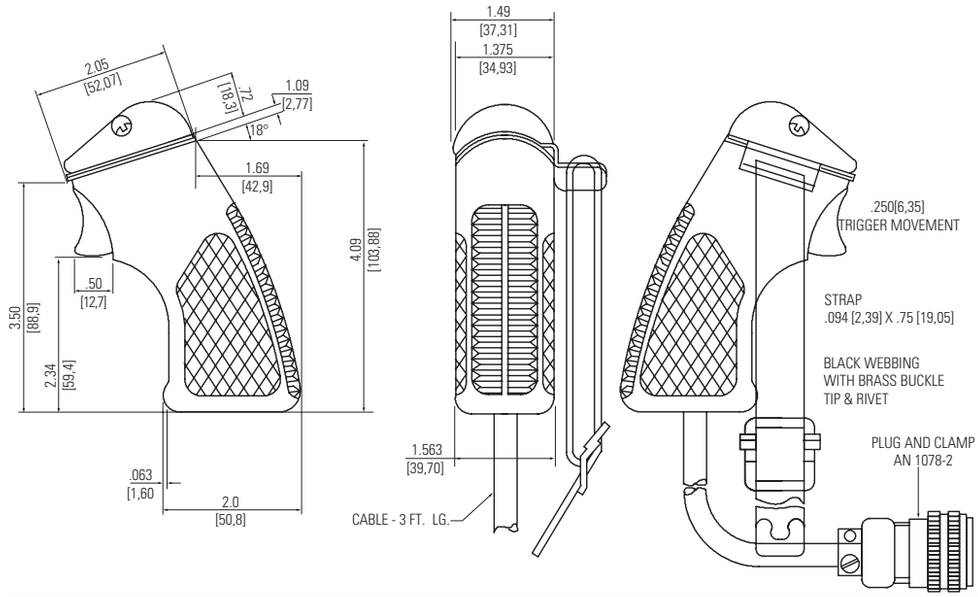


STANDARD
0.00 = inches
[0,0] = mm

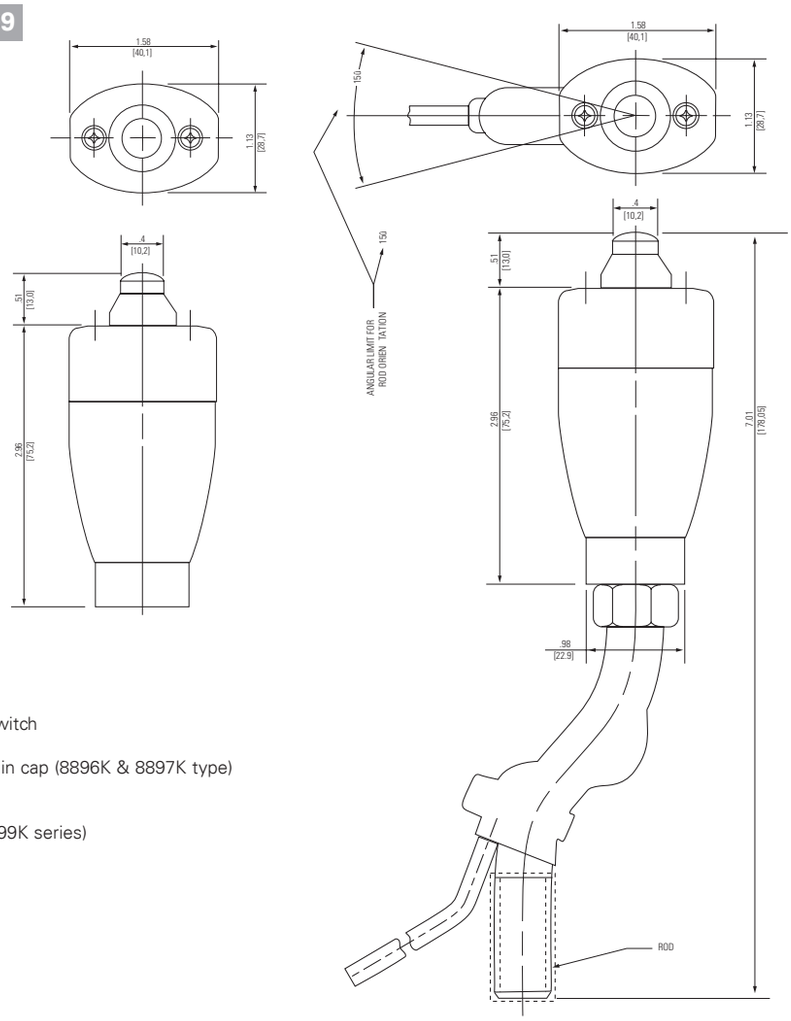
Dimensions for reference only.

Series - 8895-8897, 8899

APPROXIMATE DIMENSIONS - 8897



APPROXIMATE DIMENSIONS - 8899



OPTIONS/ACCESSORIES

- Replace trigger switch with sealed pushbutton switch
- Harness assemblies available
- Auxiliary toggle or pushbutton switches installed in cap (8896K & 8897K type)
- Multi-function switch variations
- Replacement components
- Joystick or hand-held configurations available (8899K series)

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

PUSHBUTTON SWITCHES
Series - 8870, 8809

Special Designed Pushbutton Switches

FEATURES

- All switches employ momentary action
- Foot or hand operation designs
- Plunger has ice and mud scraper
- Mechanical lock on 8909K559
- Mechanical lock has spring loaded release design
- Logic to power switching load capability

SPECIFICATIONS

- MS approved and QPL'd to MIL-PRF-8805
- Temperature Range: -40°F to +185°F (-40°C to +85°C)
- Life: 20,000 operations at rated load
  50,000 operations mechanical life

CURRENT RATINGS

Catalog Number	28VDC			115VAC 60 or 400Hz		
	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
8870K2	25	10	4	15	7.5	2
8870K3	25	10	4	15	7.5	2
8870K4	25	10	4	15	7.5	2
8870K5	25	10	4	15	7.5	2
8909K559	6	—	—	6	—	—

SELECTION TABLE

8870K2 & K4

8870K3 & K5

8909K559

Poles and Throw	Circuit Arrangement Normal	Depressed	Mounting	Features	Government Part Number	Catalog Number
1 P.S.T.	OFF	ON*	Flush ②	Microphone PB Switches	M8805/55-001	8870K2
					M8805/55-002	8870K3
				Foot Operated	M8805/55-003	8870K4
					M8805/55-004	8870K5
2 P.S.T.	OFF	ON*	Flush ②	Roller Operated	—	8909K559①

* Momentary contact.

① Electrical life of 8909K559 is 12,000 operations.

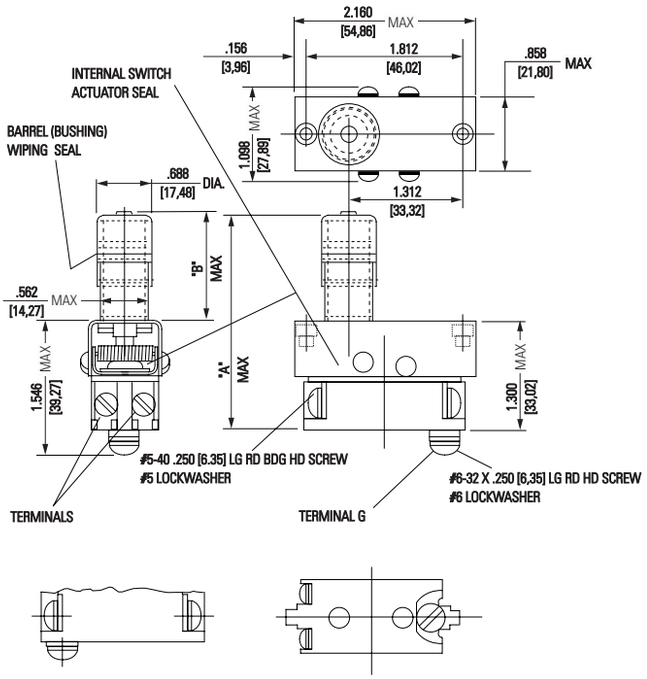
② See page B25 for mounting data.

OPTIONS/ACCESSORIES

- Terminal screws furnished assembled
- Double throw contacts - 8870
- Special marking

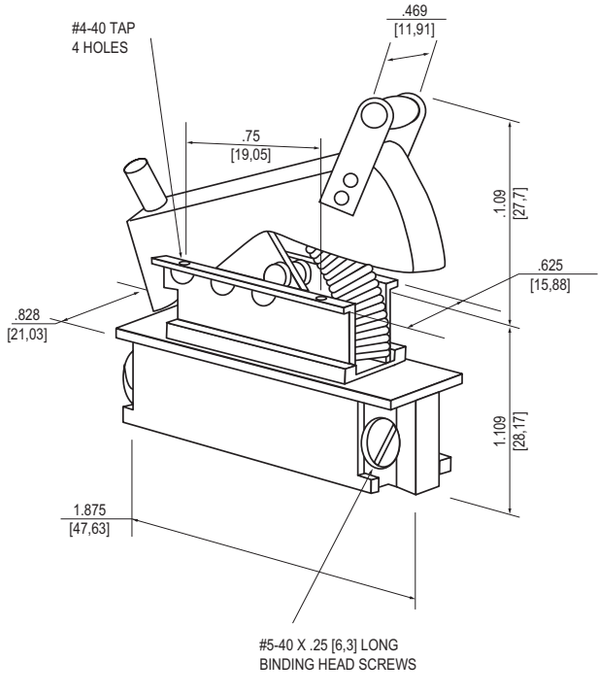
Series - 8870, 8809

APPROXIMATE DIMENSIONS - 8870K2, K3, K4, K5



8870K5	2.968	1.660	6-32 UNC-2B
8870K4	2.218	.910	6-32 UNC-2B
8870K3	2.968	1.668	6-40 UNF-2B
8870K2	2.218	.910	6-40 UNF-2B
CAT.NO.	A	B	INSERT & NUT THREAD

APPROXIMATE DIMENSIONS - 8909K559



STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

NOTES

SECTION C
Rocker Switches Index

**Most items listed in this catalog are standard products and are normally in Distributor Inventory; however, the current inventory status should be checked by contacting your Safran Electrical & Power Customer Service Representative at 800-955-7354 or your authorized Distributor before placing orders.*

"ILLUMINATER™ " SERIES SEALED ROCKER SWITCHES

DESCRIPTION

The new Illuminater series of front panel mounted rocker switches are sealed to meet the watertight requirements of MIL-STD-108E. Product variations are with standard or locking rocker Actuator, and single or double pole switching with multi-circuits. A variety of accessory items are also available. This product is ideally suited for use in harsh environmental applications.

DESIGN FEATURES

- Front panel mounted
- Totally sealed switching chamber
- Various circuit variations
- Keyed assembly - actuator to bezel and base to connector
- Removable rocker button
- One or two lamp capability
- Full size clear lens with non-glare surface
- Icons located beneath lens surface (high wearability)
- Diffusion lens alters icon background lighting
- Minimum light leakage
- Various locking styles available
- Matte black textured finish on bezel/actuator
- Molded-in terminal identification
- Molded-in orientation mark

SPECIFICATIONS

- Watertight per MIL-STD-108E
- Temperature range: -40°F to +160°F (-40°C to +71°C)
- Dielectric strength 1800 V RMS @ sea level
- Life: 50,000 cycles min. electrical; 100,000 cycles min. mechanical
- Silver plated contact - standard
- Flame retardant thermoplastic bezel and base
- Stainless steel mounting clips

ACCESSORIES

- Indicator light assembly (see page C7)
- Filler plug (see page C6)
- Connector (see page C7)
- Gang mounting system

OPTIONS

- Non-illuminated switch
- Gold plated contacts

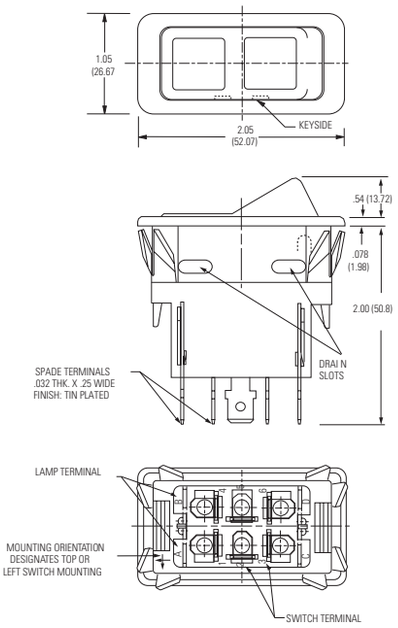
SINGLE POLE ELECTRICAL RATINGS

Type of Operation	6 & 14VDC			28VDC		
	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
Maintained	25	15	7.5	20	15	5
Momentary	20	10	6	15	10	4

DOUBLE POLE ELECTRICAL RATINGS

Type of Operation	6 & 14VDC			28VDC		
	Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
Maintained	30	20	10	20	15	7
Momentary	25	15	7.5	18	10	5

DIMENSIONS



W/O Panel Seal

Note: For recommended panel cutout dimensions, see page C7.

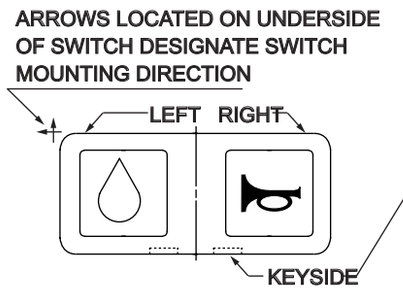


FIGURE 1
Horizontal Mount

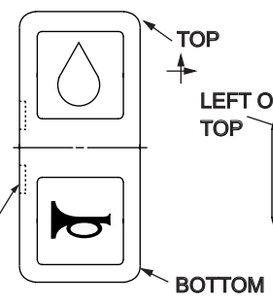


FIGURE 2
Vertical Mount

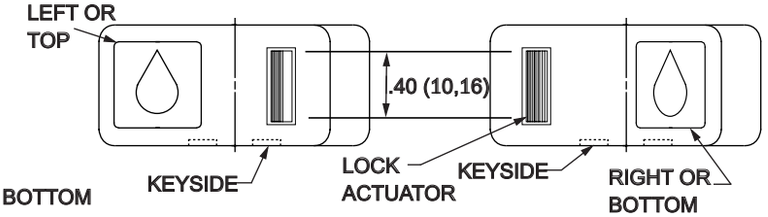


FIGURE 3
Locking Actuator Styles 4, 5, Y, & T

FIGURE 4
Locking Actuator Styles 6, 7, W, & S

"ILLUMINATER™ " SERIES PART NUMBERING SYSTEM

ACTUATOR STYLE (See Page C3, Figs 1-4)

Code	Style
1	(1) Lens Top or Left
2	(1) Lens Bottom or Right
3	(2) Lenses
4	Lock in both End Positions w/ Lens (or Plain Surface) Top or Left
5	Lock in Center Position w/ Lens (or Plain Surface) Top or Left
6	Lock in Both End Positions w/ Lens (or Plain Surface) Bottom or Right
7	Lock in Center Position w/Lens (or Plain Surface) Bottom or Right
A	Plain Rocker Button (No Lenses)
S	Lock in (1) End Position w/ Lens (or Plain Surface) Bottom or Right (Lens or Plain Surface Locked in "UP" Position
T	Lock in (1) End Position w/ Lens (or Plain Surface) Top or Left (Lens or Plain Surface Locked in "UP" Position
W	Lock in (1) End Position w/ Lens (or Plain Surface) Bottom or Right (Lens or Plain Surface Locked Actuated Position)
Y	Lock in (1) End Position w/ Lens (or Plain Surface) Top or Left (Lens or Plain Surface Locked Actuated Position)

ICON (Location - Top or Left "only")

(See Page C8 for Icon Selection Table)

Code	Function
DF	Oil

(Code "ZZ" = No Icon)

ICON (Location - Bottom or Right "only")

(See Page C8 for Icon Selection Table)

Code	Function
BF	Horn

(Code "ZZ" = No Icon)

DIFFUSION LENS COLOR

(Location - Top or Left "only")

Code	Color
0	None
1	Amber
2	Blue
3	Green
4	Red
5	White
6	Clear

DIFFUSION LENS COLOR

(Location - Bottom or Right "only")

Code	Color
0	None
1	Amber
2	Blue
3	Green
4	Red
5	White
6	Clear

BAFFLE

(Light Intensity Deflector)

Code	Color
A	(1) Top or Left
B	(1) Bottom or Right
C	(2) Baffles
Z	None

ACTUATOR MOUNTING POSITION & COLOR

Code	Orientation
F	Optional / Black (Plain Actuator no Lenses)
H	Horizontal / Black
V	Vertical / Black

B 01 A 5 J H 3 DF 2 ZZ 3 Z = B01A5JH3DF2ZZ3Z

NO. OF POLES

Code	Selection
A	Single
B	Double

OPTIONAL FEATURES

Code	Option
A	Silver Contacts
G	Gold Contacts

ROCKER TYPE

Code	Type
5	Illuminated
6	Non - Illuminated
7	Locking Feature Illuminated
8	Locking Feature Non-Illuminated

LAMP SELECTION

Code	Voltage	No. Lamps	Location
D	14VDC	1	Top or Left
E	14VDC	1	Bottom or Right
F	14VDC	2	Both Locations
G	28VDC	1	Top or Left
H	28VDC	1	Bottom or Right
J	28VDC	2	Both Locations
K	See①	1	Top or Left
L	See①	1	Bottom or Right
M	See①	2	Both Locations
Z	Non - Illuminating		

① Furnished without lamps. Provisions for lamp available as indicated under location.

CIRCUIT ARRANGEMENT

Code	Top or Left	Center	Bottom or Right	Available Locking Configuration
01	On	Off	On	4,5,6,7,Y,T,S
02	Mom On	Off	Mom On	5,7
03	On	Off	Mom On	5,7,Y,S
04	On	None	On	4,6,Y,W,T,S,
05	On	None	Mom On	Y,S
06	On	Off	None	5,Y
07	None	Off	Mom On	7
08	On	Mom Off	None	Y
09	On	None	Off	4,6,Y,W,T,S
10	On	None	Mom Off	Y,S
11	Off	None	Mom On	Y,S
12	Mom On	On	None	5
13	On	On	None	5,Y
*14	On	On	On	4,5,6,7,Y,W,T,S
* 15	On	On	Mom On	5,7,Y,S
* 16	Mom On	On	Mom On	5,7
50	Mom On	Off	On	5,7,W,T
51	Mom On	None	On	W,T
52	None	Off	On	7,W
53	Mom On	Off	None	5
54	None	Mom Off	On	W
55	Off	None	On	4,6,Y,W,T,S
56	Mom Off	None	On	W,T
57	Mom On	None	Off	W,T
58	None	On	Mom On	7
59	None	On	On	7,W
* 60	Mom On	On	On	5,7,W,T

* Double pole switches only

PART NUMBER WORKSHEET

No. of Poles	Circuit Arrangement	Bezel Color	Bezel Style	Lamp Selection	Mounting Position	Actuator Style	Icon - Top or Left	Diffusion Lens Color	Icon - Bottom or Right	Diffusion Lens Color	Diffusion Lens Color
B	01	A	5	J	H	3	DF	2	ZZ	3	Z

"ILLUMINATER™ " SERIES INDICATOR AND ACCESSORIES

DESCRIPTION

Along with this new line of illuminated rocker switches, we also offer a line of accessories. General styling and appearance match those of the basic switch, with design features as stated.

DESIGN FEATURES

Indicator

- Front panel mounted
- Keyed assembly
  - indicator lens assembly to bezel
  - connector to bezel superstructure
- Removable indicator lens assembly
- One or two lamp capability
- Full size clear lens with non-glare surface
- Icons located beneath lens surface
- Diffusion lens alters icon background lighting
- Matte black textured finish on indicator assembly
- Molded-in terminal identification
- Molded-in orientation mark

SPECIFICATIONS / MATERIALS

- Temperature range: -40°F to +160°F (-40°C to +71°C)
- Flame retardant thermoplastic bezel and base
- Stainless steel mounting clips

OTHER ACCESSORIES

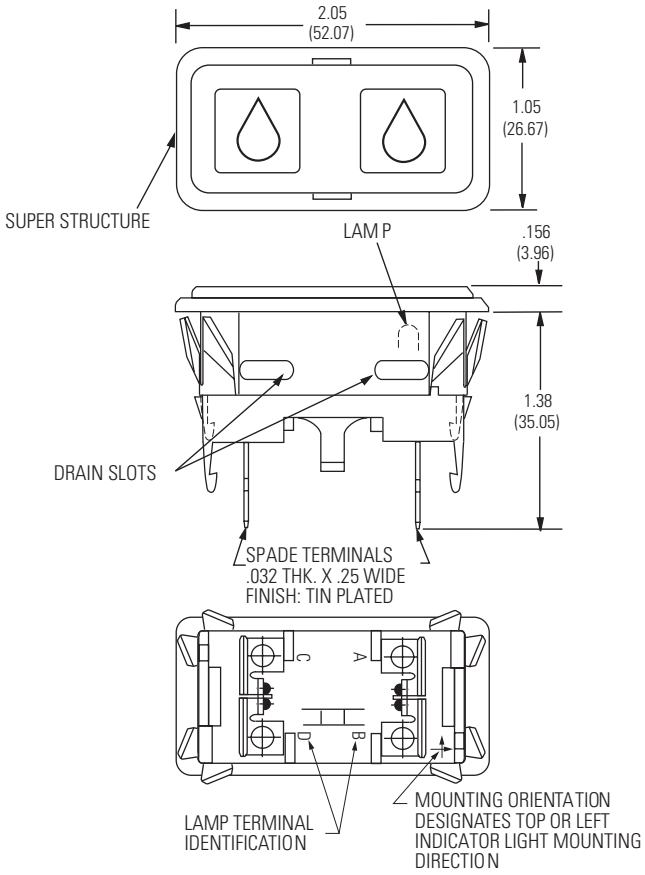
- Connector (see page C7)

FILLER PLUG

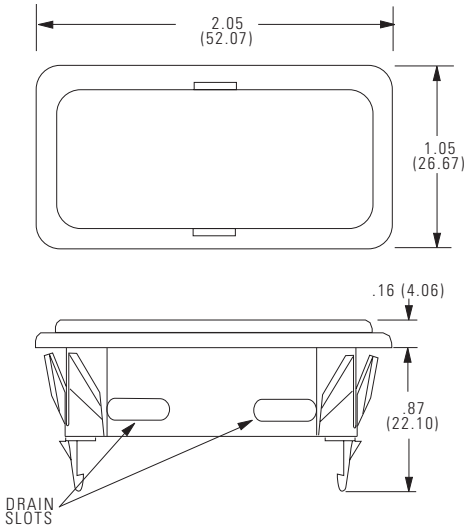
- Front panel mounted
- Accepts - connector/harness assembly
- Matte black textured finish

"ILLUMINATER™ " SERIES INDICATOR AND ACCESSORIES ENGINEERING DATA

INDICATOR



FILLER PLUG - P/N P24010



Note: For recommended panel cutout dimensions, see page C7.

"ILLUMINATER™ " SERIES INDICATOR PART NUMBERING SYSTEM

INDICATOR STYLE (See Page C7, Figs. 1&2)

Code	Style
1	Lens Top or Left
2	Lens Bottom or Right
3	Two Lenses

ICON (Location - Top or Left "only")
(See Page C8 for Icon Selection Table)

Code	Function
DF	Oil

(Code "ZZ" = No Icon)

ICON (Location - Bottom or Right "only")
(See Page C8 for Icon Selection Table)

Code	Function
BF	Horn

(Code "ZZ" = No Icon)

MOUNTING POSITION/COLOR

Code	Color
D	Horizontal/ Black
E	Vertical/ Black

DIFFUSION LENS COLOR
(Location - Top or Left "only")

Code	Color
0	None
1	Amber
2	Blue
3	Green
4	Red
5	White
6	Clear

DIFFUSION LENS COLOR
(Location - Bottom or Right

Code	Color
0	None
1	Amber
2	Blue
3	Green
4	Red
5	White
6	Clear

ROO B 5 J D 3 DF 2 ZZ 3 Y = ROOB5JD3DF2ZZ3Y

INDICATOR SUPERSTRUCTURE

BEZEL COLOR

Code	Color
B	Black

BEZEL STYLE

Code	Style
5	W/O Panel Seal

LAMP SELECTION

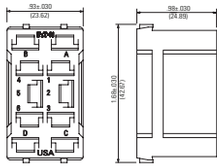
Code	Voltage	No. Lamps	Location
D	14VDC	1	Top or Left
E	14VDC	1	Bottom or Right
F	14VDC	2	Both Locations
G	28VDC	1	Top or Left
H	28VDC	1	Bottom or Right
J	28VDC	2	Both Locations
K	See①	1	Top or Left
L	See①	1	Bottom or Right
M	See①	2	Both Locations

① Furnished without lamps. Provisions for lamp available as indicated under location.

PART NUMBER WORKSHEET

Indicator Superstructure	Bezel Color	Bezel Style	Lamp Selection	Mounting Position	Indicator Style	Icon - Top or Left	Diff. Lens Color	Icon - Bot. or Right	Diff. Lens Color	Lamp Selection
ROO	B	5	J	K	3	DF	2	ZZ	3	Y
ROO										Y
ROO										Y
ROO										Y

ACCESSORY ITEM



Connector Shell P/N 17-19388.

INDICATOR STYLE

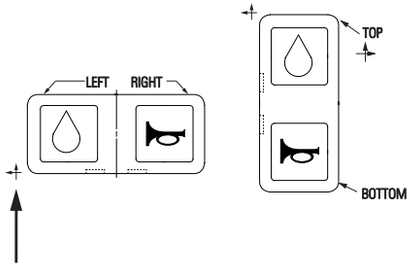


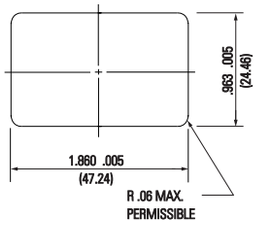
Figure 1
Horizontal Mount.

Figure 2
Vertical Mount

Mounting orientation shown on bottom of base designates top or left indicator light mounting direction.

RECOMMENDED PANEL CUTOUT

DIMENSIONS AND PANEL THICKNESS



Recommended Metal Panel Thickness
.040 (1.02) to .140 (3.56)

"ILLUMINATER™ " SERIES ICON SELECTION TABLE

Code		Description	SAE Spec. No. J1632
-DF		Oil	1056
-CW		Level Indicator	0159
-DG		Temperature	0034
-DA		On/Start	5007
-DB		Off/Stop	5008
-BF		Horn	0244
-BT		Fast	None
-BV		Slow	None
-CN		Lock	1656
-CR		Unlock	None
-DH		Rearward Moving Machine Alarm	None
-DJ		Rearward Moving Machine Alarm-CANCEL	None
-BU		Engine-Basic Symbol	1156
-CK		Engine-Electrical Preheat (Low Temperature Start Aid)	1704
-AJ		Engine-Gas Injection (Low Temperature Start Aid)	1547
-BZ		Transmission-Basic Symbol	1166
-BL		Fuel or Fuel System Basic Symbol	0245

Code		Description	SAE Spec. No. J1632
-AX		Headlights - High/Upper Beam	0082
-AY		Headlights - Low/Dipped Beam	0083
-AZ		Work Light	1204
-DK		Parking Lights	0240
-CJ		Hazard Warning Lights	0085
-BB		Interior Dome Light	1421
-BC		Beacon	1141
-DL		Turn Signals	0084
-DM		Front Fog Lights	0633
-CE		Rear Fog Lights	0634
-BA		Instrument Illumination	1556
-BG		Windshield-Wiper	0086
-BH		Windshield Washer	0088
-CU		Windshield - Washer & Wiper	0087
-BJ		Rear Window - Wiper	0097
-BK		Rear Window - Washer	0099
-DN		Rear Window - Washer & Wiper	0098
-AA		Heater/Interior Heating	0637
-BE		Air Conditioning/Cooling System	0027
-BD		Ventilating/Air Circulating Fan	0089

Typical icons illustrated are per SAE Pub No.s: J-107, J-1048, and J-1449. Additional icons are available upon request.
Note: If no icon is required, enter code "ZZ".

Series - 8551, 8552, 8553

ECONOSWITCH SEALED ROCKER SWITCHES
Econoswitch Sealed Rocker Switches With Removable Rocker Button (RB Series)

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Rocker button is removable for decal or icon interchangeability
- Multi-circuits
- Three types of termination offered as standard
- Rocker button variations
  - Smooth and serrated in opaque colors
  - Transparent
  - Translucent
- Panel mounting variations
  - Flush panel
  - Sub panel

SPECIFICATIONS

- Watertight per MIL-STD-108E and designed to meet IP68
- UL recognized and CSA certified
- Base compression seal
- Temperature Range: -50°F to +150°F (-46°C to +66 °)
- Life: 50,000 operations at rated load 100,00 operations mechanical life
- Three standard types of terminals
  - Screw 6-32" UNC-2A
  - Solder lug .125 [3,17] dia. hole
  - Spade .250 [6,35]x.032 [0,81] thick

CURRENT RATINGS

WHEN ORDERING SPECIFY

* Catalog number of base switch followed by suffix letters and numbers for mounting bracket, rocker color and style as listed in selection table.

Order Example:

8522K1	T	33	M	8552K1T33M
Base Switch	Frame Style	Rocker Style	Rocker Color	Complete Number

Sub-Panel Style

Flush Panel Style

SELECTION TABLE

CIRCUIT WITH LEVER IN . . .			BASE CATALOG NUMBER②			SUFFIX NUMBERS & LETTERS - ADD TO BASE CATALOG NUMBER					
						MOUNTING BRACKET		ROCKER STYLE③		ROCKER COLOR	
Up Position	Center Position	Down Position (ID lug)①	Screw Terminals	Solder Terminals	Spade Terminals	Frame Style	Code Letter	Style	Code No.	Color	Code Letter
One Pole											
ON	OFF	ON	8551K1	8551K91	8551K31						
ON	NONE	OFF	K9	K99	K39						
ON	NONE	ON	K4	K94	K34					White	M
ON	OFF	NONE	K6	K96	K36						
ON	NONE	ON*	K5	K95	K35						
* ON	OFF	ON*	K2	K92	K32						
NONE	OFF	ON*	K7	K97	K37						
ON	NONE	OFF*	K10	K910	K310	Flush Panel	T	Serrated	32	Red	T
OFF	NONE	ON*	K11	K911	K311						
ON	OFF	ON*	K3	K93	K33						
* ON	ON	NONE	K12	K912	K312						
ON	ON	NONE	K13	K913	K313						
Two Pole										Black	V
ON	OFF	ON	8552K1	8552K91	8552K31						
ON	NONE	OFF	K9	K99	K39						
ON	NONE	ON	K4	K94	K34						
ON	OFF	NONE	K6	K96	K36						
ON	NONE	ON*	K5	K95	K35	Sub-Panel	W	Smooth	33	Translucent	L
* ON	OFF	ON*	K2	K92	K32						
NONE	OFF	ON*	K7	K97	K37						
ON	NONE	OFF*	K10	K910	K310						
OFF	NONE	ON*	K11	K911	K311						
ON	OFF	ON*	K3	K93	K33					Transparent	P
* ON	ON	NONE	K12	K912	K312						
ON	ON	NONE	K13	K913	K313						
ON	ON	ON	K14	K914	K314						
ON	ON	ON*	K15	K915	K315						
* ON	ON	ON*	K16	K916	K316						

* Momentary Contact.
① Identification lug side.
② Incomplete catalog number: add suffix letters and numbers for Mounting Brackets, Rocker Style & Color

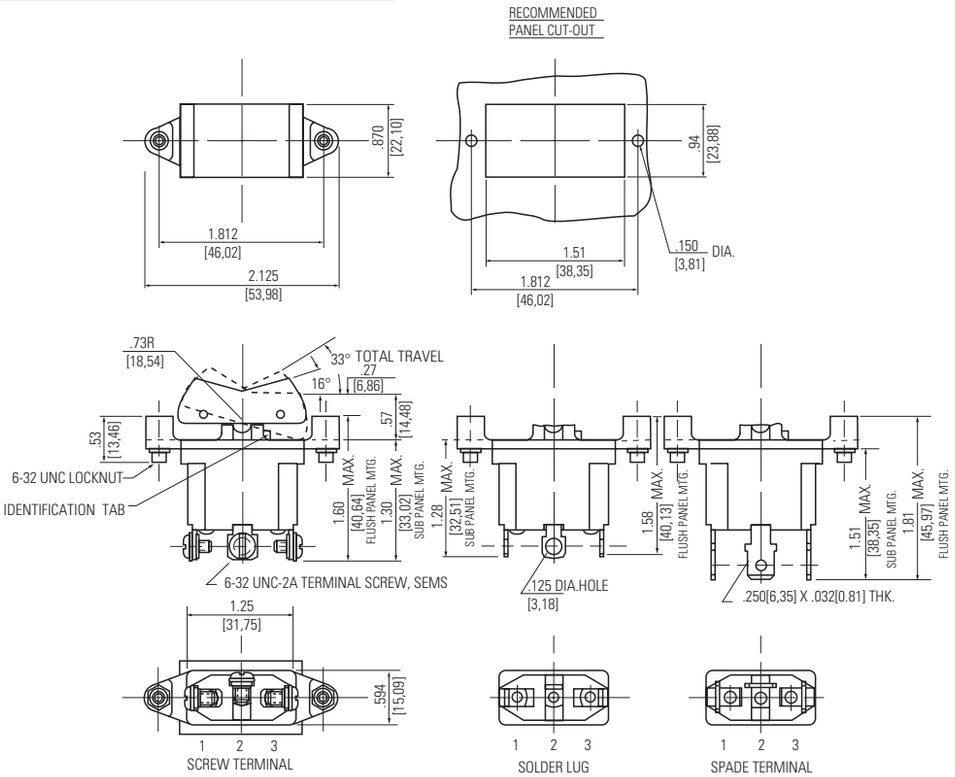
③ Other Rocker Styles available

SELECTION TABLE, CON'T.

CIRCUIT WITH LEVER IN . . .			BASE CATALOG NUMBER②			SUFFIX NUMBERS & LETTERS - ADD TO BASE CATALOG NUMBER					
Up Position	Center Position	Down Position (ID lug)①				MOUNTING BRACKET		ROCKER STYLE③		ROCKER COLOR	
			Screw Terminals	Solder Terminals	Spade Terminals	Frame Style	Code Letter	Style	Code No.	Color	Code Letter
	Four Pole										
ON	OFF	ON	8553K1	8553K91	8553K31					White	M
ON	NONE	OFF	K9	K99	K39						
ON	NONE	ON	K4	K94	K34	Flush	T	Serrated	32		
ON	OFF	NONE	K6	K96	K36	Panel				Red	T
ON	NONE	ON*	K5	K95	K35						
* ON	OFF	ON*	K2	K92	K32						
NONE	OFF	ON*	K7	K97	K37					Black	V
ON	NONE	OFF*	K10	K910	K310						
OFF	NONE	ON*	K11	K911	K311						
ON	OFF	ON*	K3	K93	K33						
* ON	ON	NONE	K12	K912	K312	Sub-	W	Smooth	33	Translucent	L
ON	ON	NONE	K13	K913	K313	Panel					
ON	ON	ON	K15	K915	K315						
ON	ON	ON*	K16	K916	K316						
* ON	ON	ON*	K17	K917	K317					Transparent	P

*** Momentary circuit.**
See pages C26-C27 and C29-C31 for circuit diagrams.
① Identification lug side.
② Incomplete catalog number: add suffix letters and numbers for Mounting Brackets, Rocker Style & Color
③ Other Rocker Styles available

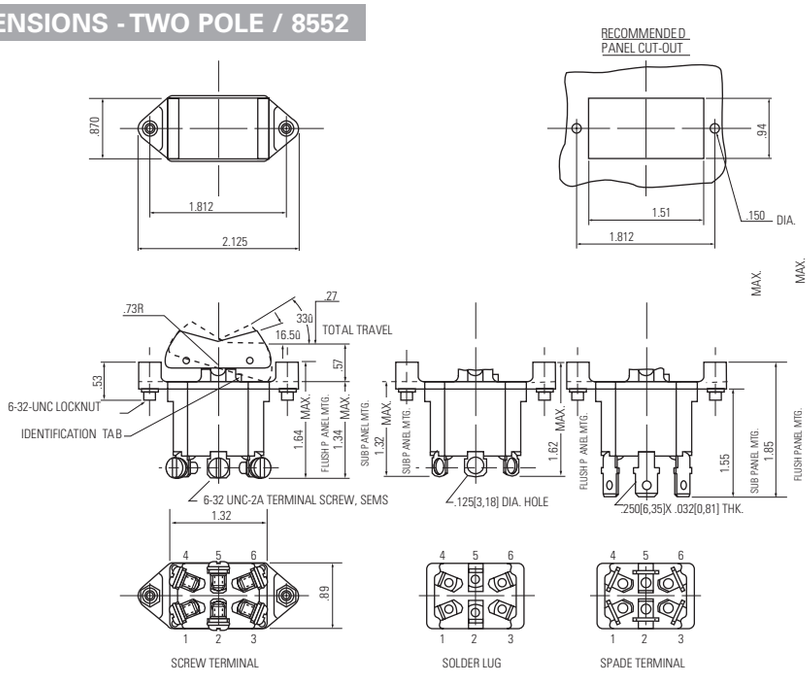
MOUNTING DIMENSIONS - ONE POLE / 8551



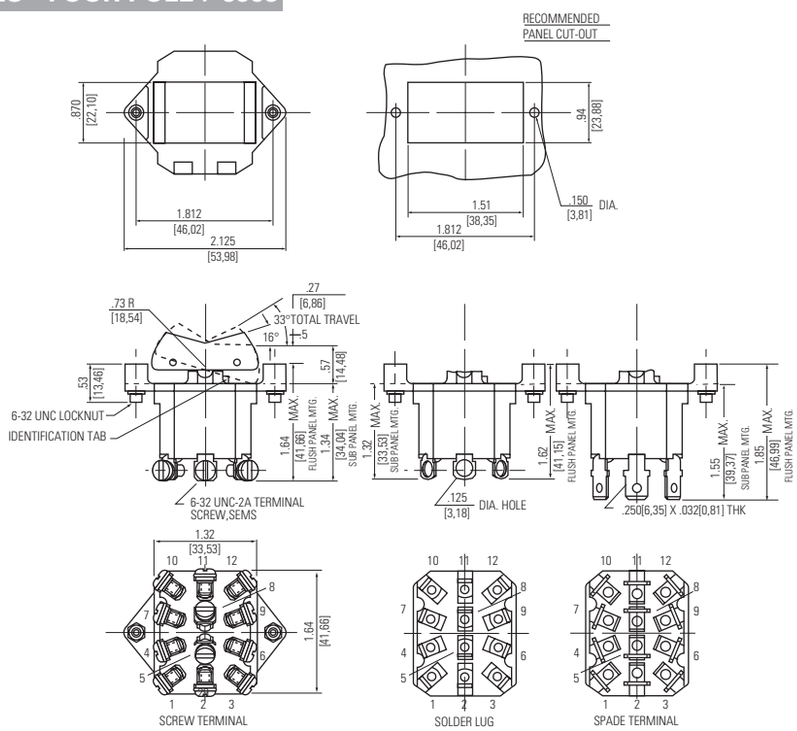
STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

MOUNTING DIMENSIONS - TWO POLE / 8552



MOUNTING DIMENSIONS - FOUR POLE / 8553



STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

Econoswitch Sealed Rocker Switches With Removable Rocker Button (RB Series)

OPTIONS/ACCESSORIES

- Special color rockers
- Hot stamped lettering on rockers - smooth rockers only
- Special marking on switches
- Optional Actuator
- Gold plated contacts

REPLACEMENT SMOOTH BUTTON SELECTION TABLE

Color	Part Number
White	53-2161-2
Red	53-2161-3
Black	53-2161-4
Translucent	53-2415
Transparent	53-2161-6

Series - 8554, 8555, 8556

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Pinned rocker button
- Rocker button style and color variations
- Multi-circuits
- Thermoplastic rocker buttons in opaque colors (serrated and smooth face)
- Panel mounting variations
  - Flush panel
  - Sub-panel
  - Snap-in

SPECIFICATIONS

- Watertight per MIL-STD-108E and designed to meet IP68
- UL recognized and CSA certified
- Temperature range: -50°F to +150°F (-46°C to + 66°C)
- Life: 50,000 operations at rated load
  100,000 operations mechanical life
- Three standard types of terminals
  - Screw 6-32 UNC-2A
  - Solder lug .125 [3,17] dia. hole
  - Spade .250 [6,35] x .032 [0.82] thick

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115 VAC 60 or 400Hz		
			Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
1	8554	Maintained	20	15	5	15	10	3
		Momentary	15	10	4	11	7	2
2	8555	Maintained	20	15	7	15	15	4
		Momentary	18	10	5	11	8	2
4	8556	Maintained	20	12	5	15	15	4
		Momentary	18	10	4	11	8	2

Note: See page C28 for UL and CSA current ratings.

WHEN ORDERING SPECIFY . . .

- Catalog number of base switch followed by suffix letters and numbers for mounting bracket, rocker color and style as listed in selection table.

Order Example:

8555K1 (Base Switch) **S** (Mounting Bracket) **32** (Rocker Style) **M** (Rocker Color) = **8555K1S32M** (Complete Number)

One Pole Snap-in Bezel Mounting

Two Pole Flush Panel Mounting

Four Pole Sub-Panel Mounting

SELECTION TABLE

CIRCUIT WITH LEVER IN . . . | BASE CATALOG NUMBER① | SUFFIX NUMBERS & LETTERS - ADD TO BASE CATALOG NUMBER

Up Position	Center Position	Down Position (Keyway)	Screw Terminals	Solder Terminals	Spade Terminals	MOUNTING BRACKET Frame Style	Mounting Holes	Code Letter	ROCKER STYLE Style	Code No.	ROCKER COLOR Color	Code Letter
One Pole												
ON	OFF	ON	8554K1	8554K91	8554K31							
ON	NONE	OFF	K9	K99	K39							
ON	NONE	ON	K4	K94	K34							
ON	OFF	NONE	K6	K96	K36	Sub-Panel Mounting-Clearance Holes	0.152	R				
ON	NONE	ON*	K5	K95	K35							
* ON	OFF	ON*	K2	K92	K32							
NONE	OFF	ON*	K7	K97	K37							
ON	NONE	OFF*	K10	K910	K310							
OFF	NONE	ON*	K11	K911	K311							
ON	OFF	ON*	K3	K93	K33	Sub-Panel Mounting-Tapped Holes	6-32 UNC-2B	W	Serrated	32	White	M
* ON	ON	NONE	K12	K912	K312							
ON	ON	NONE	K13	K913	K313							
Two Pole												
ON	OFF	ON	8555K1	8555K91	8555K31							
ON	NONE	OFF	K9	K99	K39							
ON	NONE	ON	K4	K94	K34							
ON	OFF	NONE	K6	K96	K36	Flush Panel Mounting-Clearance Holes	0.152	S			Black	V
ON	NONE	ON*	K5	K95	K35							
* ON	OFF	ON*	K2	K92	K32							
NONE	OFF	ON*	K7	K97	K37	Flush Panel Mounting-Tapped Holes	6-32 UNC-2B	T	Smooth	33	Red	T
ON	NONE	OFF*	K10	K910	K310							
OFF	NONE	ON*	K11	K911	K311							
ON	OFF	ON*	K3	K93	K33							
* ON	ON	NONE	K12	K912	K312							
ON	ON	NONE	K13	K913	K313	Snap-in Bezel Mounting	—	X				
ON	ON	ON	K14	K914	K314							
ON	ON	ON*	K15	K915	K315							
* ON	ON	ON*	K16	K916	K316							
ON	ON	ON	K17	K917	K317							
ON	ON	ON*	K18	K918	K318							
* ON	ON	ON*	K19	K919	K319							

*** Momentary Contact.**

SELECTION TABLE

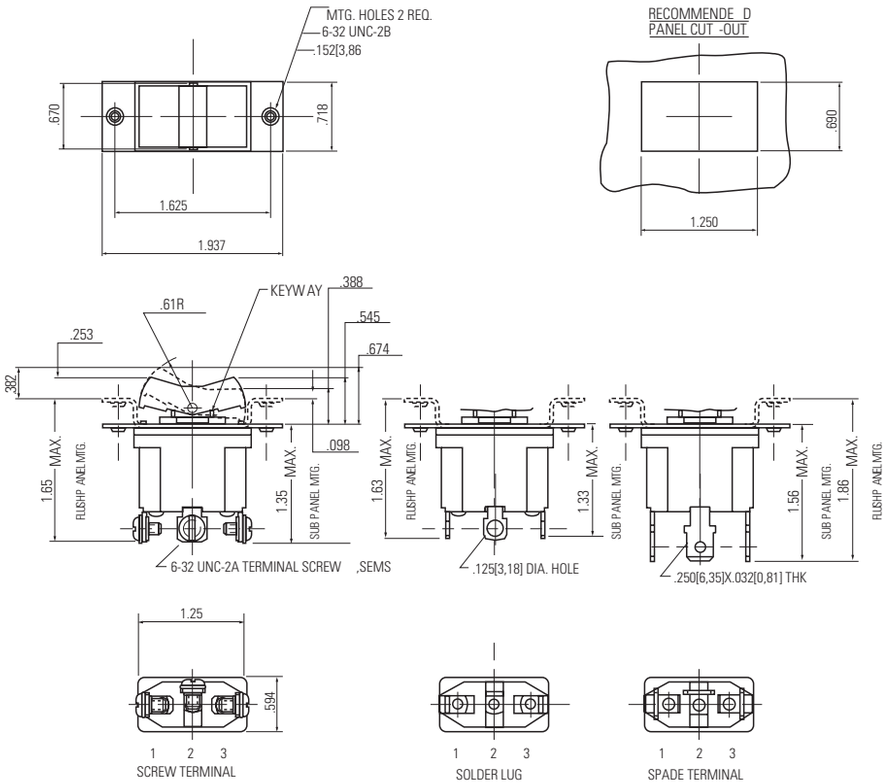
CIRCUIT WITH LEVER IN . . .			BASE CATALOG NUMBER①			SUFFIX NUMBERS & LETTERS - ADD TO BASE CATALOG NUMBER						
						MOUNTING BRACKET			ROCKER STYLE		ROCKER COLOR	
Up Position	Center Position	Down Position (Keyway)	Screw Terminals	Solder Terminals	Spade Terminals	Style	Mounting Holes	Code Letter	Style	Code No.	Color	Code Letter
Four Pole												
ON	OFF	ON	8556K1	8556K91	8556K31	Sub-Panel Mounting-Clearance Holes	0.152	R				
ON	NONE	OFF	K9	K99	K39							
ON	NONE	ON	K4	K94	K34							
ON	OFF	NONE	K6	K96	K36							
ON	NONE	ON*	K5	K95	K35						White	M
* ON	OFF	ON*	K2	K92	K32	Sub-Panel Mounting-Tapped Holes	6-32 UNC-2B	W	Serrated	32		
NONE	OFF	ON*	K7	K97	K37							
ON	NONE	OFF*	K10	K910	K310							
OFF	NONE	ON*	K11	K911	K311							
ON	OFF	ON*	K3	K93	K33	Flush Panel Mounting-Clearance Holes	0.152	S			Black	V
* ON	ON	NONE	K12	K912	K312							
ON	ON	NONE	K13	K913	K313							
ON	ON	ON	K15	K915	K315							
ON	ON	ON*	K16	K916	K316							
* ON	ON	ON*	K17	K917	K317	Flush Panel Mounting-Tapped Holes	6-32 UNC-2B	T	Smooth	33	Red	T
						Snap-in Bezel Mounting	—	X				

*** Momentary contact.**
See pages C26-C27 and C29-C31 for circuit diagrams.
① Incomplete Catalog Number - add suffix letters and numbers for Mounting Bracket, Rocker Style and Rocker Color - see "When Ordering Specify."

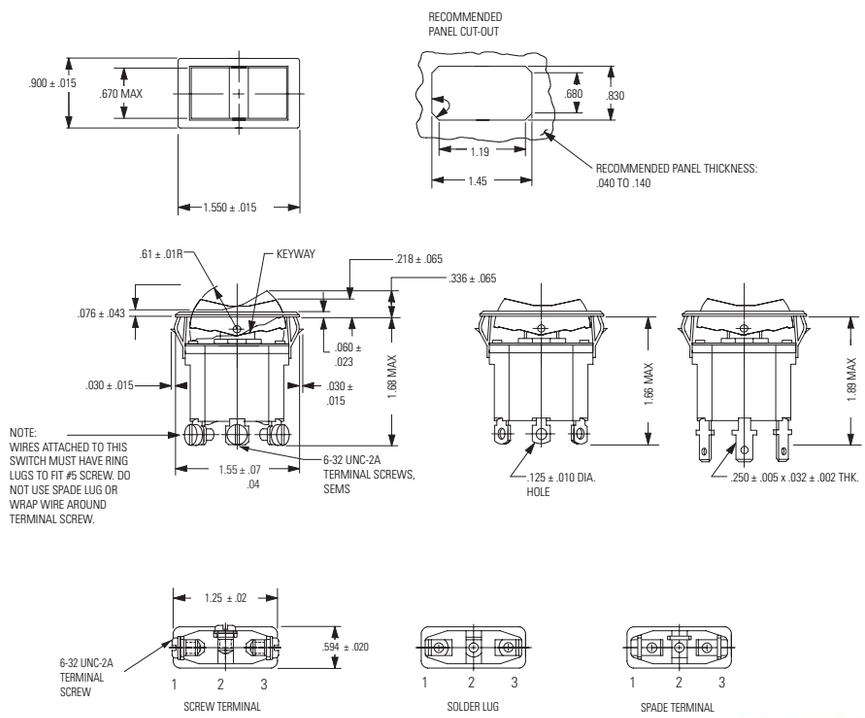
STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

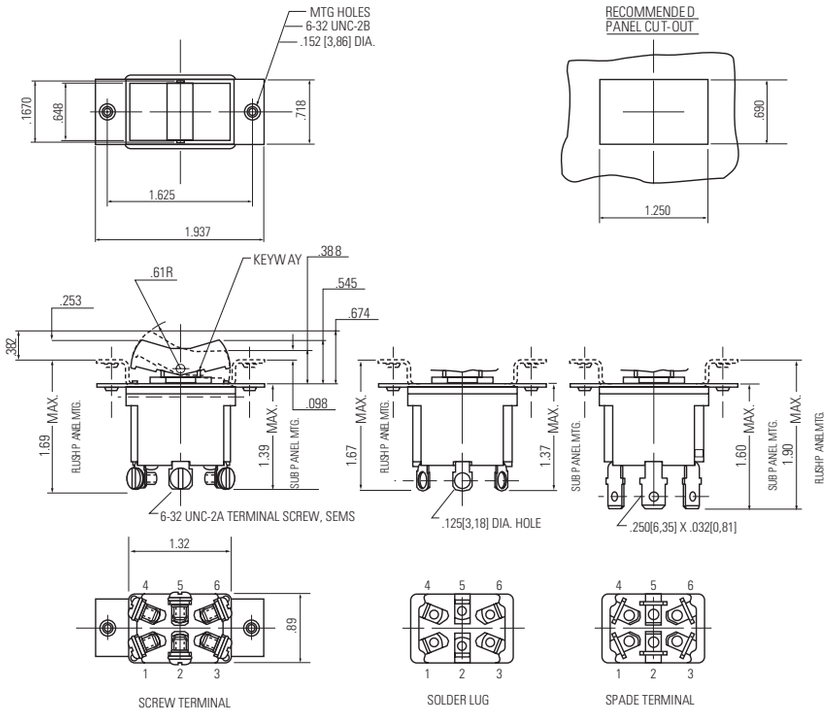
MOUNTING DIMENSIONS - ONE POLE / 8554



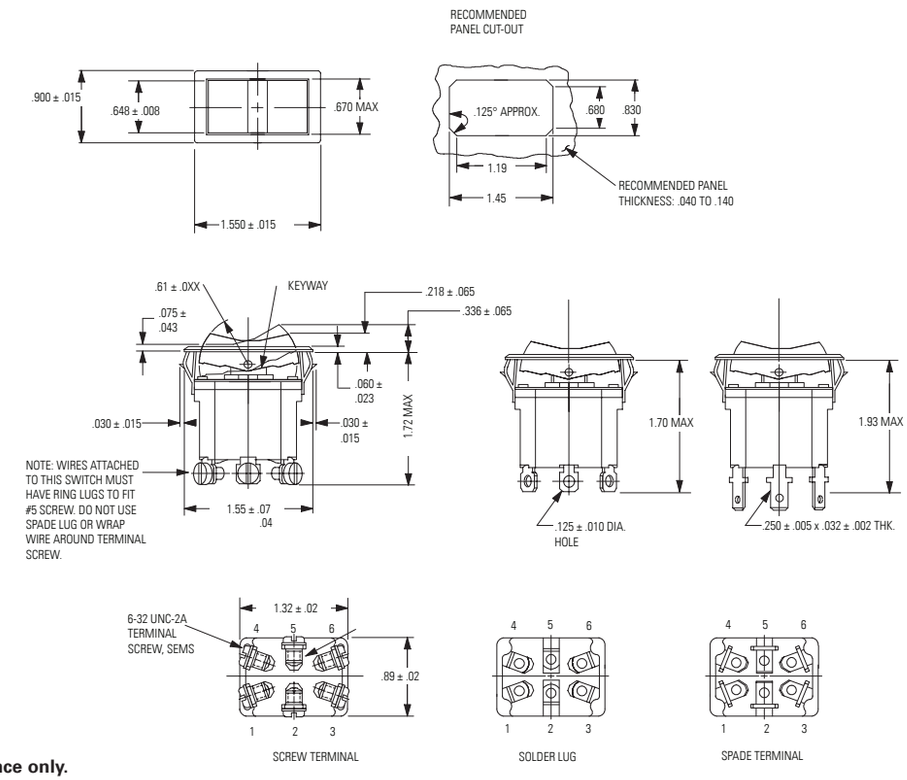
MOUNTING DIMENSIONS - SNAP-IN BEZEL ONE POLE / 8554



MOUNTING DIMENSIONS - TWO POLE / 8555



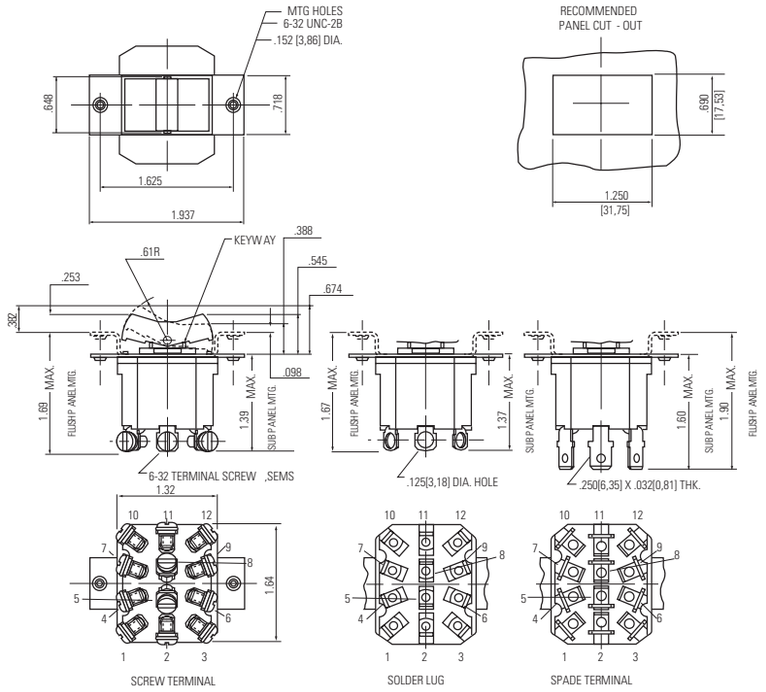
MOUNTING DIMENSIONS - SNAP-IN BEZEL TWO POLE / 8555



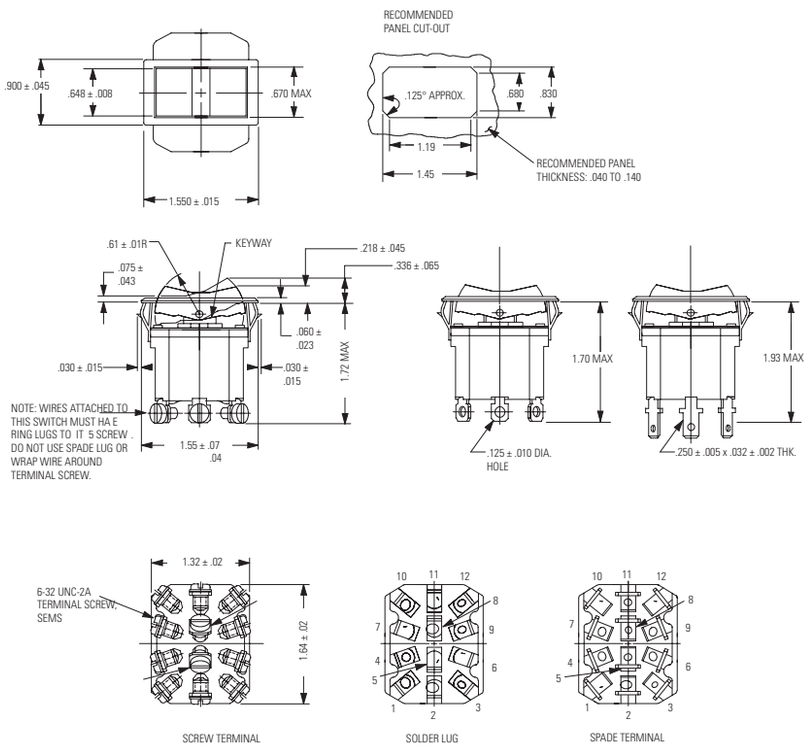
STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

MOUNTING DIMENSIONS - FOUR POLE / 8556



MOUNTING DIMENSIONS - SNAP-IN BEZEL FOUR POLE / 8556



STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

OPTIONS/ACCESSORIES

- Special color rockers
- Hot stamped lettering on rockers - smooth rockers only
- Special plated bezels
- Special marking on switches
- Optional Actuator
- Gold plated contacts

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Pinned rocker button
- Multi-circuits
- Molded-in terminal inserts and terminal numbers
- Panel mounting variations
  - Flush panel
  - Sub-panel
  - Snap-in
- Thermoplastic rocker buttons in opaque colors (serrated and smooth face)

SPECIFICATIONS

- Watertight per MIL-STD-108E and designed to meet IP68
- UL recognized and CSA certified
- Temperature range: -50°F to +150°F (-46°C to +66°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115 VAC 60 or 400Hz		
			Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
1	8540	Maintained	20	15	5	15	10	3
		Momentary	15	10	4	15	7	2
2	8541	Maintained	20	15	7	15	15	4
		Momentary	18	10	5	11	8	2
4	8542	Maintained	20	12	5	15	15	4
		Momentary	18	10	4	11	8	2

Note: See page C28 for UL and CSA current ratings.

WHEN ORDERING SPECIFY . . .

• Catalog number of base switch followed by suffix letters and numbers for mounting bracket, rocker color and style as listed in selection table.

Order Example:

8540K1 (Base Switch) **S** (Mounting Bracket) **32** (Rocker Style) **M** (Rocker Color) = **8540K1S32M** (Complete Number)

One Pole Snap-in Bezel Mounting

Two Pole Flush Panel Mounting

Four Pole Sub-Panel Mounting

SELECTION TABLE

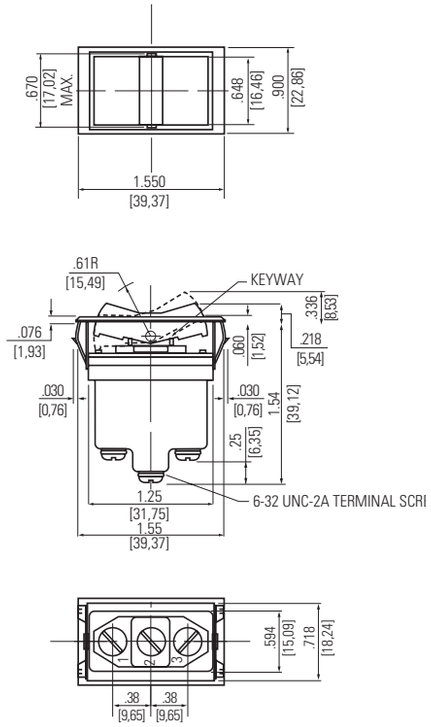
CIRCUIT WITH LEVER IN . . .			BASE CATALOG NUMBER①			SUFFIX NUMBERS & LETTERS - ADD TO BASE CATALOG NUMBER						
						MOUNTING BRACKET			ROCKER STYLE		ROCKER COLOR	
Up Position	Center Position	Down Position (Keyway)	Single Pole	Two Pole	Four Pole	Style	Mounting Holes	Code Letter	Style	Code No.	Color	Code Letter
ON	OFF	ON	8540K1	8541K1	8542K1	Sub-panel Mounting- Clear Holes	0.152 [3,86]	R				
ON	NONE	OFF	K9	K9	K9						White	M
ON	NONE	ON	K4	K4	K4							
ON	OFF	NONE	K6	K6	K6							
ON	NONE	ON*	K5	K5	K5	Sub-panel Mounting- Tapped Holes	6-32 UNC-2B	W	Serrated	32		
* ON	OFF	ON*	K2	K2	K2							
NONE	OFF	ON*	K7	K7	K7							
ON	NONE	OFF*	K10	K10	K10	Flush panel Mounting- Clear Holes	0.152 [3,86]	S			Black	V
OFF	NONE	ON*	K11	K11	K11							
ON	OFF	ON*	K3	K3	K3							
* ON	ON	NONE	K12	K12	K12	Flush panel Mounting- Tapped Holes	6-32 UNC-2B	T	Smooth	33		
ON	ON	NONE	K13	K13	K13							
ON	ON	ON		K14	K15						Red	T
ON	ON	ON*		K15	K16							
* ON	ON	ON*		K16	K17							
ON	ON	ON	—	8541K17	—	Snap-in Bezel Mounting-	—	X				
ON	ON	ON*	—	K18	—							
* ON	ON	ON*	—	K19	—							

*** Momentary contact.**

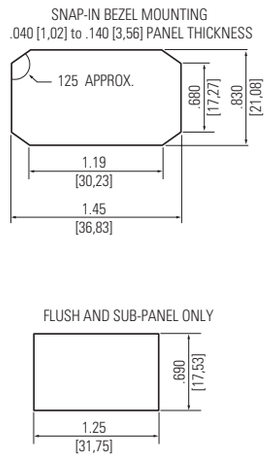
See pages C26-C27 and C29-C31 for circuit diagrams.

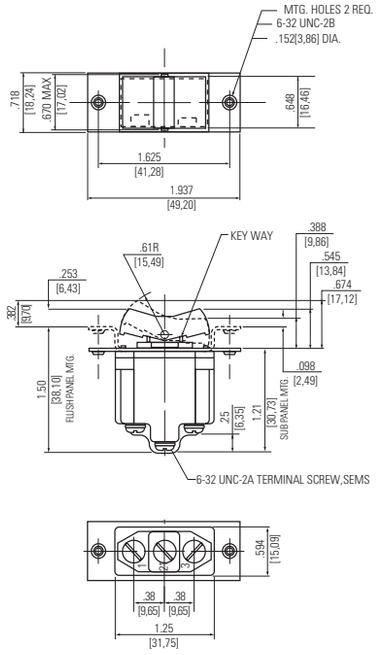
① Incomplete Catalog Number - add suffix letters and numbers for Mounting Bracket, Rocker Style and Rocker Color - see "When Ordering Specify."

DIMENSIONS - ONE POLE / 8540

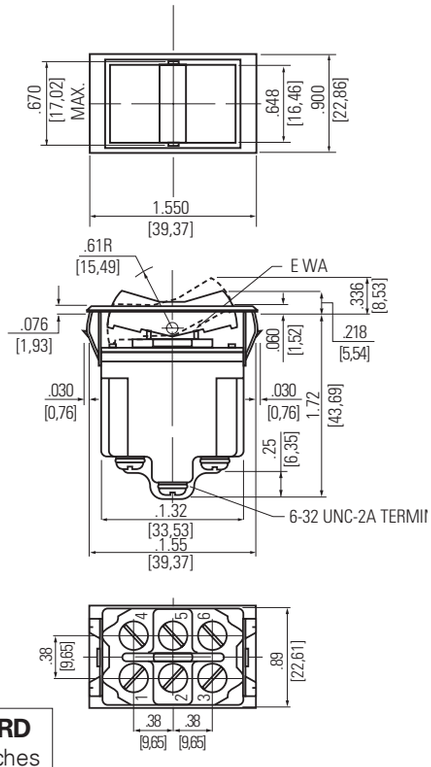


RECOMMENDED PANEL CUT-OUT

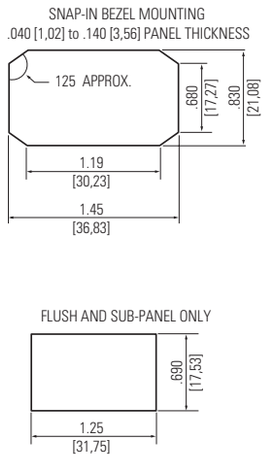


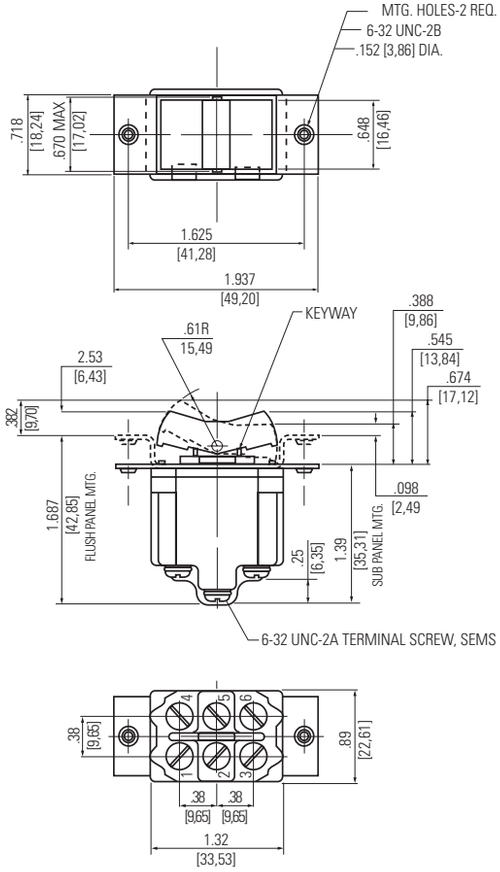


DIMENSIONS - TWO POLE / 8541



RECOMMENDED PANEL CUT-OUT

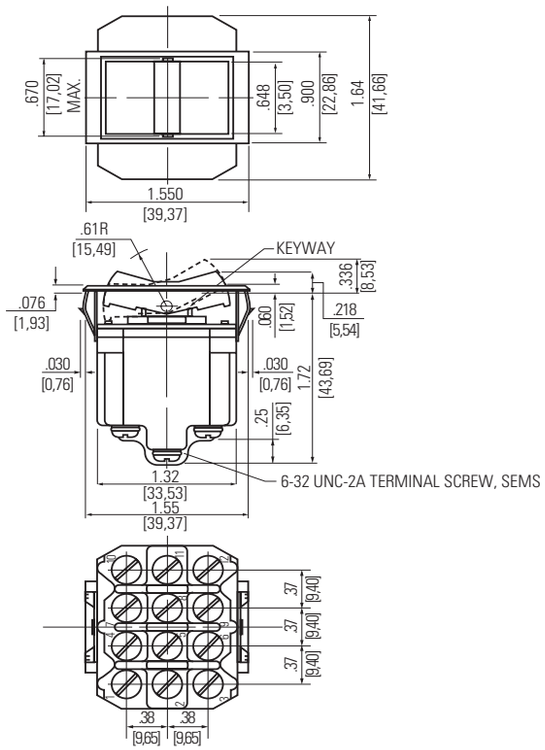




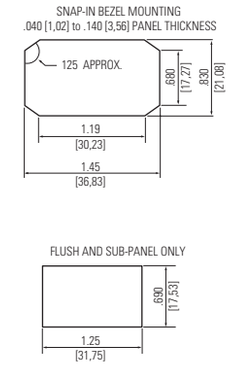
STANDARD
0.00 = inches
[0,0] = mm

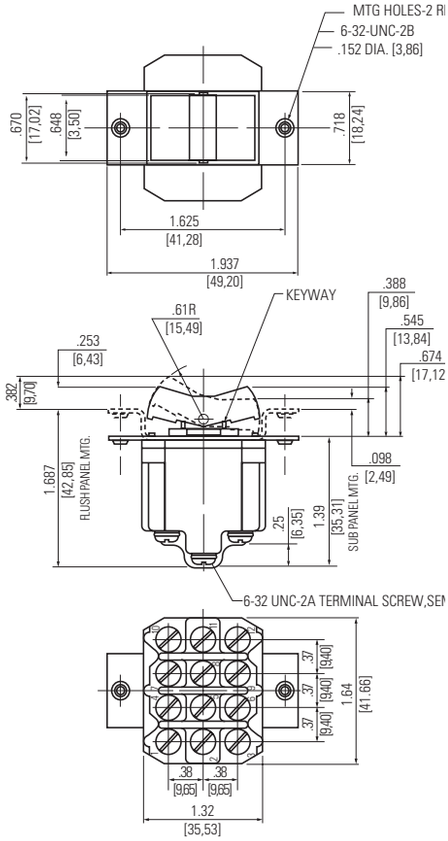
Mounting dimensions for reference only.

DIMENSIONS - FOUR POLE / 8542



RECOMMENDED PANEL CUT-OUT





OPTIONS/ACCESSORIES

- Special color rockers
- Hot stamped lettering on rockers - smooth rockers only
- Spade terminals
- Special spade terminal adapters (0.250")
- Special plated bezels
- Special marking on switches
- Optional Actuator
- Additional sealed rocker styles available

STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

ENVIRONMENTALLY SEALED ROCKER SWITCHES
Series - 8543, 8544, 8545

Environmentally Sealed Rocker Switches with Removable Button (RB Series)

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Rocker button is removable for decal or icon interchangeability
- Multi-circuit
- Panel mounting variations
  - Flush panel
  - Sub-panel
- Rocker button variations
  - Smooth and serrated in opaque colors
  - Transparent
  - Translucent

SPECIFICATIONS

- Watertight per MIL-STD-108E and designed to meet IP68
- UL recognized and CSA certified
- Temperature range: -55°F to +150°F (-46°C to +66°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
1	8543	Maintained	20	15	5	15	10	3
		Momentary	15	10	4	15	7	2
2	8544	Maintained	20	15	7	15	15	4
		Momentary	18	10	5	11	8	2
4	8545	Maintained	20	12	5	15	15	4
		Momentary	18	10	4	11	8	2

NOTE: See page C28 for UL & CSA Current Ratings

WHEN ORDERING SPECIFY . . .

• Catalog number of base switch followed by suffix letters and numbers for mounting bracket, rocker color and style as listed in selection table.

Order Example:

8543K1	T	33	M	8543K1T33M
Base Switch	Frame Style	Rocker Style	Rocker Color	Complete Number

Sub-Panel Mounting

Flush Panel Mounting

SELECTION TABLE

CIRCUIT WITH LEVER IN . . .			BASE CATALOG NUMBER②			SUFFIX NUMBERS & LETTERS - ADD TO BASE CATALOG NUMBER					
						FRAME STYLE		ROCKER STYLE		ROCKER COLOR	
Up Position	Center Position	Down① Position (Keyway)	Single Pole	Two Pole	Four Pole	Frame Style	Code Letter	Style	Code No.	Color	Code Letter
ON	OFF	ON	8543K1	8544K1	8545K1						
ON	NONE	OFF	K9	K9	K9						
ON	NONE	ON	K4	K4	K4					White	M
ON	OFF	NONE	K6	K6	K6			Serrated	32		
ON	NONE	ON*	K5	K5	K5						
* ON	OFF	ON*	K2	K2	K2	Flush Panel	T			Red	T
NONE	OFF	ON*	K7	K7	K7						
ON	NONE	OFF*	K10	K10	K10						
OFF	NONE	ON*	K11	K11	K11						
ON	OFF	ON*	K3	K3	K3					Black	V
* ON	ON	NONE	K12	K12	K12			Smooth	33		
ON	ON	NONE	K13	K13	K13						
ON	ON	ON		K14							
ON	ON	ON*		K15		Sub-Panel	W			Translucent	L
* ON	ON	ON*		K16							
ON	ON	ON		K17	K15						
ON	ON	ON*		K18	K16						
* ON	ON	ON*		K19	K17			No Rocker	34	Transparent	P
ON	ON/OFF	ON			K20						
* ON	ON/OFF	ON*			K21						

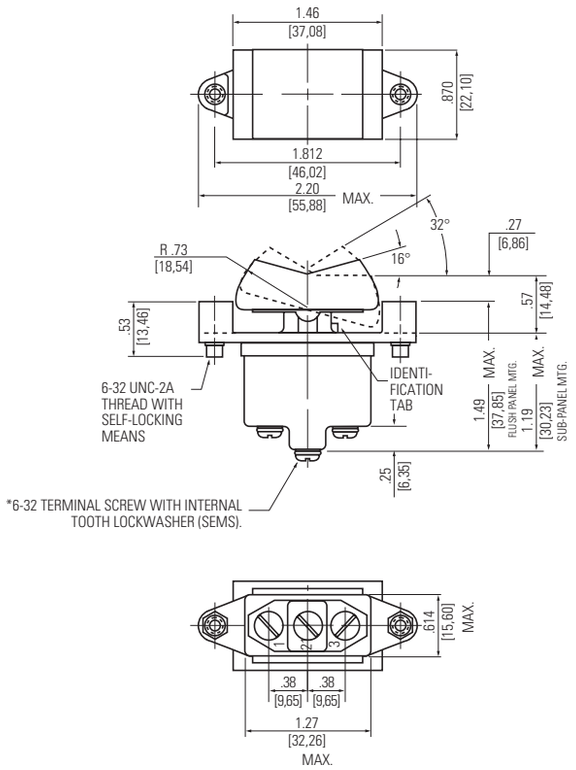
*** Momentary contact.**
See pages C26-C27 and C29-C31 for circuit diagrams.
① Identification lug side.
② Incomplete Catalog Number - add suffix letters and numbers for Mounting Bracket, Rocker Style and Rocker Color - see "When Ordering Specify."

REPLACEMENT SMOOTH BUTTON SELECTION TABLE

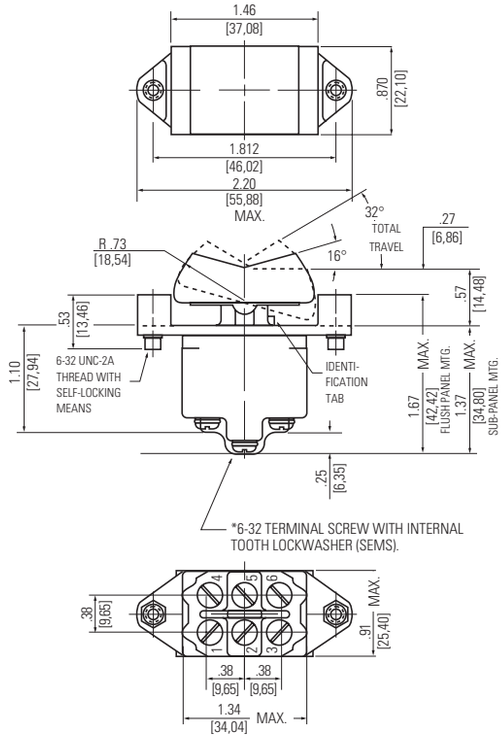
Color	Part Number
White	53-2161-2
Red	53-2161-3
Black	53-2161-4
Translucent	53-2415
Transparent	53-2161-6

ENVIRONMENTALLY SEALED ROCKER SWITCHES
Environmentally Sealed Rocker Switches with Removable Button (RB Series)

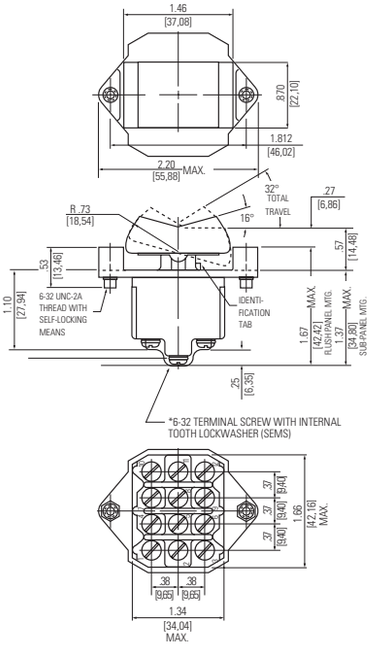
DIMENSIONS - ONE POLE / 8543



DIMENSIONS - TWO POLE / 8544



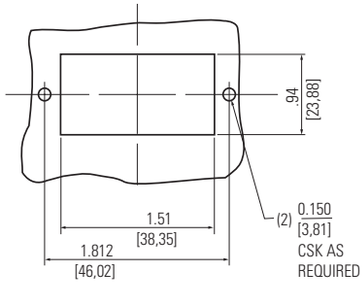
DIMENSIONS - FOUR POLE / 8545



OPTIONS/ACCESSORIES

- Special color rockers
- Hot stamped lettering on rockers - smooth rockers only
- Spade terminals
- Special spade terminal adapters 0.250" [0,63]
- Special marking on switches
- Optional Actuator

RECOMMENDED
PANEL CUT-OUT



STANDARD
0.00 = inches
[0,0] = mm

Mounting dimensions for reference only.

ENVIRONMENTALLY SEALED ROCKER SWITCHES
Series - 8546, 8547, 8548 MIL-M3950/14 Environmentally Sealed Rocker Switches

FEATURES

- Environmentally sealed
- 1, 2 and 4 pole circuitry
- 2 & 3 position with maintained and momentary action
- Rocker button is removable for decal or icon interchangeability
- Multi-circuit
- Molded-in inserts and terminal numbers
- Panel mounting variations
  - Flush panel
  - Sub-panel
- Rocker button variations
  - Smooth and serrated in opaque colors
  - Transparent
  - Translucent

SPECIFICATIONS

- MS approved and QPL'd per MIL-DTL-3950
- Thermoset molding materials meet flame retardant requirements
- Temperature range: -67°F to +160°F (-55°C to + 71°C)
- Life: 20,000 operations at rated load
  40,000 operations mechanical life

CURRENT RATINGS

No. of Poles	Catalog Number	Type of Operation	28VDC			115VAC 60 or 400Hz		
			Resistive Load	Inductive Load	Lamp Load	Resistive Load	Inductive Load	Lamp Load
1	8546	Maintained	20	15	5	15	10	3
		Momentary	15	10	4	15	7	2
2	8547	Maintained	20	15	7	15	15	4
		Momentary	18	10	5	11	8	2
4	8548	Maintained	20	12	5	15	15	4
		Momentary	18	10	4	11	8	2

WHEN ORDERING SPECIFY . . .

• Catalog number of base switch followed by suffix letters and numbers for mounting bracket, rocker color and style as listed in selection table.

Order Example:

8546K1	F	1	W	8546K1F1W
Base Switch	Frame Style	Rocker Style	Rocker Color	Complete Number

Sub-Panel Mounting

Flush Panel Mounting

SELECTION TABLE

CIRCUIT WITH LEVER IN . . . | BASE CATALOG NUMBER②

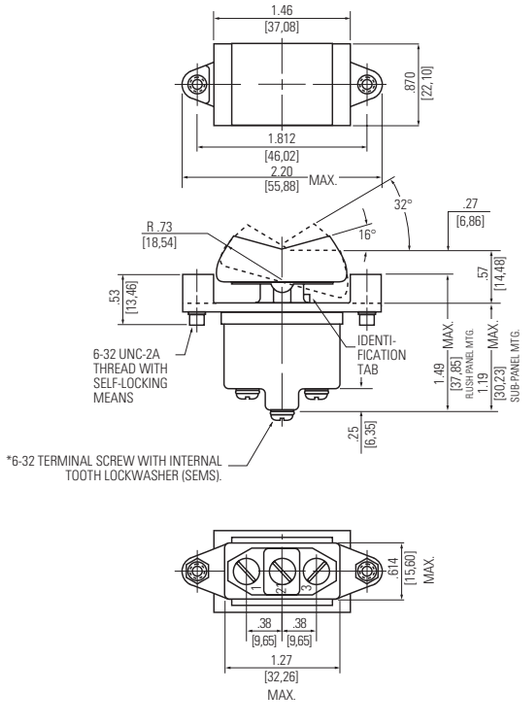
Up Position	Center Position	Down① Position (Keyway)	Single Pole Part	Single Pole M3950/14A③	Double Pole Part	Double Pole M3950/14B③	Four Pole Part	Four Pole M3950/14C③	Frame Style	Code Letter	Rocker Style	Code Letter	Rocker Color	Code Letter
ON	OFF	ON	8546K1	M3950/14A21	8547K1	M3950/14B21	8548K1	M3950/14C21						
ON	NONE	OFF	K9	A22	K9	B22	K9	C22						
ON	NONE	ON	K4	A23	K4	B23	K4	C23					White	W
ON	OFF	NONE	K6	A24	K6	B24	K6	C24						
ON	NONE	ON*	K5	A26	K5	B26	K5	C26	Flush	F	Smooth	1	Red	R
* ON	OFF	ON*	K2	A27	K2	B27	K2	C27						
NONE	OFF	ON*	K7	A28	K7	B28	K7	C28						
ON	NONE	OFF*	K10	A29	K10	B29	K10	C29					Black	B
OFF	NONE	ON*	K11	A30	K11	B30	K11	C30						
ON	OFF	ON*	K3	A31	K3	B31	K3	C31	Sub	S	Serrated	2		
* ON	ON	NONE	K12	A32	K12	B32	K12	C32					Translucent	T
ON	ON	NONE	K13	A33	K13	B33	K13	C33						
ON	ON	ON			K15	B34	K15	C34						
ON	ON	ON*			K16	B35	K16	C35					Transparent	C
* ON	ON	ON*			K17	B36	K17	C36						

*** Momentary Circuit.**
See pages C26-C27 and C29-31 for circuit diagrams.
① Identification lug side.
② Incomplete Catalog Number - add suffix letters and numbers for Frame Style, Rocker Style and Rocker Color - see "When Ordering Specify."
③ Incomplete military part number - add suffix codes for Frame Style, Rocker Style and Rocker Color for complete military part number. (i.e. M3950/14A21F1W).

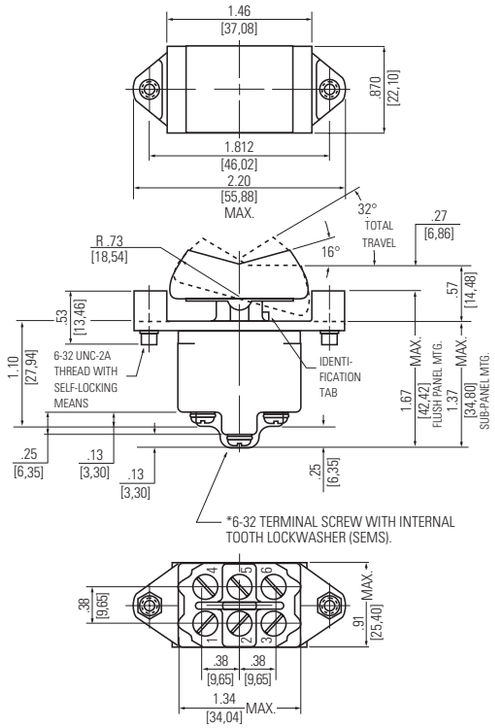
REPLACEMENT BUTTON SELECTION TABLE

Color	Part Number (Smooth Button)
White	53-2161-2
Red	53-2161-3
Black	53-2161-4
Translucent	53-2415
Transparent	53-2161-6

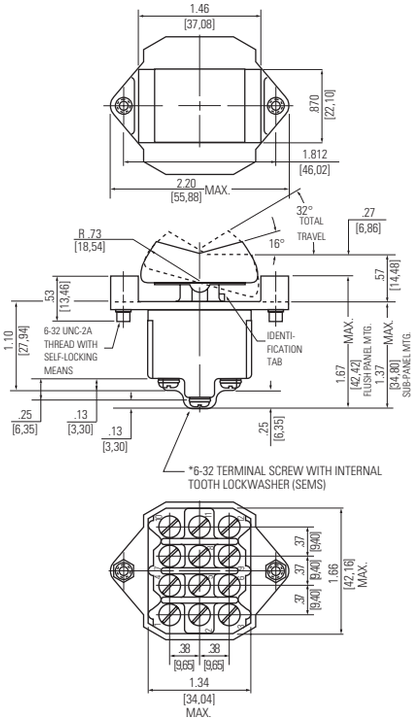
DIMENSIONS - ONE POLE / 8546



DIMENSIONS - TWO POLE / 8547



DIMENSIONS - FOUR POLE / 8548



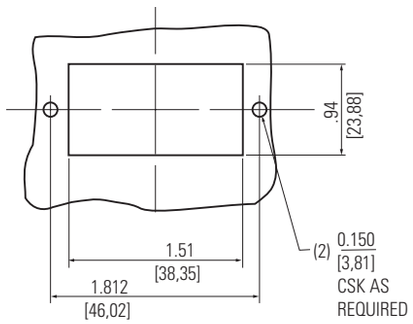
STANDARD
0.00 = inches
[0,0] = mm

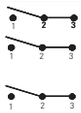
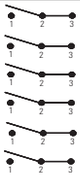
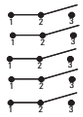
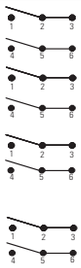
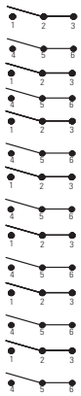
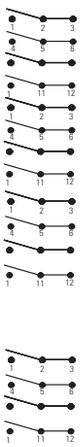
Mounting dimensions for reference only.

OPTIONS/ACCESSORIES

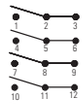
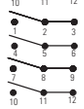
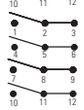
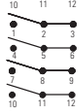
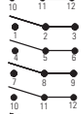
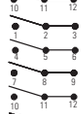
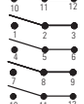
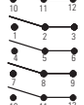
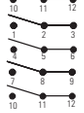
- Special color rockers
- Hot branded lettering on rockers - smooth rockers only
- Spade terminals
- Special spade terminal adapters (0.250") [0,63]
- Special marking on switches
- Optional Actuator

RECOMMENDED
PANEL CUT-OUT



Number of Poles and Throws	Switch Circuit①	CIRCUIT WITH LEVER IN . . . Up Position	Center Position	Down Position (ID Lug)
1PST				
1PDT				
2PST				
2PDT				
4PST				

CIRCUIT WITH LEVER IN . . . CON'T.

Number of Poles and Throws	Switch Circuit①	Up Position	Center Position	Down Position (ID Lug)
4PDT	ON-OFF-ON		OFF	
	ON-NONE-ON		NONE	
	ON-NONE-ON*		NONE	
	ON-OFF-ON*		OFF	
	ON-OFF-ON*		OFF	
	ON-ON-NONE			NONE
	ON-ON-NONE			NONE
	ON-ON OFF-ON			
	ON-ON OFF-ON *			

***Momentary contact.**
①See page C29 for ON-ON-ON and special circuits.

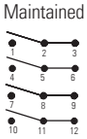
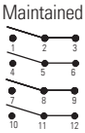
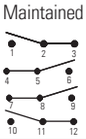
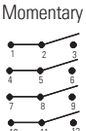
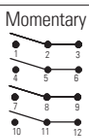
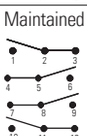
NOMINAL RATINGS
Minimum AC Contact Ratings

UL AND CSA NOMINAL RATINGS

			Maximum Horsepower		
	Amperes		1 Phase		3 Phase
Catalog Number	125VAC①	250VAC①	125VAC①	250VAC①	125/250VAC①
8540K1, 4, 6, 9, 13	18	9	1/4	1/2	—
8540K2, 3, 5, 7, 8, 10-12	18	9	—	—	—
8541K1, 4, 6, 9, 13	18	9	1/2	1	—
8541K2, 3, 5, 7, 8, 10-12, 14-16	18	9	—	—	—
8542K1, 4, 6, 9, 13	18	9	1/2	1	1
8542K2, 3, 5, 7, 8, 10-12, 15-17	18	9	—	—	—
8543K1, 4, 6, 9, 13	18	9	1/4	1/2	—
8543K2, 3, 5, 7, 8, 10-12	18	9	—	—	—
8544K1, 4, 6, 9, 13	18	9	1/2	1	—
8544K2, 3, 5, 7, 8, 10-12, 14-19	18	9	—	—	—
8545K1, 4, 6, 9, 13	18	9	1/2	1	1
8545K2, 3, 5, 7, 8, 10-12, 15-21	18	9	—	—	—
8551K1-13, K31-313, K91-913	18	9	1/4	1/2	—
8552K1-16, K31-316, K91-916	18	9	1/2	1	—
8553K1-17, K31-317, K91-917	18	9	1/2	1	1
8554K1-13, K31-313, K91-913	18	9	1/4	1/2	—
8555K1-16, K31-316, K91-916	18	9	1/2	1	—
8556K1-17, K31-317, K91-917	18	9	1/2	1	1

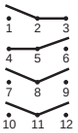
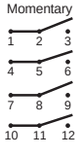
① 60 Hertz

CIRCUIT WITH LEVER IN . . .

Number of Poles	Up Position	Center Position	Down Position (Keyway)	Catalog Part Number①
Two Pole				
2	Maintained 	Maintained 	Maintained 	8541K14 8544K14 8547K15 8552K14, 8552K914, 8552K314 8555K14, 8555K914, 8555K314
2	Maintained 	Maintained 	Momentary 	8541K15 8544K15 8547K16 8552K15, 8552K915, 8552K315 8555K15, 8555K915, 8555K315
2	Momentary 	Maintained 	Momentary 	8541K16 8544K16 8547K17 8552K16, 8552K916, 8552K316 8555K16, 8555K916, 8555K316
2	Maintained 	Maintained 	Maintained 	8541K17 8544K17 8555K17, 8555K917, 8555K317
2	Maintained 	Maintained 	Momentary 	8541K18 8544K18 8555K18, 8555K918, 8555K318
2	Momentary 	Maintained 	Momentary 	8541K19 8544K19 8555K19, 8555K919, 8555K319
Four Pole				
4	Maintained 	Maintained 	Maintained 	8542K15 8545K15 8548K15 8553K15, 8553K915, 8553K315 8556K15, 8556K915, 8556K315
4	Maintained 	Maintained 	Momentary 	8542K16 8545K16 8548K16 8553K16, 8553K916, 8553K316 8556K16, 8556K916, 8556K316
4	Momentary 	Maintained 	Momentary 	8542K17 8545K17 8548K17 8553K17, 8553K917, 8553K317 8556K17, 8556K917, 8556K317

① Incomplete part number. Basic switch part number referenced only.

ROCKER SWITCHES - ENVIRONMENTALLY SEALED SWITCHES Special ON-ON-ON Circuit Arrangements for Two and Four Pole Switches Industrial, Econoswitch and MIL-DTL-3950 Series

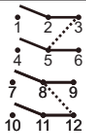
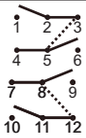
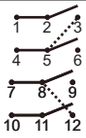
Number of Poles	CIRCUIT WITH LEVER IN . . . Up Position	Center Position	Down Position (Keyway)	Catalog Part Number①
Four Pole (Continued)				
4	Maintained 	Maintained 	Maintained 	8545K20
4	Momentary 	Maintained 	Momentary 	8545K21

① Incomplete part number. Basic switch part number referenced only.

SPECIAL "ON-ON-ON" CIRCUIT ARRANGEMENTS

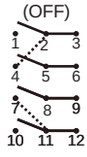
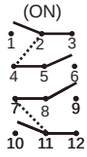
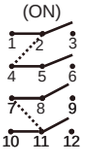
"Three Independent" ON-ON-ON Circuit Diagram
For switch modified with "Three Independent" ON-ON-ON Special Circuit.
External Jumpers are required. User to connect wiring per instructions given below.

Connection Points	Single Pole	Double Pole
Connect Common to Terminals	2	2 and 11
Connect Circuit "A" to Terminals	6	6 and 9
Connect Circuit "B" to Terminals	4	4 and 7
Connect Circuit "C" to Terminals	1	1 and 10

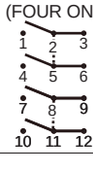
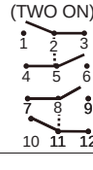
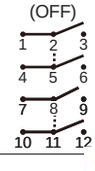
Circuit Poles	No. of Poles	Up Position	Center Maintained Position	Down Position (Keyway)
Circuit for Single Pole (Jumper between Terminals #3 & #5)	1			
Circuit for Double Pole (Jumpers between Terminals #3 & #5 #8 & #12)	2			

Note: Basic circuit same as offered with part numbers 8551K14, 8551K15 or 8551K16 for two pole devices and part numbers 8553K15, 8553K16 or 8553K17 for four pole devices.

SPECIAL CIRCUIT (OFF - ON - ON)

Circuit Note: Requires two poles to achieve a single pole device or four poles to achieve a double pole device.	No. of Poles	OFF Up Position	ON Center Maintained Position	ON Down Position (Keyway)	Circuit Being Made . . .	Terminal Numbers Making the Circuit
Circuit for Single Pole (Jumper between terminals #2 & #4). Common terminal #5. Non-functional terminal #6	2	(OFF) 	(ON) 	(ON) 	UP(OFF) CENTER (ON) DOWN (ON)	-- #3 & #5 #1 & #5
Circuit for Double Pole (Jumpers between terminals #2 & #4 and #7 & #11). Common terminals #5 & #8. Non-functional terminals #6 & #9	4	(OFF) 	(ON) 	(ON) 	UP(OFF) CENTER (ON) DOWN (ON)	-- #3 & #5 #8 & #12 #1 & #5 #8 & #10

SPECIAL PROJECTOR CIRCUIT (1 ON - 1 ON - OFF)

Circuit Note: Requires two poles to achieve a single pole device or four poles to achieve a double pole device.	No. of Poles	ON Up Position	ON Center Maintained Position	OFF Down Position (Keyway)	Circuit Being Made . . .	Terminal Numbers Making the Circuit
Circuit for Single Pole (Jumper between terminals #2 & #5). Common terminal #5. Non-functional terminal #1 & #4.	2	(TWO ON) 	(ONE ON) 	(OFF) 	UP(ON) CENTER (ON) DOWN (OFF)	#2 & #3 #5 & #6 #5 & #3 —
Circuit for Double Pole (Jumpers between terminals #2 & #5 and #8 & #11). Common terminals #5 & #8. Non-functional terminals #1, #4, #7 & #10.	4	(FOUR ON) 	(TWO ON) 	(OFF) 	UP(ON) CENTER (ON) DOWN (OFF)	#5 & #3 #5 & #6 #8 & #12 #8 & #9 #3 & #5 #8 & #12 —

NOTES

SECTION D

Precision Snap Action Switches Index

**Most items listed in this catalog are standard products and are normally in Distributor Inventory; however, the current inventory status should be checked by contacting your Safran Electrical & Power Customer Service Representative at 800-955-7354 or your authorized Distributor before placing orders.*

BASIC SWITCHES
Precision Snap Action Switches

FEATURES

- Snap action
- Plastic, flame resistant case
- Single, double and three pole circuits
- Eight types of terminations
- Long life
- 1000 V rms dielectric strength
- Current capacities from dry circuit to 40 amperes
- Military approved
- Environmentally sealed
- UL recognized
- Low movement differential and operating force types available
- Stacking and gang mounting capabilities

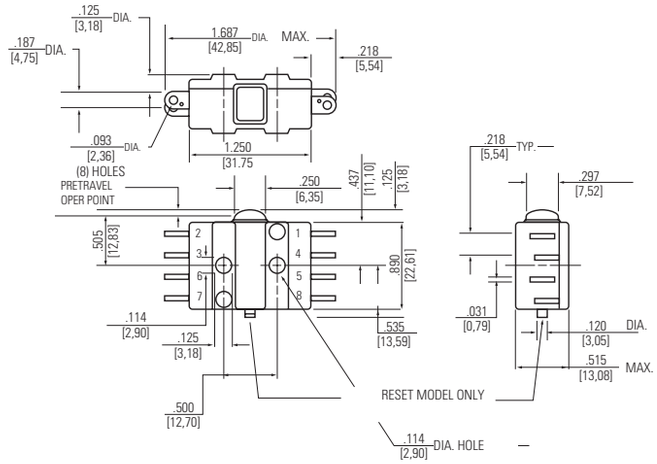
SELECTION AND SPECIFICATIONS TABLE

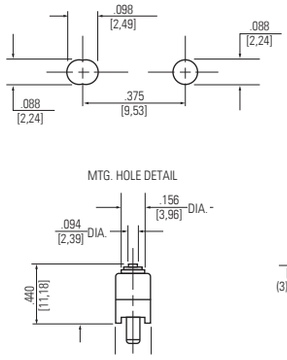
SERIES

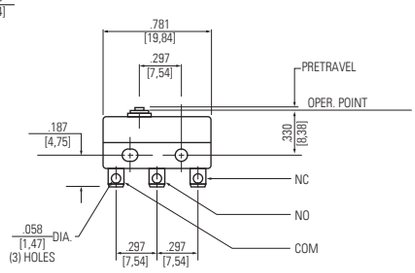
					Characteristics					
	Circuit	Electrical Rating Life	Terminals	Description	Catalog Number	Operating Force (Max.)	Release Force (Min.)	Pretravel (Max.)	Diff. Travel (Min.)	Over Travel (Min.)
 **Series D**	4 CKT Dbl. Brk.	15 amps, 125/250VAC, 60/400Hz 30VDC Resistive 10 amps, 125/250VAC, 60/400Hz 30VDC Inductive 100,000 operations mechanical life, 50,000 operations electrical life	End Solder Side Solder Side Solder End Solder Side Solder Side Solder	Standard Non-Simultaneous Break MS25348-1 MS25349-1 Reset Type	D4-4 D8-4 D8-9 D4-44 D8-44 D8-344	 28+/-5 oz 2.18 lbs 1.25 lbs	 3 oz. —	.060 in.	.028 ±.007 in.	.018 in.
 **Series E-4 & EM**	1 PDT	Operations, Min. 150,000 2.5 amps. 125/250VAC Res. & Ind. 100,000 5.0 amps. 125/250VAC Res. & Ind. 50,000 4.0 amps. 30VDC Resistive 50,000 2.5 amps. 30VDC Inductive	Solder Double Turret	 Standard (Dust, Splash-proof)	E4-103 EM-4111	 200 grams	 40 grams	.020 in.	.003 in.	.007 in.
		25,000 operations min. electrical life at: 4 amps, 28VDC Resistive 2.5 amps, 28VDC Inductive	Solder Double Turret	MS25085-1 MS25085-2	E4-270 E4-271	5 oz.	1 oz.		.004 in.	.005 in
 **Series EF**	1 PDT	150,000 operations at 2.5 amps, 125/250VAC 100,000 operations at 5.0 amps, 125/250VAC 50,000 operations at 2.5 amps, 30VDC Inductive 50,000 operations at 4.0 amps, 30VDC Resistive	Wire Leads	Standard	EF-103	5-17 oz.	4 oz.	.050 in.	.004 in.	.003 in.
		150,000 operations at 2.5 amps, 125/250VAC 100,000 operations at 5.0 amps, 125/250VAC 50,000 operations at 2.5 amps, 30VDC Inductive 50,000 operations at 4.0 amps, 30VDC Resistive	Wire Leads	High-Temp. (-65°F to +300°F)	EF-110					
 **Series G**	2 CKT (1 PDT) Mom.	125/250VAC, 30 amps Resistive 125/250VAC, 20 amps Inductive 125/250VAC, 10 amps Motor 28VDC, 40 amps Resistive 28VDC, 30 amps Inductive 28VDC, 15 amps Motor 25,000 Operations Min.	Solder	MS25357-1	G3-44	50.75 oz	6 oz.	0.093 in.	.055 +/- .010 in.	.015 in.
 **Series K**	6 CKT 3 N.O. 3 N.C.	15 amps, 125/250VAC, 60/400 Hz, 15 Amp Ind., 30VDC Resistive, 15 amps 10 amps, 30VDC Inductive 50,000 operations	Side Solder	Standard U.L. Listed - 30A, 250VAC MS25356-1 MS25353-1, Reset Type	K3-4 K3-12 K3-44 K3-344	56 oz.	4 oz.	.060 in. .075 in.	.028 +/- .007 in. .036 in.	.015 in.
	2 CKT Dbl. Brk.	750,000 operations at 10 amps, 125VAC 10,000 operations at 1 amp, 125VAC pilot duty 200,000 operations at 10 amps, 30VDC res & ind U.L. Listed for 10 amps, 125/250VAC, 1/2 amp, 125VDC (1/2 hp, 125/250VAC) Military rated for 10 amps 125/250VAC, 30VDC Ind.	End Solder End Screw Side Solder	Standard	S1-4 S2-4 S3-4	12+/-3 oz.	4 oz.	.060 in.	.020 +/- .005in	.015in
 **Series S**	2 CKT Dbl. Brk.	50,000 minimum operation 125VAC, 10 amps Resistive & Inductive 30VDC, 10 amps Resistive & Inductive 125VAC, 6 amps motor 28VDC, 6 amps motor	End Solder End Screw	MS25342-1, .027 max move. diff. MS25344-1, .027 max move. diff.	S1-44 S2-44	1.25 lbs 12 +/-3 oz	4 oz.	.060 in.	0.027 +/- .020in	.015 in.
	1 PNC Dbl brk. 1 PNO Dbl brk.	750,000 operations at 10 amps, 125VAC 10,000,000 oper. at 1 amp, 125VAC pilot duty 200,000 operations at 10 amps, 30VDC Inductive Military rated for 10 amps 125/250VAC, 30VDC	Side Solder End Screw Side Solder Side Solder	MS25343-1, .020+/- .005 move diff Standard .020 +/- .005 move. diff. Standard .010 +/- .004-.003 mv df U.L. Listed	S3-44 S2-25 S3-5 S3-6	19 oz. 15 oz. 15 oz. 15 oz.				

APPROXIMATE DIMENSIONS

Terminal Styles (Other terminations available)

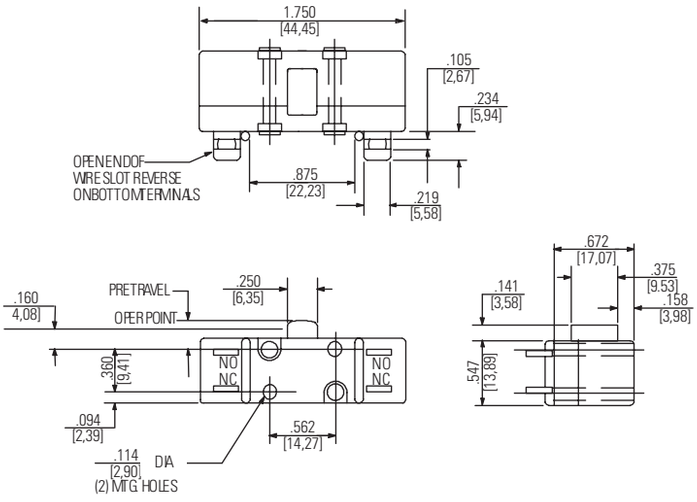


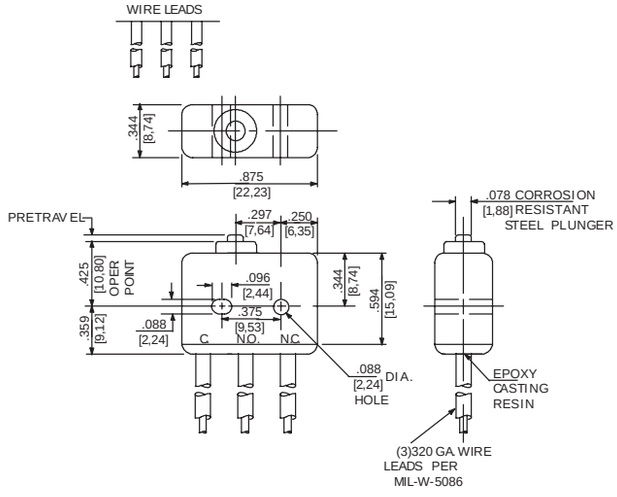




Series D

Series E4 and EM





Series G

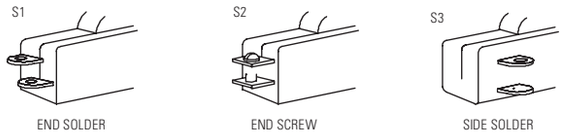
Series EF

STANDARD
0.00 = inches
[0,0] = mm

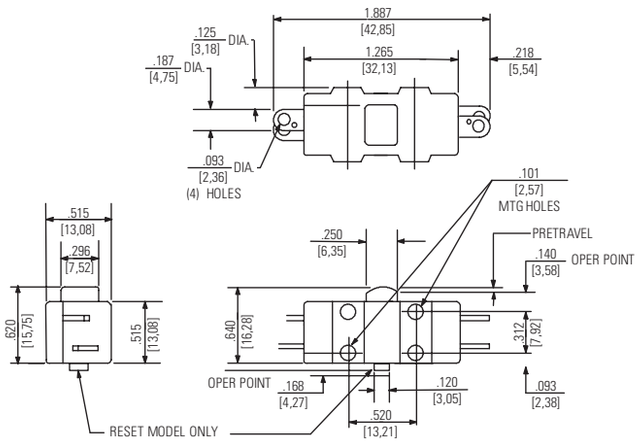
Dimensions for reference only.

BASIC SWITCHES
Precision Snap Action Switches

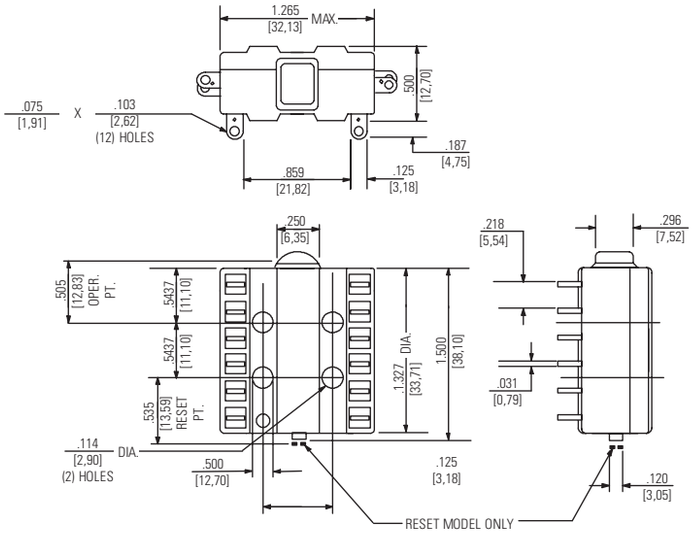
APPROXIMATE DIMENSIONS
Terminal Styles (Other terminations available)



OTHER TERMINATIONS AVAILABLE



Series S



Series K

STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

BASIC SWITCHES
Precision Snap Action Switch
Roller and Leaf Actuator

FEATURES

- All parts treated for corrosion resistance
- Actuator metal parts are stainless passivated
- Operating characteristics depend on switch selected
- Catalog numbers which appear with a slash between actuator and basic switch part number are screw type assemblies and can be supplied as separate components

WHEN ORDERING SPECIFY . . .

- Catalog number of actuator plus part number of basic switch.

Order Example:

A2-5 / **K3-4** = **A2-5/K3-4**

Catalog Number of Actuator — Basic Switch — Complete Part Number

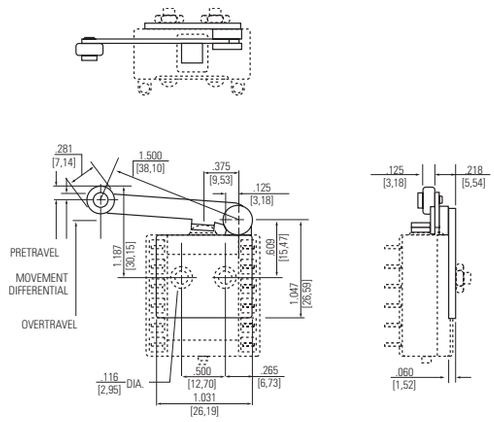
SELECTION AND SPECIFICATIONS TABLE

TYPE

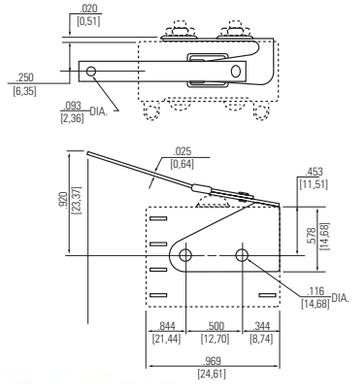
Roller Lever Type A2-5	Circuit	Electrical Rating Life	Catalog Number	Characteristics				
				Operating Force (Max.)	Release Force (Min.)	Pretravel (Max.)	Diff. Travel	Over Travel
 **Actuator A2-5 Shown with Basic Switch K3-4 Extended Leaf Type A5-18**	3 PDT 6 CKT Momentary	Can be used with "D" or "K" series basic switch shown on pg D2.	A2-5/K3-4	14 oz.	1 oz.	.240 in.	112 +/- .028 in.	.060 in.
 **Actuator A5-18 Shown with Basic Switch D8-4**	2 PDT 4 CKT Momentary	Can be used with "D" or "K" series basic switch shown on pg D2.	A5-18/D8-4	16 +/- 4 oz.		.375 in +/-.066 in.	.156 in.	.156 in.

APPROXIMATE DIMENSIONS

A2-5



A5-18



NOTES

SECTION E

Sealed Limit Switches Index

**Most items listed in this catalog are standard products and are normally in Distributor Inventory; however, the current inventory status should be checked by contacting your Safran Electrical & Power Customer Service Representative at 800-955-7354 or your authorized Distributor before placing orders.*

LIMIT SWITCHES
Series - H11

Environmentally Sealed Switches

FEATURES

- Current ratings up to 7 amperes
- Two and four pole configurations
- Wire leads with strain relief
- Connector option available
- Single hole mounting
- Ice scraping capability
- Simultaneous contact circuitry
- Reliable lifetime operation
- Durable construction for harsh environment applications
- Wiring schematic located on switch body
- Customized to fit your exact application

SPECIFICATIONS

- MIL-PRF-8805 approved
- Enclosure per MIL-PRF-8805 Design 4 (Resilient)
- Wire leads per MIL-W-22759/7
- Operating temperature range:
  -65°F to +185°F
  (-55°C to + 85°C)
- Electrical life: 25,000 cycles at rated load
- Mechanical life: 25,000 cycles
- All metal parts treated for corrosion resistance

CURRENT RATINGS

	Amperes - 28VDC			
Altitude	**Inrush**	**Resistive**	**Motor**	**Inductive**
Sea Level	24	7	4	4
50,000 Feet	24	7	4	2.5
100,000 Feet	24	7	4	1.5

Cat. No. H11-375

Cat. No. H11-330

Cat. No. H11-395

Cat. No. H11-390

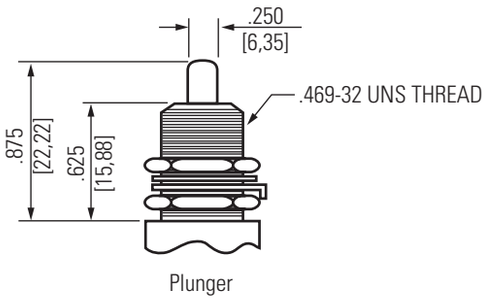
Cat. No. H11-335

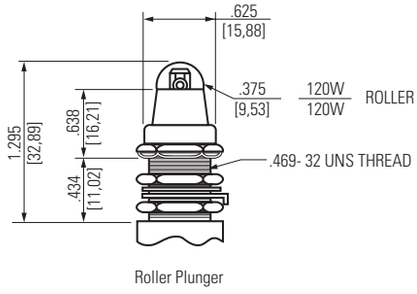
Cat. No. H11-331

SELECTION TABLE - All switches shown have 6-foot length lead wire per MIL-W-22759/7 marked per MIL-W-5088.

Poles and Throw	Characteristics						MS Part Number	Catalog Number	Weight (oz.)	Bushing Thread Size	Housing Dimensions Inches Standard Base	
	Actuator	Op. Force	Return Force	Pre-Travel	Over-Travel	Diff. Travel					Height "A" Dim.	Diameter "B" Dim.
					STANDARD SWITCH SERIES							
2 PDT	Plunger	6-12 lbs.	4 lbs. min.	.040 in. max.	.250 in. min.	.020 in. max.	MS21321-1 (8805/39)	H11-335	7.2	.625-24	.980	.720
4 PDT	Plunger	6-12 lbs.	4 lbs. min.	.040 in. max.	.250 in. min.	.020 in. max.	MS21321-2 (8805/39)	H11-395	12.5	.625-24	1.20	1.03
2 PDT	Plunger	6-12 lbs.	4 lbs. min.	.070 in. min.	.250 in. max.	.020 in. max.	MS24331-1 (8805/40)	H11-375	7.3	.625-24	.980	1.015
2 PDT	Plunger	6-12 lbs.	4 lbs. min.	.040 in. max.	.125 in. min.	.020 in. max.	MS27240-1 (8805/43)	H11-330	8	.469-32	1.0	.720
4 PDT	Plunger	6-12 lbs.	4 lbs. min.	.040 in. max.	.125 in. min.	.020 in. max.	MS27240-2 (8805/43)	H11-390	13.6	.469-32	1.20	1.03
2 PDT	Roller Plunger	6-12 lbs.	4 lbs. min.	.040 in. min.	.125 in. min.	.020 in. max.	MS27240-3 (8805/43)	H11-331	8	.32	1.0	.720
4 PDT	Roller Plunger	6-12 lbs.	4 lbs. min	.040 in. max.	.125 in. min.	.020 in. max.	MS27240-4 (8805/43)	H11-391	13.6	.469-32	1.20	1.03

STANDARD ACTUATOR



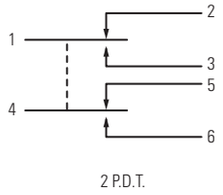


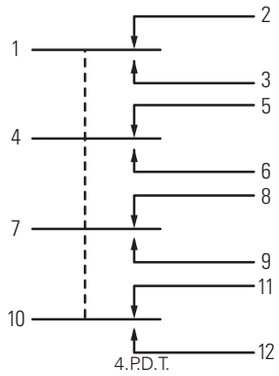
E-2-1/PART 2.AI

Plunger Operated - As with all push-on units, this actuator has an ice scraper for clearing the plunger of ice and debris with each operation.

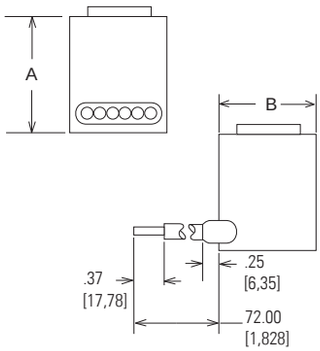
Roller Plunger - For cam and slide actuation. Roller adjusts radially in 45° increments. Cam differential should not exceed 0.125 in., and cam slope should not exceed 30° .

SCHEMATIC

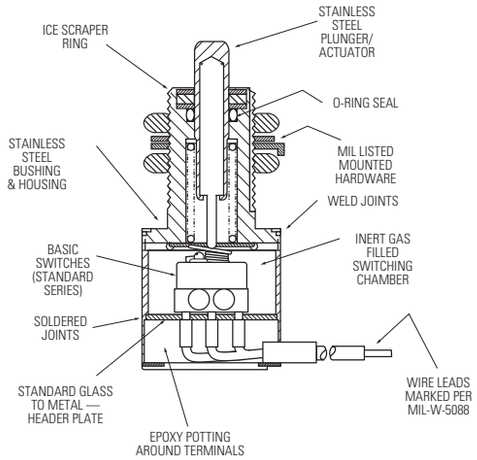




STANDARD BASE



BASIC CONSTRUCTION



STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

LIMIT SWITCHES
Series - HH

Hermetically Sealed Switches

FEATURES & SPCIFICATIONS

- Meets MIL-PRF-8805 Enclosure Design 5 (Hermetic)
- Mechanical life: 25,000 cycles
- Electrical life: 25,000 cycles
- Operating temperature:
  -65°F to +185°F
  (-55°C to +85°C)
- Leak rate less than 1 x 10^{-8}
- Rugged stainless steel construction
- Inert gas filled

OPTIONS

- Low level circuitry capability
- Rear or side exit connector
- RFI/EMI shielded cable
- High temperature operation
- Ball bearing plunger
- Custom bushing and plunger sizes
- Roller plunger available in 45° increments
- Special purpose designs

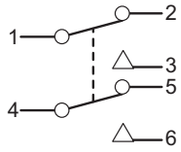
CURRENT RATINGS

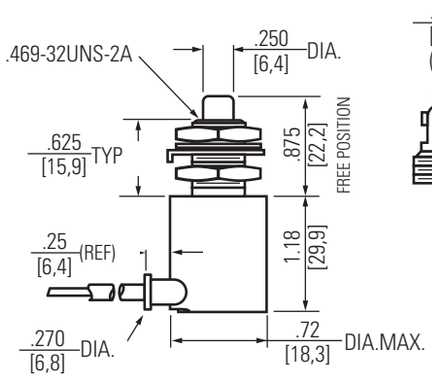
	Amperes - 28VDC		
	Resistive	**Inductive**	**Motor**
Sea Level	7.0	4.0	4.0
50,000 feet	7.0	2.5	4.0
Low Level Rating	0.1	0.1	—

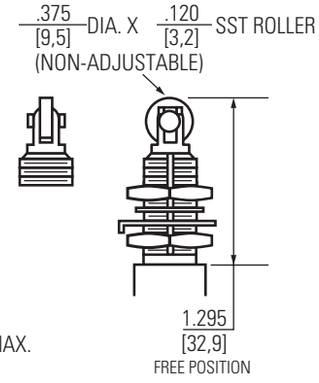
HERMETICALLY SEALED LIMIT SWITCHES

TWO POLE MINIATURE

P/N	DESCRIPTION
HH-630A	Plunger Side Exit
HH-630B	Plunger Rear Exit
HH-631A	Roller Side Exit
HH-631B	Roller Rear Exit

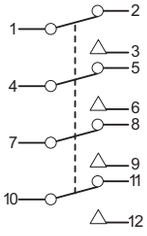


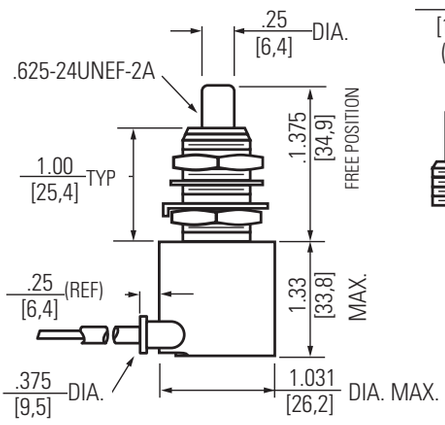


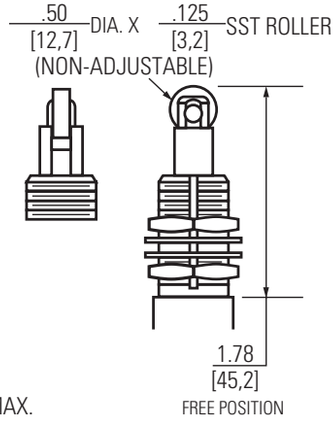


FOUR POLE SERIES

P/N	DESCRIPTION
HH-695A	Plunger Side Exit
HH-695B	Plunger Rear Exit
HH-696A	Roller Side Exit
HH-696B	Roller Rear Exit

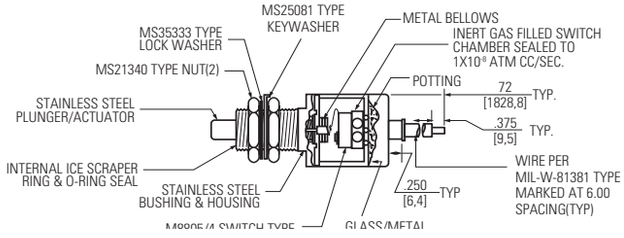






TYPICAL CONSTRUCTION - REAR EXIT DESIGN

HARDWARE SUPPLIED
UNASSEMBLED



STANDARD
0.00 = inches
[0,0] = mm

Dimensions for reference only.

SECTION F
Switch Guards & Shields

**Most items listed in this catalog are standard products and are normally in Distributor Inventory; however, the current inventory status should be checked by contacting your Safran Electrical & Power Customer Service Representative at 800-955-7354 or your authorized Distributor before placing orders.*

SWITCH GUARDS & SHIELDS
Switch Guards MIL-G-7703 and Industrial Grade

FEATURES

- For use with 2 or 3 position switches
- Lever covers molded in various colors
- Cover closure transfers toggle lever. See code number for details.
- Metal and molded covers
- Flush and One Hole Mounted (OHM) mounting styles
- MS approved and QPL'd per MIL-G-7703
- Covers are molded out of Thermoset molding materials
- Guard covers are spring loaded to either close or lock in open position
- One hole mounting and three hole mounting available
- Keyway orientation variations offered on some guards

Code 1

Code 2, 3, 16, 17

Code 7, 8, 10-14

Code 9

Code 6

Code 4, 5

Code 18-25

Code 26-29

Code 15

SELECTION TABLE

Switch Guard Code Number	Switch Mounting	Switch Positions	Lever Material	Color ④	Marking ②		Location of Keyway Tab	Military Part Number	Catalog Number
					Hinged End	Other End			
1	Flush	3	Phenolic	Red	—	—	—	MS25223-1	8496K1 ①
2	Flush	2	Phenolic	Red	—	—	—	MS25224-2	8497K2
3	Flush	3	Phenolic	Red	—	—	—	MS25225-2	8498K2
4	Flush	2	Metal	Green	—	—	—	MS25452-1	8499K1
5	Flush	2	Metal	Green	EMERGENCY		—	NAF47851-1	K2
6	Flush/OHM	2 or 3	Metal ③	Black	—	—	—	MS25221-1	8495K1
7	OHM	3	Phenolic	Red	—	—	Opp. Hinged End	MS25214-2	8494K2
8	OHM	3	Phenolic	Red	—	—	Hinged End	MS25214-3	K3
9	OHM	3	Phenolic	Red	—	—	Opp. Hinged End	MS25223-2	8496K2
10	OHM	2	Phenolic	Red	—	—	Opp. Hinged End	MS25224-1	8497K1
11		2	Phenolic	Red	—	—	Hinged End	MS25224-3	8497K3
12		2	Phenolic	Red	ON	OFF	Opp. Hinged End	—	K7
13	OHM	3	Phenolic	Red	—	—	Opp. Hinged End	MS25225-1	8498K1
14		3	Phenolic	Red	—	—	Hinged End	MS25225-3	K3
15		2 or 3	Metal ③	Black	—	—	Opp. Pin Hole	MS24417-1	8492K1
16		2 or 3	Phenolic	Red	—	—	Opp. Hinged End	MS27752-1	8498K6
17	Flush	3	Phenolic	Red	—	—	—	MS25214-1	8494K1
18		3		Red	—	—	Hinged End		8493K4
19		3		Red	—	—	Opp. Hinged End		K5
20	OHM	2	Metal	Red	—	—	Hinged End		K6
21		2		Red	—	—	Opp. Hinged End		K7
22		3		Black	—	—	Hinged End		K8
23		3		Black	—	—	Opp. Hinged End		8493K9
24		2		Black	—	—	Hinged End		K10
25	OHM	2	Metal	Black	—	—	Opp. Hinged End		K11
26		3		Red	—	—	Right Side		K12
27		3		Red	—	—	Left Side		K13
28	OHM	3	Metal	Black	—	—	Right Side		K14
29		3		Black	—	—	Left Side		K15

① Will not return lever when mounting plate is over .0625 [1,58] thick. ②Custom lettering or symbols available. ③Guard has no moving lever. ④ Optional colors: black phenolic available for 8497. Where other colors are required, they are sprayed over standard color.

SPECIFICATIONS

Code 1 and 9
- For three-position switches
- Returns lever to center position from either extreme
- Guard housing is spring loaded to retain closed position

Code 2, 10, 11 and 12
- For full throw single throw switches
- Returns lever to OFF position

Code 3, 13 and 14
- For three-position switches
- Returns lever from up position to center position
- Will not change toggle position when it is in down position

Code 4 and 5
- For two-position full throw switches
- Permits locking toggle in extreme up position

Code 6 and 15
- Insertion of pin through guard prevents accidental operation
- Prevents transfer of single throw switches
- Permits operation from first position to center on three-position switches

Code 17
- For three-position flush mount switches
- Guard lever remains fixed in open or closed position
- Return lever to center position from either extreme

Code 7 and 8
- For three-position switches
- Returns lever to center position from either extreme
- Guard housing remains fixed in open and closed position

Code 16
- For two- or three-position switches
- Closing guard does not affect toggle position

Code 18, 19, 22 and 23
- For three-position switches
- Returns lever from up position to center position
- Will not change toggle position when it is in down position

Code 20, 21, 24 and 25
- For two-position full throw switches
- Returns lever from up position to down position

Code 26-29
- For three-position switches
- With both guards in closed position, switch toggle lever is locked in center position. With one guard each in open and closed position, switch can be toggled between center and open guard position; with both guards in open position, switch can be toggled between left, center, and right position.

SWITCH GUARDS & SHIELDS
Switch Guard Application Table

Switch Catalog Number①	Switch Guard Code Number	Switch Catalog Number①	Switch Guard Code Number
8200K7	1, 3, 6, 17	8837K4 & K94	10, 11, 15, 16, 20, 21, 24, 25
8201K6, K14	2, 4, 5, 6	K5 & K95	10, 11, 15, 16, 21, 25
8209K6	3, 6	K6 & K96	13, 15, 16, 19, 23, 26-29
8210K7	6	K7 & K97	7, 9, 13, 15, 16
8211K7	2, 6	K8 & K98	11, 15, 16
8212K6	3, 6	8837K9 & K99	10, 12, 15, 16, 21, 25
8500K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	K10 & K910	10, 11, 15, 16, 21, 25
K2	13, 14, 15, 16, 18, 19, 22, 26-29	K11 & K911	10, 11, 15, 16, 21, 25
K3	13, 14, 15, 16, 18, 19, 22, 26-29	8838K1 & K91	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K4	10, 11, 15, 16, 20, 21, 24, 25	K2 & K92	13, 14, 15, 16, 18, 19, 22, 26-29
8500K5	10, 11, 15, 16, 21, 25	8838K3 & K93	13, 14, 15, 16, 18, 19, 22, 26-29
K6	13, 15, 16, 19, 23, 26-29	K4 & K94	10, 11, 15, 16, 20, 21, 24, 25
K7	7, 9, 13, 15, 16	K5 & K95	10, 11, 15, 16, 21, 25
K8	11, 15, 16	K6 & K96	13, 15, 16, 19, 23, 26-29
K9	10, 12, 15, 16, 21, 25	K7 & K97	7, 9, 13, 15, 16
8500K10	10, 11, 15, 16, 21, 25	8838K8 & K98	11, 15, 16
K11	10, 11, 15, 16, 21, 25	K9 & K99	10, 12, 15, 16, 21, 25
K12	15, 16	K10 & K910	10, 11, 15, 16, 21, 25
K13	13, 15, 16, 19, 23	K11 & K911	10, 11, 15, 16, 21, 25
8501K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	8868K1, K51, K61	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
8501K2	13, 14, 15, 16, 18, 19, 22, 26-29	8868K2, K52, K62	13, 14, 15, 16, 18, 19, 22, 26-29
K3	13, 14, 15, 16, 18, 19, 22, 26-29	K3, K53, K63	13, 14, 15, 16, 18, 19, 22, 26-29
K4	10, 11, 15, 16, 20, 21, 24, 25	K4, K54, K64	10, 11, 15, 16, 20, 21, 24, 25
K5	10, 11, 15, 16, 21, 25	K5, K55, K65	10, 11, 15, 16, 21, 25
K6	13, 15, 16, 19, 23, 26-29	K6, K56, K66	9, 13, 15, 16
8501K7	7, 9, 13, 15, 16	8868K7, K57, K67	10, 12, 15, 16, 21, 25
K8	11, 15, 16	K8, K58, K68	10, 12, 15, 16, 21, 25
K9	10, 12, 15, 16, 21, 25	8869K1, K1X, K51, K51X, K61, K61X	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K10	10, 11, 15, 16, 21, 25	K2, K2X, K52, K52X, K62, K62X	13, 14, 15, 16, 18, 19, 22, 26-29
K11	10, 11, 15, 16, 21, 25	K3, K3X, K53, K53X, K63, K63X	13, 14, 15, 16, 18, 19, 22, 26-29
8501K12	15, 16	8869K4, K4X, K54, K54X, K64, K64X	10, 11, 15, 16, 20, 21, 24, 25
K13	13, 15, 16, 19, 23	K5, K5X, K55, K55X, K65, K65X	10, 11, 15, 16, 21, 25
K14 thru K19	7, 9, 13, 15, 16, 18, 19, 22, 23, 26-29	K6, K6X, K56, K56X, K66, K66X	7, 9, 13, 15, 16
8502K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	K7, K7X, K57, K57X, K67, K67X	10, 12, 15, 16, 21, 25
K2	13, 14, 15, 16, 18, 19, 22, 26-29	8867K8, K8X, K58, K58X, K68, K68X	10, 12, 15, 16, 21, 25
8502K3	13, 14, 15, 16, 18, 19, 22, 23, 26-29	8869K9, K9X, K59, K59X, K69, K69X	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K4	10, 11, 15, 16, 20, 21, 24, 25	K10, K10X, K510, K510X, K610, K610X	13, 14, 15, 16, 18, 19, 22, 26-29
K5	10, 11, 15, 16, 21, 25	K11, K11X, K511, K511X, K611, K611X	13, 14, 15, 16, 18, 19, 22, 26-29
K6	13, 15, 16, 19, 23, 26-29	8854K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K7	7, 9, 13, 15, 16	8854K2	13, 14, 15, 16, 18, 19, 22, 26-29
8502K8	11, 15, 16	8854K3	13, 14, 15, 16, 18, 19, 22, 26-29
K9	10, 12, 15, 16, 21, 25	K4	10, 11, 15, 16, 20, 21, 24, 25
K10	10, 11, 15, 16, 21, 25	K5	10, 11, 15, 16, 21, 25
K11	10, 11, 15, 16, 21, 25	K6	7, 9, 13, 15, 16
K12	15, 16	K7	10, 12, 15, 16, 21, 25
8502K13	13, 15, 16, 19, 23	8854K8	10, 12, 15, 16, 21, 25
K15 thru K17	7, 9, 13,15, 16, 18, 19, 22, 23, 26-29	K9	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
8700K15	1, 3, 6, 17	K10	13, 14, 15, 16, 18, 19, 22, 26-29
8701K14	4, 5, 6	K11	13, 14, 15, 16, 18, 19, 22, 26-29
8709K15	3, 6		
8718K5	3, 6	8570K1-16, -20	7, 9, 13, 14, 16, 18, 19, 22, 23, 26-29
8740K12	2, 6	K2-16, -20	13, 14, 16, 18, 19, 22, 26-29
8742K10	3, 6, 17	K3-16, -20	13, 14, 16, 18, 19, 22, 26-29
8744K10	2, 6	K4-16, -20	10, 11, 16, 20, 21, 24, 25
8790K4	6	K5-16, -20	10, 11, 16, 21, 25
8792K3	6	8570K6-16, -20	13, 16, 19, 23, 26-29
8836K1 & K91	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	K7-16, -20	7, 9, 13, 16
K2 & K92	13, 14, 15, 16, 18, 19, 22, 26-29	K8-16, -20	11, 16
K3 & K93	13, 14, 15, 16, 18, 19, 22, 26-29	K9-16, -20	10, 12, 16, 21, 25
K4 & K94	10, 11, 15, 16, 20, 21, 24, 25	K10-16, -20	10, 11, 16, 21, 25
8836K5 & K95	10, 11, 15, 16, 21, 25	8570K11-16, -20	10, 11, 16, 21,25
K6 & K96	13, 15, 16, 19, 23, 26-29	K12-16, -20	16
K7 & K97	7, 9, 13, 15, 16	K13-16, -20	13, 16, 19, 23
K8 & K98	11, 15, 16	8571K1-16, -20	7, 9, 13, 14, 16, 18, 19, 22, 23, 26-29
K9 & K99	10, 12, 15, 16, 21, 25	K2-16, -20	13, 14, 16, 18, 19, 20, 26-29
8836K10 & K910	10, 11, 15, 16, 21, 25	8571K3-16, -20	13, 14, 16, 18, 19, 22, 26-29
K11 & K911	10, 11, 15, 16, 21, 25	K4-16, -20	10, 11, 16, 20, 21, 24, 25
8837K1 & K91	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	K5-16, -20	10, 11, 16, 21, 25
K2 & K92	13, 14, 15, 16, 18, 19, 22, 26-29	K6-16, -20	13, 16, 19, 23, 26-29
K3 & K93	13, 14, 15, 16, 18, 19, 22, 26-29	K7-16, -20	7, 9, 13, 16

① Listing covers only those switches that can be used with a switch guard.

SWITCH GUARDS & SHIELDS
Switch Guard Application Table

Switch Catalog Number①	Switch Guard Code Number	Switch Catalog Number①	Switch Guard Code Number
8571K8-16, -20	11, 16	8520K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K9-16, -20	10, 12, 16, 21, 25	K4	10, 11, 15, 16, 20, 21, 24, 25
K10-16, -20	10, 11, 16, 21, 25	K9	10, 12, 15, 16, 21, 25
K11-16, -20	10, 11, 16, 21, 25	8521K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23
K12-16, -20	16	K4	10, 11, 15, 16, 20, 21, 24, 25
8571K13-16, -20	13, 16, 19, 23	8521K9	10, 12, 15, 16, 20, 21, 24, 25
K17-16, -20	7, 9, 13, 16, 18, 19, 22, 23, 26-29	8522K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K18-16, -20	13, 14, 16, 18, 19, 22, 26-29	K4	10, 11, 15, 16, 20, 21, 24, 25
K19-16, -20	13, 14, 16, 18, 19, 22, 26-29	K9	10, 12, 15, 16, 21, 25
8572K1-16, -20	7, 9, 13, 14, 16, 18, 19, 22, 23, 26-29	8526K2	13, 14, 15, 16, 18, 19, 22, 26-29
8572K2-16, -20	13, 14, 16, 18, 19, 22, 26-29	8526K3	13, 14, 15, 16, 18, 19, 22, 26-29
K3-16, -20	13, 14, 16, 20, 21, 24, 25	K5	10, 11, 15, 16, 21, 25
K4-16, -20	10, 11, 16, 20, 21, 24, 25	8527K2	13, 14, 15, 16, 18, 19, 22, 26-29
K5-16, -20	10, 11, 16, 21, 25	K3	13, 14, 15, 16, 18, 19, 22, 26-29
K6-16, -20	13, 16, 19, 23, 26-29	K5	10, 11, 15, 16, 21, 25
8572K7-16, -20	7, 9, 13, 16	8528K2	13, 14, 15, 16, 18, 19, 22, 26-29
K8-16, -20	11, 16	K3	13, 14, 15, 16, 18, 19, 22, 26-29
K9-16, -20	10, 12, 16, 21, 25	K5	10, 11, 15, 16, 21, 25
K10-16, -20	10, 11, 16, 21, 25	8530K1, K31, K91	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K11-16, -20	10, 11, 16, 21, 25	K2, K32, K92	13, 14, 15, 16, 18, 19, 22, 26-29
8572K12-16, -20	16	8530K3, K33, K93	13, 14, 15, 16, 18, 19, 22, 26-29
K13-16, -20	13, 16, 19, 23	K4, K34, K94	10, 11, 15, 16, 20, 21, 24, 25
K15-16, -20	7, 9, 13, 16, 18, 19, 22, 23, 26-29	K5, K35, K95	10, 11, 15, 16, 21, 25
K16-16, -20	13, 14, 16, 18, 19, 22, 26-29	K6, K36, K96	13, 15, 16, 19, 23, 26-29
K17-16, -20	13, 14, 16, 18, 19, 22, 26-29	K7, K37, K97	7, 9, 13, 15, 16
8510K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	8530K8, K38, K98	11, 15, 16
K2	13, 14, 15, 16, 18, 19, 22, 26-29	K9, K39, K99	10, 12, 15, 16, 21, 25
K3	13, 14, 15, 16, 18, 19, 22, 26-29	K10, K310, K910	10, 11, 15, 16, 21, 25
K4	10, 11, 15, 16, 20, 21, 24, 25	K11, K311, K911	10, 11, 15, 16, 21, 25
K5	10, 11, 16, 21, 25	K12, K312, K912	15, 16
8510K6	13, 15, 16, 18, 23, 26-29	8530 K13, K313, K913	13, 15, 16, 19, 23
K7	7, 9, 13, 15, 16	8531 K1, K31, K91	7, 9, 13, 14, 15, 18, 19, 22, 23, 26-29
K8	11, 15, 16	K2, K32, K92	13, 14, 15, 16, 18, 19, 22, 26-29
K9	10, 12, 15, 16, 21, 25	K3, K33, K93	13, 14, 15, 16, 18, 19, 22, 26-29
K10	10, 11, 15, 16, 21, 25	K4, K34, K94	10, 11, 15, 16, 20, 21, 24, 25
8510K11	10, 11, 15, 16, 21, 25	8531K5, K35, K95	10, 11, 15, 16, 21, 25
K12	15, 16	K6, K36, K96	13, 15, 16, 19, 23, 26-29
K13	13, 15, 16, 19, 23	K7, K37, K97	7, 9, 13, 15, 16
8511K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	K8, K38, K98	11, 15, 16
K2	13, 14, 15, 16, 18, 19, 22, 26-29	K9, K39, K99	10, 12, 15, 16, 21, 25
8511K3	13, 14, 15, 16, 18, 19, 22, 26-29	8531K10, K310, K910	10, 11, 15, 16, 21, 25
K4	10, 11, 15, 16, 20, 21, 24, 25	K11, K311, K911	10, 11, 15, 16, 21, 25
K5	10, 11, 15, 16, 21, 25	K12, K312, K912	15, 16
K6	13, 15, 16, 19, 23, 26-29	K13, K313, K913	13, 15, 16, 19, 23
K7	7, 9, 13, 15, 16	K14, K314, K914	7, 9, 13, 15, 16, 18, 19, 22, 23, 26-29
8511K8	11, 15, 16	8531K15, K315, K915	13, 14, 15, 16, 18, 19, 22, 26-29
K9	10, 12, 15, 16, 21, 25	K16, K316, K916	13, 14, 15, 16, 18, 19, 22, 26-29
K10	10, 11, 15, 16, 21, 25	K17, K317, K917	7, 9, 13, 15, 16, 18, 19, 22, 23, 26-29
K11	10, 11, 15, 16, 21, 25	K18, K318, K918	13, 14, 15, 16, 18, 19, 22, 26-29
K12	15, 16	K19, K319, K919	13, 14, 15, 16, 18, 19, 22, 26-29
8511K13	13, 15, 16, 18, 23	8532K1, K31, K91	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29
K14	7, 9, 13, 15, 16, 18, 19, 22, 23, 26-29	K2, K32, K92	13, 14, 15, 16, 18, 19, 22, 26-29
K15	13, 14, 15, 16, 18, 19, 22, 26-29	K3, K33, K93	13, 14, 15, 16, 18, 19, 22, 26-29
K16	13, 14, 15, 16, 18, 19, 22, 26-29	K4, K34, K94	10, 11, 15, 16, 20, 21, 24, 25
8512K1	7, 9, 13, 14, 15, 16, 18, 19, 22, 23, 26-29	K5, K35, K95	10, 11, 15, 16, 21, 25
8512K2	13, 14, 15, 16, 18, 19, 22, 26-29	8532K6, K36, K96	13, 15, 16, 19, 23, 26-29
K3	13, 14, 15, 16, 18, 19, 22, 26-29	K7, K37, K97	7, 9, 13, 15, 16
K4	10, 11, 15, 16, 20, 21, 24, 25	K8, K38, K98	11, 15, 16
K5	10, 11, 15, 16, 21, 25	K9, K39, K99	10, 12, 15, 16, 21, 25
K6	13, 15, 16, 19, 23, 26-29	K10, K310, K910	10, 11, 15, 16, 21, 25
8512K7	7, 9, 13, 15, 16	8532K11, K311, K911	10, 11, 15, 16, 21, 25
K8	11, 15, 16	K12, K312, K912	15, 16
K9	10, 12, 15, 16, 21, 25	K13, K313, K913	13, 15, 16, 19, 23
K10	10, 11, 15, 16, 21, 25	K15, K315, K915	7, 9, 13, 15, 16, 18, 19, 22, 23, 26-29
K11	10, 11, 15, 16, 21, 25	K16, K316, K916	13, 14, 15, 16, 18, 19, 22, 26-29
8512K12	15, 16	8532K17, K317, K917	13, 14, 15, 16, 18, 19, 22, 26-29
K13	13, 15, 16, 19, 23		
K15	7, 9, 13, 15, 16, 18, 19, 22, 23, 26-29		
K16	13, 14, 15, 16, 18, 19, 22, 26-29		
K17	13, 14, 15, 16, 18, 19, 22, 26-29		

① Listing covers only those switches that can be used with a switch guard.

SWITCH GUARDS & SHIELDS
Switch Guard Application Table

Switch Catalog Number①	Switch Guard Code Number	Switch Catalog Number①	Switch Guard Code Number
A3-10 SERIES	10, 12, 15, 16, 21, 25	A3-206-06	10, 11, 15, 16, 21, 25
A3-32 SERIES	10, 11, 15, 16, 20, 21, 24, 25	-07	10, 11, 15, 16, 21, 25
A3-33 SERIES	10, 11, 15, 16, 20, 21, 24, 25	A3-208-01	7, 9, 13, 14, 15, 16, 18, 19, 22, 23
A3-40 SERIES	10, 11, 15, 16, 20, 21, 24, 25	-02	13, 14, 15, 16, 18, 19, 22, 26-29
A3-200-01	7, 9, 13, 14, 15, 16, 18, 19, 22, 23	-03	13, 14, 15, 16, 18, 19, 22, 26-29
A3-200-02	13, 14, 15, 16, 18, 19, 22, 26-29	A3-208-04	13, 14, 15, 16, 18, 19, 22, 26-29
-03	13, 14, 15, 16, 18, 19, 22, 26-29	-05	10, 11, 15, 16, 20, 21, 24, 25
-04	13, 14, 15, 16, 18, 19, 22, 26-29	-06	10, 11, 15, 16, 21, 25
-05	10, 11, 15, 16, 20, 21, 24, 25	-07	10, 11, 15, 16, 21, 25
A3-200-07	10, 11, 15, 16, 21, 25	A3-210-02	13, 14, 15, 16, 18, 19, 22, 26-29
A3-202-01	7, 9, 13, 14, 15, 16, 18, 19, 22, 23	-03	13, 14, 15, 18, 19, 22, 26-29
-02	13, 14, 15, 16, 18, 19, 22, 26-29	-04	13, 14, 15, 16, 18, 19, 22, 26-29
-03	13, 14, 15, 16, 18, 19, 22, 26-29	-05	10, 11, 15, 16, 20, 21, 24, 25
-04	13, 14, 15, 16, 18, 19, 22, 26-29	-06	10, 11, 15, 16, 21, 25
A3-202-05	10, 11, 16, 20, 21, 24, 25	A3-210-07	10, 11, 15, 16, 21, 25
-06	10, 11, 15, 16, 21, 25	A3-212-01	7, 9, 13, 14, 15, 16, 18, 19, 22, 23
-07	10, 11, 15, 16, 21, 25	-02	13, 14, 15, 16, 18, 19, 22, 26-29
A3-204-01	7, 9, 13, 14, 15, 16, 18, 19, 22, 23	-03	13, 14, 15, 16, 18, 19, 22, 26-29
-02	13, 14, 15, 16, 18, 19, 22, 26-29	-04	13, 14, 15, 16, 18, 19, 22, 26-29
A3-204-03	13, 14, 15, 16, 18, 19, 22, 26-29	A3-212-05	10, 11, 15, 16, 20, 21, 24, 25
-04	13, 14, 15, 16, 18, 19, 22, 26-29	-06	10, 11, 15, 16, 21, 25
-05	10, 11, 15, 16, 20, 21, 24, 25	-07	10, 11, 15, 16, 21, 25
-06	10, 11, 15, 16, 21, 25	A3-214-01	7, 9, 13, 14, 15, 16, 18, 19, 22,23
-07	10, 11, 15, 16, 21, 25	-02	12, 14, 15, 16, 18, 19, 22, 26-29
A3-206-01	7, 9, 13, 14, 15, 16, 18, 19, 22, 23	A3-214-03	13, 14, 15, 16, 18, 19, 22, 26-29
-02	13, 14, 15, 16, 18, 19, 22, 26-29	-04	13, 14, 15, 16, 18, 19, 22, 26-29
-03	13, 14, 15, 16, 18, 19, 22, 26-29	-05	10, 11, 15, 16, 20, 21, 24, 25
-04	13, 14, 15, 16, 18, 19, 22, 26-29	-06	10, 11, 15, 16, 21, 25
-05	10, 11, 15, 16, 20, 21, 24, 25	-07	10, 11, 15, 16, 21, 25

① Listing covers only those switches that can be used with a switch guard.

SWITCH GUARDS & SHIELDS
Pushbutton Shields for Series C100, D200W, H2200, J300, W100 and WC1500 Switches

FEATURES

- Protection against accidental actuation
- Rugged construction
- Anodized for corrosion protection
- Threaded or unthreaded
- Available in black, clear or red
- Various size ranges

DESCRIPTION

These anodized aluminum shields guard pushbuttons against accidental operation. Internally threaded and unthreaded, the shields are usually used on basic switches in place of mounting adapters, although Type W or other narrow adapters can be used with shields. Consult switch and adapter drawings for proper thread size when ordering shields. Order shields separately by part number.

SELECTION TABLE

Type	Active P/N	Obsolete P/N	Color	Dimension "A"	Dimension "B"	Dimension "C"	Dimension "D"	Dimension "E"
Knurled Shields	73-2474	120011	Clear Anodized	.625"	.875"	.500"	1/2-32 NS-2B	—
	73-2474-2	102012	Black Anodized	.625"	.875"	.500"	1/2-32 NS-2B	—
	73-2474-3	102012	Red Anodized	.625"	.875"	.500"	1/2-32 NS-2B	—
	73-2475	120016	Clear Anodized	.406"	.875"	.281"	1/2-32 NS-2B	—
	73-2475-2	120017	Black Anodized	.406"	.875"	.281"	1/2-32 NS-2B	—
	73-2475-3	120018	Red Anodized	.406"	.875"	.281"	1/2-32 NS-2B	—
Knurled Shields	73-2486	120081	Clear Anodized	.406"	.875"	.281"	5/8-24 NEF-2B	—
	73-2486-2	120082	Black Anodized	.406"	.875"	.281"	5/8-24 NEF-2B	—
	73-2486-3	120083	Red Anodized	.406"	.875"	.281"	5/8-24 NEF-2B	—
	73-2487	120091	Clear Anodized	.406"	.875"	.281"	15/32-32 NS-2B	—
	73-2487-2	120092	Black Anodized	.406"	.875"	.281"	15/32-32 NS-2B	—
	73-2487-3	120093	Red Anodized	.406"	.875"	.281"	15/32-32 NS-2B	—
Smooth Shields	73-2478	120031	Clear Anodized	.688"	.957"	.641"	1/2" HOLE	—
	73-2478-2	120032	Black Anodized	.688"	.957"	.641"	1/2" HOLE	—
	73-2478-3	120033	Red Anodized	.688"	.957"	.641"	1/2" HOLE	—
Smooth Shields	73-2479	120036	Clear Anodized	.844"	.957"	.719"	5.8-24 NEF-28	—
	73-2479-2	120037	Black Anodized	.844"	.957"	.719"	5/8-24 NEF-28	—
	73-2479-3	120038	Red Anodized	.844"	.957"	.719"	5/8-24 NEF-28	—
Rolled Edge Shields	73-2476	120021	Clear Anodized	.422"	1.063"	.375"	1/2" HOLE	61/64
	73-2476-2	120022	Black Anodized	.422"	1.063"	.375"	1/2" HOLE	61/64
	73-2476-3	120023	Red Anodized	.422"	1.063"	.375"	1/2" HOLE	61/64
	73-2477	120026	Clear Anodized	.688"	1.063"	.641"	1/2" HOLE	61/64
	73-2477-2	120027	Black Anodized	.688"	1.063"	.641"	1/2" HOLE	61/64
	73-2477-3	120028	Red Anodized	.688"	1.063"	.641"	1/2" HOLE	61/64
	73-2480	120041	Clear Anodized	.422"	1.063"	.375"	5/8" HOLE	61/64
	73-2480-2	120042	Black Anodized	.422"	1.063"	.375"	5/8" HOLE	61/64
	73-2480-3	120043	Red Anodized	.422"	1.063"	.375"	5/8" HOLE	61/64
	73-2481	120046	Clear Anodized	.610"	1.188"	.563"	5/8" HOLE	1 3/32
	73-2481-3	120048	Red Anodized	.610"	1.188"	.563"	5/8" HOLE	1 3/32
	73-2485	120071	Clear Anodized	.688"	1.063"	.641"	5/8" HOLE	61/64
	73-2485-2	120072	Black Anodized	.688"	1.063"	.641"	5/8" HOLE	61/64
	73-2485-3	120073	Red Anodized	.688"	1.063"	.641"	5/8" HOLE	61/64
Rolled Edge Shields	73-2488	120106	Clear Anodized	.500"	1.063"	.375"	5/8-24 NEF-2B	61/64
	73-2488-2	120107	Black Anodized	.500"	1.063"	.375"	5/8-24 NEF-2B	61/64
	73-2488-3	120108	Red Anodized	.500"	1.063"	.375"	5/8-24 NEF-2B	61/64
	73-2489-2①	120127	Clear Anodized	.719"	1.063"	.594"	5/8-24 NEF-2B	61/64
	73-2489-3①	120128	Black Anodized	.719"	1.063"	.594"	5/8-24 NEF-2B	61/64
	73-2489-4①	120129	Red Anodized	.719"	1.063"	.594"	5/8-24 NEF-2B	61/64
	73-2490	120146	Clear Anodized	.547"	1.063"	.500"	5/8" HOLE	61/64
	73-2490-2	120147	Red Anodized	.547"	1.063"	.500"	5/8" HOLE	61/64
	73-2490-3	120148	Black Anodized	.547"	1.063"	.500"	5/8" HOLE	61/64

① May also be used with following mounting adapter types: A, B, D, DA, E, HA, P, PA, U, W.

NOTES

Index G1

Protective Seals G2
- Panel seal for One Hole Mounting (OHM)
- O-Ring seals for panel mounting
- Switch boots

Attachable Tips G3
- Vinyl slip-on types
- Fluorescent tips
- Thermoplastic shaped levers
- 3-Cateye lever assembly

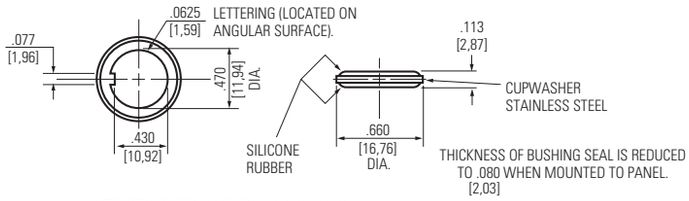
Mounting and Terminal Hardware G4 - G6
- Replacement hardware for military switches
- Optional hardware
- Mounting adapters for thick panel mounting
- Pushbutton mounting adapter

**Most items listed in this catalog are standard products and are normally in Distributor Inventory; however, the current inventory status should be checked by contacting your Safran Electrical & Power Customer Service Representative at 800-955-7354 or your authorized Distributor before placing orders.*

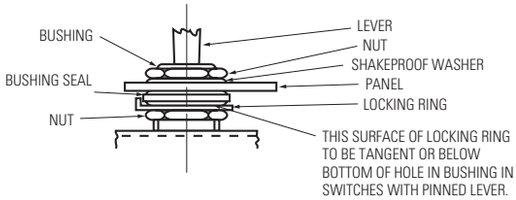
SECTION G - ACCESSORIES
Protective Seals

PANEL SEAL PART NO. 32-341

- Prevents moisture and contaminants from entering panel enclosure
- Behind panel mounting
- Stainless steel cup washer assures proper seating of silicone rubber seal
- Seal withstands 20 psi water pressure
- MIL part number M5423/16-001 (Supercedes MIL part number MS25196-1)



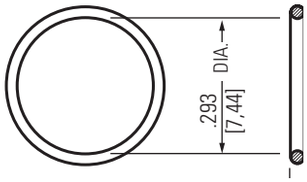
INSTRUCTIONS FOR ASSEMBLING BUSHING SEAL



BUSHING SEAL TO BE ASSEMBLED SO THAT SURFACE, WITH MARKING "BOTTOM," IS DOWN. LOCKING RING CAN BE ASSEMBLED WITH EAR EITHER UP OR DOWN.

"O" RING SEAL PART NO. 32-239-15

- Replacement panel seal for miniature positive action switches (8866 and 8867)
- Prevents entrance of contaminants into the panel enclosure
- Silicone rubber



SWITCH BOOTS

Specifications

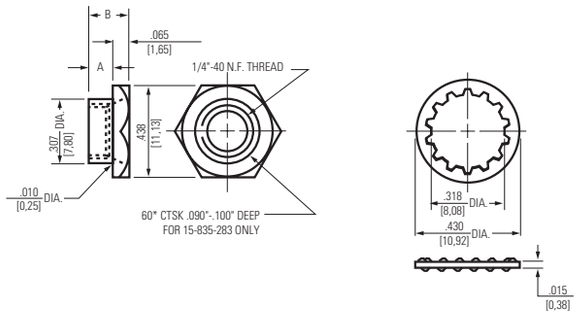
- Flexible silastic material prevents contaminants from entering switch
- 49-2030-2 designed for sealing Military high capacity switches (1-11/16" large lever)
- Popular 8864K2 consists of a boot 49-2033-2, nut 15-567, flexible washer 16-3084 and metal washer 16-1382

SELECTION TABLE

Application	Catalog or Part Number
Flush Mounted Switches	49-2030-2
One Hole Mounted Switches	8864K2

MOUNTING ADAPTER NUT FOR MINIATURE POSITIVE ACTION

- For 8866 and 8867 type miniature switches
- Facilitates thick panel mounting
- Three adapter sizes available



SELECTION TABLE

Mounting Adapter Nut

Dimension "A"	Dimension "B"	Panel Thickness (in.)		Part Number
		Standard Without Optional Lockwasher	With Optional Lockwasher Pt. No. 16-1880	
.067 [1,70] .077 [1,95]	.137 [3,47] Nominal	.107 [2,71] .157 [3,98]	.090 [2,28] .140 [3,55]	15-835
.129 [3,27] .139 [3,53]	.199 [5,05] Nominal	.169 [4,29] .219 [5,56]	.152 [3,86] .202 [5,13]	15-835-3
.192 [4,87] .202 [5,13]	.262 [6,65] Nominal	.232 [5,89] .282 [7,16]	.215 [5,46] .265 [6,73]	15-835-2

ATTACHABLE TIPS

- Facilitates identification of various switch functions
- 24-1939 tips nickel-plated for corrosion resistance
- 24-1939 tips snap on and are held by strong clip action at the base
- Vinyl slip-on lever caps available for both miniature and standard bat lever switches

SELECTION TABLE

Part Numbers 49-4307 and 49-4308

Part Numbers 49-4157 thru 49-4159

Part Number 24-1939

Application	Type of Tip	Government Part Number	Part Number
Attachable Tips			
Standard Bat Lever Switches	Fluorescent	AN3221-1	24-1939
Vinyl Slip-On Lever Caps			
Standard Bat Lever Switches	Black Red	- -	49-4307 49-4308
Miniature Bat Lever Switches	Black Red White	- - -	49-4157 49-4158 49-4159

ACCESSORIES
Mounting and Terminal Hardware

Switch Catalog Number	Mounting Hardware①				Terminal Hardware①			
	Lock Nut	Face Nut	Lock Washer	Locking Ring	Terminal Screws	Terminal Lug or Nut	Lock Washer	Misc. Hardware
8500-8505	15-966-6	15-966-6	16-886	29-761	11-2379	—	—	—
8510-8515	15-966-6	15-966-6	16-886	29-761	11-2379	—	—	—
8520-8528	15-966-6	15-966-6	16-886	29-761	11-2379	—	—	—
8530-8538	15-966-6	15-966-6	16-886	29-761	11-2379	—	—	—
8540-8548	—	—	—	—	11-2379	—	—	—
8566-8568	15-966-6	15-966-6	16-886	29-761	11-2379	—	—	—
8570-8575	15-966-6	15-966-6	16-886	29-761	—	—	—	—
8780-8782	—	—	—	—	—	815-601-3	16-365-2	16-4640
8790-8792	—	—	—	—	—	815-601-3	16-3493	821-1114-6
8836-8838	15-966-6	15-966-6	16-886	29-761	11-2379	—	—	—
8843-8845	15-966-6	15-966-6	16-886	29-761	11-2379	—	—	—
8855-8856	15-966-6	15-966-6	16-886	29-761	—	—	—	—
8866-8867	—	15-454-13	16-1751	—	—	—	—	32-239-15
8868-8869	15-966-6	15-966-6	16-886	29-761	—	—	—	—
A11200	15-1577	Adapter	16-3207	—	11-4177	80-4961	16-3257-22	—
A1224BT	—	15-1574	16-3209	—	11-4074	—	16-3257-12	—
A1285BT	—	15-1574	16-3209	—	11-4074	—	16-3257-12	—
A20267	—	15-1594	15-3215-3	52-2075	—	—	—	—
A20271	—	15-1594	16-3215-3	52-2075	—	—	—	—
A20272	—	15-1594	16-3215-3	52-2075	—	—	—	—
A20273	—	15-1594	16-3215-3	52-2075	—	—	—	—
A3-200 thru A3-215	15-1594	15-1594	16-3215	52-2050	—	—	—	—
A3-32-270	—	15-1596	16-3255-23	52-2041-6	—	—	—	—
A3-41-270 thru A3-48-270	15-1591	15-1591	—	52-20511	—	—	—	—
A3-54-103	15-1596	15-1623-2	16-3255-23	52-2041-6	—	—	—	—
A3-54-270	15-1596	15-1623-2	16-3255-23	52-2041-6	—	—	—	—
A3-55-270	15-1596	15-1623-2	16-3255-23	52-2041-6	—	—	—	—
A4-5-270	15-1591	15-1591	—	52-2051	—	—	—	—
A4-6-270	15-1591	15-1591	—	52-2051	—	—	—	—
A4-7-270	15-1666-6	15-1566-6	—	52-2041-6	—	—	—	—
A4-18-270	15-1566-6	15-1566-6	—	52-2041-6	—	—	—	—
A4-63-110	15-1566-6	15-1566-6	—	52-2041-6	—	—	—	—
A4-86-270	15-1566-6	15-1566-6	—	52-2041-6	—	—	—	—
A800	15-1572	Adapter	16-3209	—	11-4177	80-4961	16-3257-22	—
AT1226	—	15-1572	16-3209	52-2039	—	—	—	—
B7070	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
B7070B	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
B7070BR	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
B7070R	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
B9001B	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
B9001BB	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
B9001BR	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
B9001R	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
B9002B	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
B9002BB	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
B9002BR	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
B9002R	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
B9021BB thru B9021CR	15-1568	—	16-3203	—	—	—	—	—
B9022BB thru B9022CR	15-1568	—	16-3203	—				
BR7070	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
BW9001B	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
BW9001BB	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
BW9001BR	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
BW9001R	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
BW9002B	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
BW9002BB	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
BW9002BR	15-1580-3	15-1580-3	16-3255-16	—	—	—	—	—
BW9002R	15-1580-4	15-1580-4	16-3255-16	—	—	—	—	—
BW9021BB thru BW9021CR	15-1568	—	16-3203	—	—	—	—	—
BW9022BB thru BW9022CR	15-1568	—	16-3203	—	—	—	—	—
C100 Series w/adapter	15-1572*	Adapter	16-3209*	—	11-4177	80-4961	16-3257-22	—
C200 Series w/adapter	15-1572*	Adapter	16-3209*	—	11-4177	80-4961	16-3257-22	—
TW3103	15-1580	15-1580	—	52-2043	—	—	—	—
TW3113	15-1580	15-1580	—	52-2043	—	—	—	

① Hardware items are sold as replacement parts for Safran Electrical & Power switches only. *Locking nut 15-1597 and washer 16-3209-2 furnished with black finished devices.

Switch Catalog Number	Mounting Hardware①				Terminal Hardware①			
	Lock Nut	Face Nut	Lock Washer	Locking Ring	Terminal Screws	Terminal Lug or Nut	Lock Washer	Misc. Hardware
TW20000	15-1582	15-1582	16-3202	52-2046	—	—	—	—
TW20001	15-1582	15-1582	16-3202	52-2046	—	—	—	—
TW20002	15-1582	15-1582	16-3202	52-2046	—	—	—	—
W100 Series w/adapter	15-1572*	Adapter	16-3209*	—	11-4177	80-4961	16-3257-22	—
W1501	15-1573	Adapter	16-3201	—	—		—	—
W1501R	15-1573	Adapter	16-3201	—	—	—	—	—
W301	—	15-1577	16-3207	—	—	—	—	—
W302	—	15-1577	16-3207	—	—	—	—	—
W303	—	15-1577	16-3207	—	—	—	—	—
W403P6	15-1572	Adapter	16-3207	—	—	—	—	—
W403P6R	15-1572	Adapter	16-3209	—	—	—	—	—
W9001 thru W9006 Series	15-1572	Adapter	16-3209	52-2042	—	—	—	—
W9601 thru W9606 Series	15-1572	Adapter	16-3209 and 16-3113	—	11-4177	80-4961	16-3257-22	—
W9623 Series	15-1572	Adapter	16-3209 and 16-3113	—	11-4177	80-4961	16-3257-22	—
W150 Series	15-1572*	Adapter	16-3209*	—	—	—	—	—
C20050 Series	—	15-1577	16-3207	—	11-4177	80-4961	16-3257-22	—
C3100 Series	15-1577	15-1577	16-3207	—	11-4177	80-4961	16-3257-22	—
C4100 Series	15-1577	15-1577	16-3207	—	11-4177	80-4961	16-3257-22	
D201 thru D207 Series	15-1576 or 15-1577 or 15-1579	Adapter	16-3204 or 16-3207 or 16-3210	—	11-4082	—	16-3257-22	—
H11-330	15-1637	15-1637	16-3255-23	52-2041-6	—	—	—	—
H11-331	15-1637	15-1637	16-3255-23	52-2041-6	—	—	—	—
H11-334	15-1637	15-1637	16-3255-23	52-2041-6	—	—	—	—
H11-335	15-1618-2	15-1618-2	16-3209	52-2055	—	—	—	—
H11-374	15-1637	15-1637	16-3255-23	52-2041-6	—	—	—	—
H11-375	15-1718-2	15-1618-2	16-3209	52-2055	—	—	—	—
H11-390	15-1637	15-1637	16-3255-23	52-2041-6	—	—	—	—
H11-391	15-1637	15-1637	16-3255-23	52-2041-6	—	—	—	—
H11-394	15-1637	15-1637	16-3255-23	52-2041-6	—	—	—	—
H11-395	15-1618-2	15-1618-2	16-3209	52-2055	—	—	—	—
H2211	15-1572	Adapter	16-3209	—	—	—	—	—
H2256	15-1572	Adapter	16-3209	—	—	—	—	—
J100	15-1576	Adapter	16-3210	—	11-4177-65	—	16-3257-22	—
J103	15-1576	Adapter	16-3210	—	11-4177-65	—	16-3257-22	—
J20145	—	15-1594	16-3215-3	52-2075	—	—	—	—
J20149	—	15-1594	16-3215-3	52-2075	—	—	—	—
J20152	—	15-1594	16-3215-3	52-2075	—	—	—	—
J20153	—	15-1594	16-3215-3	52-2075	—	—	—	—
J300 Series	15-1572	Adapter	16-3209-3	—	—	—	—	—
J4004	15-1572	Adapter	16-3209	—	—	—	—	—
T1002	—	15-1566	16-3204	52-2041	11-4177-65	—	16-3257-12	—
T1003	—	15-1566	16-3204	52-2041	11-4177-65	—	16-3257-12	—
T1202	—	15-1566	16-3204	52-2041	—	—	—	—
T1203	—	15-1566	16-3204	52-2041	—	—	—	—
T2106	15-1580	15-1580	—	52-2043	—	—	—	—
T2114	15-1580	15-1580	—	52-2043	—	—	—	—
T2150	15-1580	15-1580	—	52-2043	—	—	—	—
T2153	15-1580	15-1580	—	52-2043	—	—	—	—
T3103	15-1580	15-1580	—	52-2043	—	—	—	—
T3106	15-1580	15-1580	—	52-2043	—	—	—	—
T3113	15-1580	15-1580	—	52-2043	—	—	—	—
TW1002	—	15-1566	16-3204	52-2041	11-4177-65	—	16-3257-12	—
TW1003	—	15-1566	16-3204	52-2041	11-4177-65	—	16-3257-12	—
TW2106	15-1580	15-1580	—	52-2043	—	—	—	—
TW2150	15-1580	15-1580	—	52-2043	—	—	—	—
TW2161	15-1580	15-1580	—	52-2043	—	—	—	—

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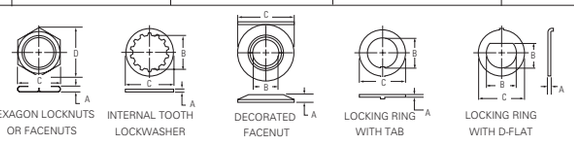
ACCESSORIES
Mounting and Terminal Hardware

SELECTION TABLE — MOUNTING HARDWARE FOR ONE HOLE MOUNTING SWITCHES

Size (Inches)	Description	Material	Dimensions (Inches) Thickness (Dimension "A")	Inside Diameter (Dimension "B")	O.D. or Dim. Across Flats (Dimension "C")	Dim. Across Corners (Dimension "D")	Part Number
MOUNTING NUTS							
1/4-40	Hexagon Facenut	Dull nickel plated brass	.063	—	.307	.344	15-454-13
	Hexagon Locknut/Facenut	Cadmium plated brass	.063	—	.309	—	15-1580
	Hexagon Locknut/Facenut	Black plated brass	.063	—	.309	—	15-1580-3
	Hexagon Locknut/Facenut	Cadmium plated steel	.063	—	.309	—	15-1580-4
	Hexagon Locknut/Facenut	Stainless steel-passivated	.094	—	.375	—	15-1591
13/32-32	Hexagon Facenut	Cadmium plated brass	.109	—	.500	—	15-1568
15/32-32	Hexagon Locknut/Facenut	Dull nickel plated steel	.078	—	.563	.656	15-966-6
	Hexagon Facenut	Cadmium plated brass	.078	—	.563	—	15-1566
	Hexagon Locknut/Facenut	Cadmium plated steel	.078	—	.563	—	15-1566-6
	Hexagon Locknut/Facenut	Cadmium plated steel	.093	—	.558	.640	15-1594
	Hexagon Locknut/Facenut	Stainless steel-passivated	.078	—	.563	—	15-1596
	Decorative Facenut	Chrome plated brass	.125	.375	.775	—	15-1623-2
	Hexagon Locknut/Facenut	Cadmium plated steel	.125	—	.625	.720	15-1637
1/2-32	Hexagon Locknut/Facenut	Cadmium plated brass	.140	—	.625	—	15-1577
5/8-18	Hexagon Facenut	Cadmium plated brass	.125	—	.813	—	15-1574
5/8-24	Hexagon Locknut	Tin-zinc plated brass	.094	—	.750	—	15-1572
	Hexagon Locknut/Facenut	Stainless steel-passivated	.125	—	.813	.930	15-1618-2
3/4-32	Hexagon Locknut	Cadmium plated brass	.125	—	1.00	—	15-1573
MOUNTING WASHERS, LOCKING RING AND PANEL SEAL							
1/4 DIA.	Internal Tooth Lockwasher	Stainless steel-passivated	.018	.261	.402	—	16-1751
	Internal Tooth Lockwasher	Cadmium plated steel	.018	.261	.403	—	16-3202
	Internal Tooth Lockwasher	Stainless steel-passivated	.025	.261	.469	—	16-3255-16
	Panel Seal	Silicone Rubber	.035	.295	.372	—	32-239-15
	Locking Ring (tab)	Cadmium plated brass	.031	.252	.344	—	52-2043
	Locking Ring (tab)	Stainless steel-passivated	.031	.260	.476	—	52-2051
	Locking Ring (D-flat)	Stainless steel-passivated	.029	.255	.398	—	52-2046
13/32 DIA.	Internal Tooth Lockwasher	Cadmium plated bronze	.022	.441	.540	—	16-3202
15/32 DIA.	Internal Tooth Lockwasher	Stainless steel-passivated	.018	.476	.600	—	16-886
	Internal Tooth Lockwasher	Stainless steel-passivated	.019	.476	.600	—	16-3255-23
	Internal Tooth Lockwasher	Cadmium plated steel	.018	.472	.594	—	16-3215
	Internal Tooth Lockwasher	Cadmium plated steel	.018	.472	.594	—	16-3215-3
	Internal Tooth Lockwasher	Cadmium plated bronze	.018	.472	.594	—	16-3204
	Locking Ring (tab)	Cadmium plated brass	.040	.475	.719	—	52-2041
	Locking Ring (tab)	Stainless steel-passivated	.040	.475	.719	—	52-2041-6
	Locking Ring (D-flat)	Cadmium plated steel	.048	.470	.719	.446	52-2075
	Locking Ring (tab)	Stainless steel-passivated	.040	.475	.719	—	29-761
	Locking Ring (D-flat)	Stainless steel-passivated	.040	.475	.719	—	52-2050
1/2 DIA.	Internal Tooth Lockwasher	Cadmium plated bronze	.022	.500	.625	—	16-3207
5/8 DIA.	Internal Tooth Lockwasher	Tin-zinc plated bronze	.022	.640	.875	—	16-3209
	Internal Tooth Lockwasher	Nickel plated bronze	.022	.640	.875	—	16-3209-3
	Gasket, washer	Neoprene rubber	.062	.625	.875	—	16-3113
	Locking Ring (tab)	Cadmium plated brass	.031	.631	.938	—	52-2042
	Locking Ring (tab)	Stainless steel-passivated	.040	.652	.875	—	52-2055
3/4 DIA.	Internal Tooth Lockwasher	Stainless steel-passivated	.022	.759	1.063	—	16-3201
7/8 DIA.	Internal Tooth Lockwasher	Cadmium plated bronze	.020	.885	1.095	—	16-3210
TERMINAL HARDWARE - SCREWS, LOCKWASHERS, LUGS AND NUTS							
#6-32 x.250	Terminal Sem screw	Dull nickel plated brass	—	—	—	—	11-2379
#6-32 x.187	Terminal screw	Dull nickel plated brass	—	—	—	—	11-4082
#6-32 x.187	Terminal screw	Dull nickel plated brass	—	—	—	—	11-4074
#2-56 x.130	Terminal screw	Dull nickel plated brass	—	—	—	—	11-4177
#6-32 x.190	Terminal screw	Dull nickel plated brass	—	—	—	—	11-4177-65
1/4 DIA.	Lockwasher	Nickel plated brass	.064	.265	.500	—	16-421-5
1/4 DIA.	Lockwasher	Silver plated brass	.040	.275	.562	—	821-1114-6
1/4 DIA.	Lockwasher	Cadmium plated brass	.062	.259	.489	—	16-3493
1/4 DIA.	Lockwasher	Cadmium plated bronze	.063	.255	.487	—	16-365-2
6/32 DIA.	Lockwasher	Cadmium plated bronze	.031	.141	.253	—	16-3257-12
2/56 DIA.	Lockwasher	Cadmium plated bronze	.015	.088	.165	—	16-3257-22
#2/56 x.130	Terminal Lug	Tin plated brass	—	—	—	—	80-4961
1/4 - 20	Terminal Nut	Silver plated brass	—	—	—	—	815-601-3

① Hardware items are sold as replacement parts for Safran Electrical & Power switches only.



Notes

Notes

REFERENCE DOCUMENTS
Cross Reference

MILITARY PART NUMBERS TO SAFRAN ELECTRICAL & POWER CATALOG NUMBERS

Military Part Number	Part Catalog No.	MIL Specification
AN3221-1	24-1939	MIL-T-6750
-2	19-1939-2	MIL-T-6750
AN3223-1	8864K2	MIL-B-5423
-2	49-2033-2	MIL-B-5423
AN3230-1	8780K11	MIL-S-6745
-2	8781K11	MIL-S-6745
-3	8782K11	MIL-S-6745
E1663-1	8790K4	XEL37
-3	8792K3	XEL37
M3950/14A21	8546K1	MIL-DTL-3950
A22	K9	MIL-DTL-3950
A23	K4	MIL-DTL-3950
A24	K6	MIL-DTL-3950
A25	K8	MIL-DTL-3950
A26	K5	MIL-DTL-3950
A27	K2	MIL-DTL-3950
A28	K7	MIL-DTL-3950
A29	K10	MIL-DTL-3950
A30	K11	MIL-DTL-3950
A31	K3	MIL-DTL-3950
A32	K12	MIL-DTL-3950
A33	K13	MIL-DTL-3950
B21	8547K1	MIL-DTL-3950
B22	K9	MIL-DTL-3950
B23	K4	MIL-DTL-3950
B24	K6	MIL-DTL-3950
B25	K8	MIL-DTL-3950
B26	K5	MIL-DTL-3950
B27	K2	MIL-DTL-3950
B28	K7	MIL-DTL-3950
B29	K10	MIL-DTL-3950
B30	K11	MIL-DTL-3950
B31	K3	MIL-DTL-3950
B32	K12	MIL-DTL-3950
B33	K13	MIL-DTL-3950
B34	K15	MIL-DTL-3950
B35	K16	MIL-DTL-3950
B36	K17	MIL-DTL-3950
C21	8548K1	MIL-DTL-3950
C22	8548K9	MIL-DTL-3950
C23	K4	MIL-DTL-3950
M3950/14C24	8548K6	MIL-DTL-3950
C25	K8	MIL-DTL-3950
C26	K5	MIL-DTL-3950
C27	K2	MIL-DTL-3950
C28	K7	MIL-DTL-3950
C29	K10	MIL-DTL-3950
C30	K11	MIL-DTL-3950
C31	K3	MIL-DTL-3950
C32	K12	MIL-DTL-3950
C33	K13	MIL-DTL-3950
C34	K15	MIL-DTL-3950
C35	K16	MIL-DTL-3950
C36	8548K17	MIL-DTL-3950
M5423/16-01	32-341	MIL-B-5423
M8805/2	(see MS25085)	
/4	(see MS24547)	
/5	(see MS25350)	
/11	(see MS25342)	
/11	(see MS25343)	
/14	(see MS25345)	
/14	(see MS25346)	
/14	(see MS25347)	
/15	(see MS25348)	
/15	(see MS25349)	
/16	(see MS25351)	
/17	(see MS25353)	
/18	(see MS25356)	
/19	(see MS25357)	
/20	(see MS16712)	
/38	(see MS27903)	
/39	(see MS21321)	
/40	(see MS24331)	
/43	(see MS27248)	
/53	(see MS27996)	
M8805/55-001	8870K2	MIL-S-8805/55
-002	K3	MIL-S-8805/55
-003	K4	MIL-S-8805/55
-004	K5	MIL-S-8805/55
M8805/93-001	A3-212-01	MIL-S-8805/93
-002	-02	MIL-S-8805/93
-003	-03	MIL-S-8805/93
-004	-04	MIL-S-8805/93
-005	-05	MIL-S-8805/93
-006	-06	MIL-S-8805/93
-007	-07	MIL-S-8805/93
-008	A3-200-01	MIL-S-8805/93
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-010	-03	MIL-S-8805/93
-011	-04	MIL-S-8805/93
-012	-05	MIL-S-8805/93
-013	-06	MIL-S-8805/93
-014	-07	MIL-S-8805/93
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-016	-02	MIL-S-8805/93
-017	-03	MIL-S-8805/93
-018	-04	MIL-S-8805/93
-019	-05	MIL-S-8805/93
-020	A3-202-06	MIL-S-8805/93
-021	-07	MIL-S-8805/93
-022	A3-204-01	MIL-S-8805/93
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-010	BW9001B	MIL-S-8805/96
-011	BW9002R	MIL-S-8805/96
-012	BW9002B	MIL-S-8805/96
-013	BW9001BR	MIL-S-8805/96
-014	BW9001BB	MIL-S-8805/96
-015	BW9002BR	MIL-S-8805/96
-016	BW9002BB	MIL-S-8805/96
M22885/18-01	A20267	MIL-S-22885
-02	J20145	MIL-S-22885
-03	A20271	MIL-S-22885
-04	J20149	MIL-S-22885
-05	A20272	MIL-S-22885
-06	J20152	MIL-S-22885
-07	A20273	MIL-S-22885
-08	J20153	MIL-S-22885
MS14001-212	8836K91	MIL-DTL-8834
-222	K99	MIL-DTL-8834
-232	K94	MIL-DTL-8834
-242	K96	MIL-DTL-8834
-262	K95	MIL-DTL-8834
-272	K92	MIL-DTL-8834
-282	K97	MIL-DTL-8834
-292	K910	MIL-DTL-8834
-302	K911	MIL-DTL-8834
-312	K93	MIL-DTL-8834
MS14002-212	8837K91	MIL-DTL-8834
-222	K99	MIL-DTL-8834
-232	K94	MIL-DTL-8834
-242	K96	MIL-DTL-8834
-262	K95	MIL-DTL-8834
-272	K92	MIL-DTL-8834
-282	K97	MIL-DTL-8834
-292	K910	MIL-DTL-8834
-302	K911	MIL-DTL-8834
-312	K93	MIL-DTL-8834
MS14003-212	8838K91	MIL-DTL-8834
-222	K99	MIL-DTL-8834
-232	K94	MIL-DTL-8834
-242	K96	MIL-DTL-8834
-262	K95	MIL-DTL-8834
-272	K92	MIL-DTL-8834
-282	K97	MIL-DTL-8834
-292	K910	MIL-DTL-8834
-302	K911	MIL-DTL-8834
-312	K93	MIL-DTL-8834
MS16712-1	C20050	MIL-S-8805/20
MS16712-2	C20050R	MIL-S-8805/20
MS18150-1	TW20001	MIL-S-83731
MS18151-1	TW20002	MIL-S-83731
MS18152-1	TW20000	MIL-S-83731
MS21026-A211	8855K4	MIL-DTL-8834
-B211	K5	MIL-DTL-8834
-B241	K19	MIL-DTL-8834
-C221	K13	MIL-DTL-8834
MS21026-C231	8855K7	MIL-DTL-8834
-D211	K10	MIL-DTL-8834
-E221	K14	MIL-DTL-8834
-E231	K8	MIL-DTL-8834
-F271	K15	MIL-DTL-8834
-G311	K16	MIL-DTL-8834
-H271	K17	MIL-DTL-8834
-J241	K9	MIL-DTL-8834
-K281	K18	MIL-DTL-8834
-K311	K20	MIL-DTL-8834
-L311	K12	MIL-DTL-8834
MS21027-A211	8856K4	MIL-DTL-8834
-A331	K21	MIL-DTL-8834
-A711	K4X	MIL-DTL-8834
-A831	K21X	MIL-DTL-8834
-B211	K5	MIL-DTL-8834
-B241	K19	MIL-DTL-8834
-B331	K30	MIL-DTL-8834
-B711	K5X	MIL-DTL-8834
-B741	K19X	MIL-DTL-8834
-B831	K30X	MIL-DTL-8834
-C221	K13	MIL-DTL-8834
-C231	K7	MIL-DTL-8834
-C331	K31	MIL-DTL-8834
-C721	K13X	MIL-DTL-8834
-C731	K7X	MIL-DTL-8834
-C831	K31X	MIL-DTL-8834
-D211	K10	MIL-DTL-8834
-D331	K32	MIL-DTL-8834
-D711	K10X	MIL-DTL-8834
-D831	K32X	MIL-DTL-8834
-E221	K14	MIL-DTL-8834
-E231	K8	MIL-DTL-8834
-E721	K14X	MIL-DTL-8834
-E731	K8X	MIL-DTL-8834
-F341	K22	MIL-DTL-8834
-F371	K27	MIL-DTL-8834
-F841	K22X	MIL-DTL-8834
-F871	K27X	MIL-DTL-8834
-G311	K16	MIL-DTL-8834
-G351	K35	MIL-DTL-8834
-G811	K16X	MIL-DTL-8834
-G851	K35X	MIL-DTL-8834
-H341	8856K34	MIL-DTL-8834
-H371	K29	MIL-DTL-8834
-H841	K34X	MIL-DTL-8834
-H871	K29X	MIL-DTL-8834
-J241	K9	MIL-DTL-8834
-J741	K9X	MIL-DTL-8834
-K311	K20	MIL-DTL-8834
-K321	K24	MIL-DTL-8834
-K351	K23	MIL-DTL-8834
-K381	K28	MIL-DTL-8834
-K811	K20X	MIL-DTL-8834
-K821	K24X	MIL-DTL-8834
-K851	K23X	MIL-DTL-8834
-K881	K28X	MIL-DTL-8834
-L311	K12	MIL-DTL-8834
-L351	K36	MIL-DTL-8834
-L811	K12X	MIL-DTL-8834
-L851	K36X	MIL-DTL-8834
MS21321-1	H11-335	MIL-S-8805/39
-2	H11-395	MIL-S-8805/39
MS21346-211	8868K51	MIL-DTL-8834
-221	K57	MIL-DTL-8834
-231	K54	MIL-DTL-8834
-241	K55	MIL-DTL-8834
-271	K52	MIL-DTL-8834
-281	K56	MIL-DTL-8834
-311	K53	MIL-DTL-8834
-321	K58	MIL-DTL-8834
-A211	8855K54	MIL-DTL-8834
-B211	K55	MIL-DTL-8834
-B241	K519	MIL-DTL-8834
-C221	K513	MIL-DTL-8834
-C231	K57	MIL-DTL-8834
-D211	K510	MIL-DTL-8834
-E221	K514	MIL-DTL-8834
-E231	K58	MIL-DTL-8834
-F271	K515	MIL-DTL-8834
-G311	K516	MIL-DTL-8834
-H271	K517	MIL-DTL-8834
-J241	K59	MIL-DTL-8834
-K281	K518	MIL-DTL-8834
-K311	K520	MIL-DTL-8834
-L311	K512	MIL-DTL-8834

MILITARY PART NUMBERS TO SAFRAN ELECTRICAL & POWER CATALOG NUMBERS

Military Part Number	Part Catalog No.	MIL Specification	Military Part Number	Part Catalog No.	MIL Specification	Military Part Number	Part Catalog No.	MIL Specification
MS21347-211	8869K51	MIL-DTL-8834	MS21357-221	8869K67	MIL-DTL-8834	MS21437-H341	8856K734	MIL-DTL-8834
-821	K58X	MIL-DTL-8834	-231	K64	MIL-DTL-8834	-H371	K729	MIL-DTL-8834
-831	K59X	MIL-DTL-8834	-241	K65	MIL-DTL-8834	-H841	K734X	MIL-DTL-8834
-841	K511X	MIL-DTL-8834	-271	K62	MIL-DTL-8834	-H871	K729X	MIL-DTL-8834
-851	K510X	MIL-DTL-8834	-281	K66	MIL-DTL-8834	-J241	K79	MIL-DTL-8834
-A211	8856K54	MIL-DTL-8834	-311	K63	MIL-DTL-8834	-J741	K79X	MIL-DTL-8834
-A331	K521	MIL-DTL-8834	-321	K68	MIL-DTL-8834	-K311	K720	MIL-DTL-8834
-B211	K55	MIL-DTL-8834	-331	K69	MIL-DTL-8834	-K321	K724	MIL-DTL-8834
-B241	K519	MIL-DTL-8834	-341	K611	MIL-DTL-8834	-K351	K723	MIL-DTL-8834
-B331	K530	MIL-DTL-8834	-351	K610	MIL-DTL-8834	-K381	K728	MIL-DTL-8834
-C221	K513	MIL-DTL-8834	MS21357-711	8869K61X	MIL-DTL-8834	-K811	K720X	MIL-DTL-8834
-C231	K57	MIL-DTL-8834	-721	K67X	MIL-DTL-8834	-K821	K724X	MIL-DTL-8834
-C331	K531	MIL-DTL-8834	-731	K64X	MIL-DTL-8834	-K851	K723X	MIL-DTL-8834
-D211	K510	MIL-DTL-8834	-741	K65X	MIL-DTL-8834	-K881	K728X	MIL-DTL-8834
-D331	K532	MIL-DTL-8834	-771	K62X	MIL-DTL-8834	-L311	K712	MIL-DTL-8834
-E221	K514	MIL-DTL-8834	-781	K66X	MIL-DTL-8834	-L351	K736	MIL-DTL-8834
-E231	K58	MIL-DTL-8834	-811	K63X	MIL-DTL-8834	-L811	K712X	MIL-DTL-8834
-F271	K515	MIL-DTL-8834	-821	K68X	MIL-DTL-8834	-L851	K736X	MIL-DTL-8834
-F341	K522	MIL-DTL-8834	-831	K69X	MIL-DTL-8834	MS24331-1	H11-375	MIL-S-8805/40
-F371	K527	MIL-DTL-8834	-841	K611X	MIL-DTL-8834	MS24417-1	8492K1	MIL-G-7703
-G311	K516	MIL-DTL-8834	-851	K610X	MIL-DTL-8834	MS24523-21	8500K1	MIL-DTL-3950
-G351	K535	MIL-DTL-8834	MS21433-211	8866KA61	MIL-DTL-8834	-22	K9	MIL-DTL-3950
-H271	K517	MIL-DTL-8834	-221	KA67	MIL-DTL-8834	-23	K4	MIL-DTL-3950
-H341	K534	MIL-DTL-8834	-231	KA64	MIL-DTL-8834	-24	K6	MIL-DTL-3950
-H371	K529	MIL-DTL-8834	-241	KA65	MIL-DTL-8834	-26	K5	MIL-DTL-3950
-J241	K59	MIL-DTL-8834	-271	KA62	MIL-DTL-8834	-27	K2	MIL-DTL-3950
-K281	K518	MIL-DTL-8834	-281	KA66	MIL-DTL-8834	-28	K7	MIL-DTL-3950
-K311	K520	MIL-DTL-8834	-311	KA63	MIL-DTL-8834	-29	K10	MIL-DTL-3950
-K321	K524	MIL-DTL-8834	-321	KA68	MIL-DTL-8834	-30	K11	MIL-DTL-3950
-K351	K523	MIL-DTL-8834	MS21434-211	8867KA61	MIL-DTL-8834	-31	K3	MIL-DTL-3950
-K381	K528	MIL-DTL-8834	-221	KA67	MIL-DTL-8834	-32	K12	MIL-DTL-3950
-L311	K512	MIL-DTL-8834	-231	KA64	MIL-DTL-8834	-33	K13	MIL-DTL-3950
-L351	K536	MIL-DTL-8834	-241	KA65	MIL-DTL-8834	MS24524-21	8501K1	MIL-DTL-3950
-221	8869K57	MIL-DTL-8834	-271	KA62	MIL-DTL-8834	-22	K9	MIL-DTL-3950
-231	K54	MIL-DTL-8834	-281	KA66	MIL-DTL-8834	-23	K4	MIL-DTL-3950
-241	K55	MIL-DTL-8834	-311	KA63	MIL-DTL-8834	-24	K6	MIL-DTL-3950
-271	K52	MIL-DTL-8834	-321	KA68	MIL-DTL-8834	-26	K5	MIL-DTL-3950
-281	K56	MIL-DTL-8834	-331	KA69	MIL-DTL-8834	-27	K2	MIL-DTL-3950
-311	K53	MIL-DTL-8834	-341	KA611	MIL-DTL-8834	-28	K7	MIL-DTL-3950
-321	K58	MIL-DTL-8834	-351	KA610	MIL-DTL-8834	-29	K10	MIL-DTL-3950
-331	K59	MIL-DTL-8834	MS21436-A211	8855K74	MIL-DTL-8834	-30	K11	MIL-DTL-3950
-341	K511	MIL-DTL-8834	-B211	K75	MIL-DTL-8834	-31	K3	MIL-DTL-3950
-351	K510	MIL-DTL-8834	-B241	K719	MIL-DTL-8834	-32	K12	MIL-DTL-3950
-711	K51X	MIL-DTL-8834	-C221	K713	MIL-DTL-8834	-33	K13	MIL-DTL-3950
-721	K57X	MIL-DTL-8834	-C231	K77	MIL-DTL-8834	MS24525-21	8502K1	MIL-DTL-3950
-731	K54X	MIL-DTL-8834	-D211	K710	MIL-DTL-8834	-22	K9	MIL-DTL-3950
-741	K55X	MIL-DTL-8834	-E221	K714	MIL-DTL-8834	-23	K4	MIL-DTL-3950
-771	K52X	MIL-DTL-8834	-E231	K78	MIL-DTL-8834	-24	K6	MIL-DTL-3950
-781	K56X	MIL-DTL-8834	-F271	K715	MIL-DTL-8834	-26	K5	MIL-DTL-3950
-811	K53X	MIL-DTL-8834	-G11	K716	MIL-DTL-8834	-27	K2	MIL-DTL-3950
MS21351-321	8868K8	MIL-DTL-8834	-H271	K717	MIL-DTL-8834	-28	K7	MIL-DTL-3950
MS21353-321	8869K8	MIL-DTL-8834	-J241	K79	MIL-DTL-8834	-29	K10	MIL-DTL-3950
-331	K9	MIL-DTL-8834	-K281	K718	MIL-DTL-8834	-30	K11	MIL-DTL-3950
-341	K11	MIL-DTL-8834	-K311	K720	MIL-DTL-8834	-31	K3	MIL-DTL-3950
-351	K10	MIL-DTL-8834	-L311	K712	MIL-DTL-8834	-32	K12	MIL-DTL-3950
-821	K8X	MIL-DTL-8834	MS21437-A211	8856K74	MIL-DTL-8834	-33	K13	MIL-DTL-3950
-831	K9X	MIL-DTL-8834	-A331	K721	MIL-DTL-8834	MS24547-1	SS30AT40	MIL-S-8805/4
-841	K11X	MIL-DTL-8834	-A711	8856K74X	MIL-DTL-8834	-2	KT40	MIL-S-8805/4
-851	K10X	MIL-DTL-8834	-A831	K21X	MIL-DTL-8834	-3	DT40	MIL-S-8805/4
MS21354-211	8866K61	MIL-DTL-8834	-B211	K75	MIL-DTL-8834	-4	AT41	MIL-S-8805/4
-221	K67	MIL-DTL-8834	-B241	K719	MIL-DTL-8834	-5	KT41	MIL-S-8805/4
-231	K64	MIL-DTL-8834	-B331	K730	MIL-DTL-8834	MS24612-A212	8843K1	MIL-DTL-8834
-241	K65	MIL-DTL-8834	-B711	K75X	MIL-DTL-8834	-B212	K2	MIL-DTL-8834
-271	K62	MIL-DTL-8834	-B741	K719X	MIL-DTL-8834	-B242	K16	MIL-DTL-8834
-281	K66	MIL-DTL-8834	-B831	K730X	MIL-DTL-8834	-C212	K3	MIL-DTL-8834
-311	K63	MIL-DTL-8834	-C221	K713	MIL-DTL-8834	-C222	K9	MIL-DTL-8834
-321	K68	MIL-DTL-8834	-C231	K77	MIL-DTL-8834	-C232	K7	MIL-DTL-8834
MS21355-211	8867K61	MIL-DTL-8834	-C331	K731	MIL-DTL-8834	-D212	K4	MIL-DTL-8834
-221	K67	MIL-DTL-8834	-C721	K713X	MIL-DTL-8834	-E212	K5	MIL-DTL-8834
-231	K64	MIL-DTL-8834	-C731	K77X	MIL-DTL-8834	-E222	K10	MIL-DTL-8834
-241	K65	MIL-DTL-8834	-C831	K731X	MIL-DTL-8834	-E232	K6	MIL-DTL-8834
-271	K62	MIL-DTL-8834	-D211	K710	MIL-DTL-8834	-F272	K12	MIL-DTL-8834
-281	K66	MIL-DTL-8834	-D331	K732	MIL-DTL-8834	-G312	K13	MIL-DTL-8834
-311	K63	MIL-DTL-8834	-D711	K710X	MIL-DTL-8834	-H272	K14	MIL-DTL-8834
-321	K68	MIL-DTL-8834	-D831	K732X	MIL-DTL-8834	-J242	K11	MIL-DTL-8834
-331	K69	MIL-DTL-8834	-E221	K714	MIL-DTL-8834	-K282	K15	MIL-DTL-8834
-341	K611	MIL-DTL-8834	-E231	K78	MIL-DTL-8834	-K312	K18	MIL-DTL-8834
-351	K610	MIL-DTL-8834	-E721	K714X	MIL-DTL-8834	-L262	K20	MIL-DTL-8834
MS21356-211	8868K61	MIL-DTL-8834	-E731	K78X	MIL-DTL-8834	-L292	K21	MIL-DTL-8834
-221	K67	MIL-DTL-8834	-F341	K722	MIL-DTL-8834	-L302	K19	MIL-DTL-8834
-231	K64	MIL-DTL-8834	-F371	K727	MIL-DTL-8834	-M312	K8	MIL-DTL-8834
-241	K65	MIL-DTL-8834	-F841	K722X	MIL-DTL-8834	-N312	K17	MIL-DTL-8834
-271	K62	MIL-DTL-8834	-F871	K727X	MIL-DTL-8834	MS24613-A212	8844K1	MIL-DTL-8834
-281	K66	MIL-DTL-8834	-G311	K716	MIL-DTL-8834	-B212	K2	MIL-DTL-8834
-311	K63	MIL-DTL-8834	-G351	K735	MIL-DTL-8834			
-321	K68	MIL-DTL-8834	-G811	K716X	MIL-DTL-8834			
MS21357-211	8869K61	MIL-DTL-8834	-G851	K735X	MIL-DTL-8834			

REFERENCE DOCUMENTS
Cross Reference

MILITARY PART NUMBERS TO SAFRAN ELECTRICAL & POWER CATALOG NUMBERS

Military Part Number	Part Catalog No.	MIL Specification
MS24613-B242	8844K16	MIL-DTL-8834
-C212	K3	MIL-DTL-8834
-C222	K9	MIL-DTL-8834
-C232	K7	MIL-DTL-8834
-D212	K4	MIL-DTL-8834
-E212	K5	MIL-DTL-8834
-E222	K10	MIL-DTL-8834
-E232	K6	MIL-DTL-8834
-F272	K12	MIL-DTL-8834
-G312	K13	MIL-DTL-8834
-H272	K14	MIL-DTL-8834
-J242	K11	MIL-DTL-8834
-K282	K15	MIL-DTL-8834
-K312	K18	MIL-DTL-8834
-L262	K20	MIL-DTL-8834
-L292	K21	MIL-DTL-8834
-L302	K19	MIL-DTL-8834
-M312	K8	MIL-DTL-8834
-N312	K17	MIL-DTL-8834
MS24614-A212	8845K1	MIL-DTL-8834
-B212	K2	MIL-DTL-8834
-B242	K16	MIL-DTL-8834
-C212	K3	MIL-DTL-8834
-C222	K9	MIL-DTL-8834
-C232	K7	MIL-DTL-8834
-D212	K4	MIL-DTL-8834
-E212	K5	MIL-DTL-8834
-E222	K10	MIL-DTL-8834
-E232	K6	MIL-DTL-8834
-F272	K12	MIL-DTL-8834
-G312	K13	MIL-DTL-8834
-H272	K14	MIL-DTL-8834
-J242	K11	MIL-DTL-8834
-K282	K15	MIL-DTL-8834
-K312	K18	MIL-DTL-8834
-L262	K20	MIL-DTL-8834
-L292	K21	MIL-DTL-8834
-L302	K19	MIL-DTL-8834
-M312	K8	MIL-DTL-8834
-N312	K17	MIL-DTL-8834
MS24655-211	8866K1	MIL-DTL-8834
-221	K7	MIL-DTL-8834
-231	K4	MIL-DTL-8834
-241	K5	MIL-DTL-8834
-271	K2	MIL-DTL-8834
-281	K6	MIL-DTL-8834
-311	K3	MIL-DTL-8834
-321	K8	MIL-DTL-8834
-211W	K51	MIL-DTL-8834
-221W	K57	MIL-DTL-8834
-231W	K54	MIL-DTL-8834
-241W	K55	MIL-DTL-8834
-271W	K52	MIL-DTL-8834
-281W	K56	MIL-DTL-8834
-311W	K53	MIL-DTL-8834
-321W	K58	MIL-DTL-8834
MS24656-211	8867K1	MIL-DTL-8834
-221	K7	MIL-DTL-8834
-231	K4	MIL-DTL-8834
-241	K5	MIL-DTL-8834
-271	K2	MIL-DTL-8834
-281	K6	MIL-DTL-8834
-311	K3	MIL-DTL-8834
-321	K8	MIL-DTL-8834
-331	K9	MIL-DTL-8834
-341	K11	MIL-DTL-8834
-351	K10	MIL-DTL-8834
-211W	K51	MIL-DTL-8834
-221W	K57	MIL-DTL-8834
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-281W	K56	MIL-DTL-8834
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-331W	K59	MIL-DTL-8834
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-33K	K26	MIL-DTL-3950
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MS25082-8	15-404-6	MIL-S-83731
MS25085-1	E4-270	MIL-S-8805/2
MS25085-2	E4-271	MIL-S-8805/2
MS25214-1	8494K1	MIL-S-7703
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-3	K3	MIL-G-7703
MS25221-1	8495K1	MIL-G-7703
MS25223-1	8496K1	MIL-G-7703
-2	K2	MIL-G-7703
MS25224-1	8497K1	MIL-G-7703
-2	K2	MIL-G-7703
-3	K3	MIL-G-7703
MS25225-1	8498K1	MIL-G-7703
-2	K2	MIL-G-7703
-3	K3	MIL-G-7703
MS25246-1	24-1164-2	
MS25301-1	49-1740-2	MIL-B-5423
MS25306-212	8836K1	MIL-DTL-8834
-222	K9	MIL-DTL-8834
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MS25342-1	S1-44	MIL-S-8805/11
MS25343-1	S3-44	MIL-S-8805/11
MS25344-1	S2-44	MIL-S-8805/11
MS25345-1	S1-344	MIL-S-8805/14
MS25346-1	S3-344	MIL-S-8805/14
MS25347-1	S2-344	MIL-S-8805/14
MS25348-1	D4-44	MIL-S-8805/15
MS25349-1	D8-44	MIL-S-8805/15
MS25350-1	D4-344	MIL-S-8805/5

MILITARY PART NUMBERS TO SAFRAN ELECTRICAL & POWER CATALOG NUMBERS

Military Part Number	Part Catalog No.	MIL Specification
MS25351-1	D8-344	MIL-S-8805/16
MS25353-1	K3-344	MIL-S-8805/17
MS25356-1	K3-44	MIL-S-8805/18
MS25357-1	G3-44	MIL-S-8805/19
MS25452-1	8499K1	MIL-G-7703
MS27240-1	H11-330	MIL-S-8805/43
-2	-390	MIL-S-8805
-3	-331	MIL-S-8805/43
-4	-391	MIL-S-8805
MS27259-1	H11-334	MIL-S-8805
-2	-394	MIL-S-8805
MS27406-1	8502K15	MIL-DTL-3950
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MS27407-1	8501K14	MIL-DTL-3950
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MS27781-21A	8573K1-16	MIL-DTL-3950
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-31E	K18-16	MIL-DTL-3950
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-33K	K26-16	MIL-DTL-3950
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-3N	K64-16	MIL-DTL-3950
-21A	K1-16	MIL-DTL-3950
-21B	K27-16	MIL-DTL-3950
-21D	K5-16	MIL-DTL-3950
-21E	K2-16	MIL-DTL-3950

REFERENCE DOCUMENTS
Cross Reference

MILITARY PART NUMBERS TO SAFRAN ELECTRICAL & POWER CATALOG NUMBERS

Military Part Number	Part Catalog No.	MIL Specification
MS27783-21F	8575K28-16	MIL-DTL-3950
-21G	K3-16	MIL-DTL-3950
-21H	K29-16	MIL-DTL-3950
-21J	K30-16	MIL-DTL-3950
-21K	K31-16	MIL-DTL-3950
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-21M	K33-16	MIL-DTL-3950
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-21P	K34-16	MIL-DTL-3950
-22D	K10-16	MIL-DTL-3950
-22F	K35-16	MIL-DTL-3950
-22G	K9-16	MIL-DTL-3950
-23D	K6-16	MIL-DTL-3950
-23F	K36-16	MIL-DTL-3950
-23G	K7-16	MIL-DTL-3950
-24E	K16-16	MIL-DTL-3950
-24F	K37-16	MIL-DTL-3950
-24K	K38-16	MIL-DTL-3950
-24M	K11-16	MIL-DTL-3950
-26F	K20-16	MIL-DTL-3950
-27E	K12-16	MIL-DTL-3950
-27L	K39-16	MIL-DTL-3950
-27N	K14-16	MIL-DTL-3950
-28E	K15-16	MIL-DTL-3950
-29F	K21-16	MIL-DTL-3950
-30F	K19-16	MIL-DTL-3950
-31E	K18-16	MIL-DTL-3950
-31F	K40-16	MIL-DTL-3950
-31K	K41-16	MIL-DTL-3950
-31L	K13-16	MIL-DTL-3950
-31M	K17-16	MIL-DTL-3950
-31N	K8-16	MIL-DTL-3950
-32E	K23-16	MIL-DTL-3950
-33E	K24-16	MIL-DTL-3950
-33F	K25-16	MIL-DTL-3950
-33K	K26-16	MIL-DTL-3950
-33M	K42-16	MIL-DTL-3950
MS27784-21	8570K1-20	MIL-DTL-3950
-22	K9-20	MIL-DTL-3950
-23	K4-20	MIL-DTL-3950
-24	K6-20	MIL-DTL-3950
-26	K5-20	MIL-DTL-3950
-27	K2-20	MIL-DTL-3950
-28	K7-20	MIL-DTL-3950
-29	K10-20	MIL-DTL-3950
-30	K11-20	MIL-DTL-3950
-31	K3-20	MIL-DTL-3950
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MS27785-1	8571K17-20	MIL-DTL-3950
-2	K18-20	MIL-DTL-3950
-3	K19-20	MIL-DTL-3950
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-22	K9-20	MIL-DTL-3950
-23	K4-20	MIL-DTL-3950
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-26	K5-20	MIL-DTL-3950
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MS27786-1	8572K15-20	MIL-DTL-3950
-2	K16-20	MIL-DTL-3950
-3	K17-20	MIL-DTL-3950
-21	K1-20	MIL-DTL-3950
-22	K9-20	MIL-DTL-3950
-23	K4-20	MIL-DTL-3950
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-26	K5-20	MIL-DTL-3950
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MS27787-21A	8573K1-20	MIL-DTL-3950
-21B	K27-20	MIL-DTL-3950
-21D	K5-20	MIL-DTL-3950
-21E	K2-20	MIL-DTL-3950
MS27787-21F	8573K8-20	MIL-DTL-3950
-21G	K3-20	MIL-DTL-3950
-21H	K29-20	MIL-DTL-3950
-21J	K30-20	MIL-DTL-3950
-21K	K31-20	MIL-DTL-3950
-21L	K32-20	MIL-DTL-3950
-21M	K33-20	MIL-DTL-3950
-21N	K4-20	MIL-DTL-3950
-21P	K34-20	MIL-DTL-3950
-22D	K10-20	MIL-DTL-3950
-22F	K35-20	MIL-DTL-3950
-22G	K9-20	MIL-DTL-3950
-23D	K6-20	MIL-DTL-3950
-23F	K36-20	MIL-DTL-3950
-23G	K7-20	MIL-DTL-3950
-24E	K16-20	MIL-DTL-3950
-24F	K37-20	MIL-DTL-3950
-24K	K38-20	MIL-DTL-3950
-24M	K11-20	MIL-DTL-3950
-26F	K20-20	MIL-DTL-3950
-27E	K12-20	MIL-DTL-3950
-27L	K39-20	MIL-DTL-3950
-27N	K14-20	MIL-DTL-3950
-28E	8573K15-20	MIL-DTL-3950
-29F	K21-20	MIL-DTL-3950
-30F	K19-20	MIL-DTL-3950
-31E	K18-20	MIL-DTL-3950
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-31K	K41-20	MIL-DTL-3950
-31L	K13-20	MIL-DTL-3950
-31M	K17-20	MIL-DTL-3950
-31N	K8-20	MIL-DTL-3950
-32E	K23-20	MIL-DTL-3950
-33E	K24-20	MIL-DTL-3950
-33F	K25-20	MIL-DTL-3950
-33K	K26-20	MIL-DTL-3950
-33M	K42-20	MIL-DTL-3950
MS27788-1A	8574K65-20	MIL-DTL-3950
-1B	K66-20	MIL-DTL-3950
-1D	K67-20	MIL-DTL-3950
-1E	K68-20	MIL-DTL-3950
-1F	K69-20	MIL-DTL-3950
-1G	K70-20	MIL-DTL-3950
-1H	K71-20	MIL-DTL-3950
-1J	K72-20	MIL-DTL-3950
-1K	K73-20	MIL-DTL-3950
-1L	K74-20	MIL-DTL-3950
-1M	K75-20	MIL-DTL-3950
-1N	K76-20	MIL-DTL-3950
-1P	K77-20	MIL-DTL-3950
-2E	K78-20	MIL-DTL-3950
-2F	K79-20	MIL-DTL-3950
-2K	K80-20	MIL-DTL-3950
-2L	K81-20	MIL-DTL-3950
-2M	K82-20	MIL-DTL-3950
-2N	K83-20	MIL-DTL-3950
-3E	K84-20	MIL-DTL-3950
-3L	K85-20	MIL-DTL-3950
-3N	K86-20	MIL-DTL-3950
-21A	K1-20	MIL-DTL-3950
-21B	K27-20	MIL-DTL-3950
-21D	K5-20	MIL-DTL-3950
-21E	K2-20	MIL-DTL-3950
-21F	K28-20	MIL-DTL-3950
-21G	K3-20	MIL-DTL-3950
-21H	K29-20	MIL-DTL-3950
-21J	K30-20	MIL-DTL-3950
-21K	K31-20	MIL-DTL-3950
-21L	K32-20	MIL-DTL-3950
-21M	K33-20	MIL-DTL-3950
-21N	K4-20	MIL-DTL-3950
-21P	K34-20	MIL-DTL-3950
-22D	K10-20	MIL-DTL-3950
-22F	K35-20	MIL-DTL-3950
-22G	K9-20	MIL-DTL-3950
-23D	K6-20	MIL-DTL-3950
-23F	K36-20	MIL-DTL-3950
-23G	K7-20	MIL-DTL-3950
-24E	K16-20	MIL-DTL-3950
-24F	K37-20	MIL-DTL-3950
-24K	K38-20	MIL-DTL-3950
-24M	K11-20	MIL-DTL-3950
-26F	K20-20	MIL-DTL-3950
-27E	K12-20	MIL-DTL-3950
-27L	K39-20	MIL-DTL-3950
MS27788-27N	8574K14-20	MIL-DTL-3950
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-29F	K21-20	MIL-DTL-3950
-30F	K19-20	MIL-DTL-3950
-31E	K18-20	MIL-DTL-3950
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-31L	K13-20	MIL-DTL-3950
-31M	K17-20	MIL-DTL-3950
-31N	K8-20	MIL-DTL-3950
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-33F	K25-20	MIL-DTL-3950
-33K	K26-20	MIL-DTL-3950
-33M	K42-20	MIL-DTL-3950
MS27789-1A	8575K43-20	MIL-DTL-3950
-1B	K44-20	MIL-DTL-3950
-1D	K45-20	MIL-DTL-3950
-1E	K46-20	MIL-DTL-3950
-1F	K47-20	MIL-DTL-3950
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-1H	K49-20	MIL-DTL-3950
-1J	K50-20	MIL-DTL-3950
-1K	K51-20	MIL-DTL-3950
-1L	K52-20	MIL-DTL-3950
-1M	K53-20	MIL-DTL-3950
-1N	K54-20	MIL-DTL-3950
-1P	K55-20	MIL-DTL-3950
-2E	K56-20	MIL-DTL-3950
-2F	K57-20	MIL-DTL-3950
-2K	K58-20	MIL-DTL-3950
-2L	K59-20	MIL-DTL-3950
-2M	K60-20	MIL-DTL-3950
-2N	K61-20	MIL-DTL-3950
-3E	K62-20	MIL-DTL-3950
-3L	K63-20	MIL-DTL-3950
-3N	K64-20	MIL-DTL-3950
-21A	K1-20	MIL-DTL-3950
-21B	K27-20	MIL-DTL-3950
-21D	K5-20	MIL-DTL-3950
-21E	K2-20	MIL-DTL-3950
-21F	K28-20	MIL-DTL-3950
-21G	K3-20	MIL-DTL-3950
-21H	K29-20	MIL-DTL-3950
-21J	K30-20	MIL-DTL-3950
-21K	K31-20	MIL-DTL-3950
-21L	K32-20	MIL-DTL-3950
-21M	8575K33-20	MIL-DTL-3950
-21N	K4-20	MIL-DTL-3950
-21P	K34-20	MIL-DTL-3950
-22D	K10-20	MIL-DTL-3950
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-23D	K6-20	MIL-DTL-3950
-23F	K36-20	MIL-DTL-3950
-23G	K7-20	MIL-DTL-3950
-24E	K18-20	MIL-DTL-3950
-24F	K37-20	MIL-DTL-3950
-24K	K38-20	MIL-DTL-3950
-24M	K11-20	MIL-DTL-3950
-26F	K20-20	MIL-DTL-3950
-27E	K12-20	MIL-DTL-3950
-27L	K39-20	MIL-DTL-3950
-27N	K14-20	MIL-DTL-3950
-28E	K15-20	MIL-DTL-3950
-29F	K21-20	MIL-DTL-3950
-30F	K19-20	MIL-DTL-3950
-31E	K18-20	MIL-DTL-3950
-31F	K40-20	MIL-DTL-3950
-31K	K41-20	MIL-DTL-3950
-31L	K13-20	MIL-DTL-3950
-31M	K17-20	MIL-DTL-3950
-31N	K8-20	MIL-DTL-3950
-32E	K23-20	MIL-DTL-3950
-33E	K24-20	MIL-DTL-3950
-33F	K25-20	MIL-DTL-3950
-33K	K26-20	MIL-DTL-3950
-33M	K42-20	MIL-DTL-3950
MS27903-1	WC150PB6	MIL-S-8805/38
-2	WC150PB6R	MIL-S-8805/38
-3	WC150PAB6	MIL-S-8805/38
-4	WC150PAB6R	MIL-S-8805/38
-5	WC150WB6	MIL-S-8805/38
-6	WC150WB6R	MIL-S-8805/38
MS27994-1	SF-203	MIL-S-8805/32
-2	-206	MIL-S-8805/32

MILITARY PART NUMBERS TO SAFRAN ELECTRICAL & POWER CATALOG NUMBERS

Military Part Number	Part Catalog No.	MIL Specification
-3	-103	MIL-S-8805/32
-4	-203-1	MIL-S-8805/32
-5	-206-1	MIL-S-8805/32
MS27995-1	H11-228	MIL-S-8805/42
MS27996-1	H6-1029	MIL-S-8805/53
MS90310-211	8868K1	MIL-DTL-8834
-221	K7	MIL-DTL-8834
-231	K4	MIL-DTL-8834
-241	K5	MIL-DTL-8834
-271	K2	MIL-DTL-8834
-281	K6	MIL-DTL-8834
-311	K3	MIL-DTL-8834
MS90311-211	8869K1	MIL-DTL-8834
-221	K7	MIL-DTL-8834
-231	K4	MIL-DTL-8834
-241	K5	MIL-DTL-8834
-271	K2	MIL-DTL-8834
-281	K6	MIL-DTL-8834
-311	K3	MIL-DTL-8834
-711	K1X	MIL-DTL-8834
-721	K7X	MIL-DTL-8834
-731	K4X	MIL-DTL-8834
-741	K5X	MIL-DTL-8834
-771	K2X	MIL-DTL-8834
-781	K6X	MIL-DTL-8834
-811	K3X	MIL-DTL-8834
NAF1173-1	8896K1	
-2	8895K1	
NAF1174-1	8897K1	
NAF47851-1	8499K2	

REFERENCE DOCUMENTS
Rating, Cross Reference and Engineering Data

MIL Specifications

	MIL SPECIFICATION			
TEST REQUIREMENT	**MILPRF-8805**	**MIL-PRF-22885**	**MIL-DTL-3950**	**MIL-DTL-8834**
1 .Strength of Terminal	Solder - 9 lb. #4 Screw - 5 lb. #6 Screw - 30 lb. Leads - 15 lb.	Solder - 5 lb. #4 Screw - 5 lb. #6 Screw - 30 lb. Leads - 15 lb.	5 lb. solder lug. 25 lb. screw term. 5 lb. in. torque screw term. 15 lb. I.W.T.S. term.	5 lb. solder lug 25 lb. screw term. 5 lb. in. torque screw term. 5 lb. I.W.T.S. term.
2. Strength of Actuating Lever Pivot and Stop	10 lb.	25 lb.	25 lb. throughout range	25 lb. throughout range
3. Strength of Mounting Means	15 lb.-in.	15 lb.-in.	25 lb.-in. torque	65 lb.-in. torque 15/32 & over 15 lb.-in. torque under 15/32
4. Dielectric (Sea Level) Indication **Dielectric (Altitude)**	1000V ac for one minute 500V ac above 10,000 ft.	1000V ac for one minute 400V ac above 10,000 ft.	1200V ac Group A 750V ac after electrical endurance toggle to terminal only. 500 microampere max. leakage 500V ac (65K ft.)	1800V ac Group A 500 microamperes max. leakage 500V ac (65K ft.)
5. Contact Voltage Drop	Contact Resistance .025 Ohm New .040 Ohm After Mechanical Life	Contact Resistance .025 Ohm New .080 Ohm After Electrical Life	2.5 millivolt initial 5.0 millivolt after mechanical endurance I.W.T.S. 8.0 millivolt initial @2-6Vdc 0.1 amp.	1.0 millivolt initial @ 2-6V dc 0.1 amp.
6. Temperature Rise	50 deg. C max. at rated resistive load after life	50 deg. C max. at rated resistive load after life	50 deg. C rise @ rated res. after endurance test current	50 deg. C rise @ rated res. after endurance test current
7. Short Circuit	60 times rated resistive load	60 times rated resistive load	10 oper. make & carry 60 x rated resistive load @ lowest dc V	10 oper. make & carry 60 x rated resistive load @ lowest dc V
8. Mechanical Life	As specified at high and low temperature		20K operations -65 deg. C 20K operations +71 deg. C	20K operations -55 deg. C 20K operations +71 deg. C
9. Electrical Endurance	As specified	As specified	20K operations	20K operations
10. Overload	50 operations @ 150% rated resistive load	50 operations @ 150% rated resistive load	50 operations @ 150% rated resistive load	50 operations @ 150% rated resistive load
11. A) Electrical Endurance at Altitude **B) Electrical Endurance at Sea Level**	Sequence of test, ratings and environmental conditions are specified in MIL-S-8805	Sequence of test, ratings and environmental conditions are specified in MIL-S-22885	20K oper. resistive load @65K ft. rm temp 20K oper. ind. load @65K ft. rm. temp. Performed on separate test samples 20K operations resistive load @71 deg. C 20K operations ind. load @ rm. temp. Performed on separate test samples	20K oper. resistive load @65K ft. rm temp 20K oper. ind. load @65K ft. rm. temp. Performed on separate test samples 20K operations resistive load @ rm. temp. 20K operations ind. load @ rm. temp. Performed on separate test samples
12. Vibration	See Detail Sheet	See Detail Sheet	Method 204 of MIL-STD-202. Test Condition A .06 D.A. or 10 G's 10-500 Hz 10 micro sec. max. chatter	Method 204 of MIL-STD-202. Test Condition D .06 D.A. or 20 G's 2000 Hz 10 micro sec. max. chatter
13. Shock	See Detail Sheet	See Detail Sheet	Pulse-Method 213 of MIL-STD-202, Test Condition B @ 75 G's 10 micro sec. max. chatter Pulse-Method 213 of MIL-STD-202,	Test Condition I @ 100G's 10 micro sec. max. chatter
14. Salt Spray **Test Upon Completion**	MIL-STD-202 Method 101 See Detail Sheet	MIL-STD-202 Method 101 See Detail Sheet	48 hours-Method 101 of MIL-STD-202, Test Condition B 10 operations @ lowest rated dc voltage	96 hours-Method 101 of MIL-STD-202, Test Condition A Env. 50 oper. @ rated resistive current and lowest rated dc V
15. Moisture Resistance	MIL-STD-202 Method 106, 100V dc potential between current carrying parts & panel	MIL-STD-202 Method 106, 100V dc potential between current carrying parts & panel	Method 106 of MIL-STD-202 10 days, 100V dc potential between current carrying parts & panel	Method 106 of MIL-STD-202, 10 days, 100V dc potential between current carrying parts & panel, 0.1 A. max. leakage

MIL Specifications - Continued

TEST REQUIREMENT	MIL SPECIFICATION			
	MIL-S-8805	**MIL-S-22885**	**MIL-DTL-3950F**	**MIL-DTL-8834F**
See Detail Sheet	See Detail Sheet	Method 110 of MIL-STD-202, Test Cond. B; 6 hrs @ 23 deg. C; 6 hrs @ 63 deg. C.	Method 110 of MIL-STD-202, Test Cond. B; 6 hours @ 23 deg. C, 6 hrs @ 63 deg. C.	
17. Explosion MIL-STD-202 Method 109	MIL-STD-202 Method 109	No Requirement	Method 109 of MIL-STD-202. Max. rated dc inductive load toggle seal only.	
18. Sealing	See Detail Sheet	See Detail Sheet	1) Non destructive-submerge in H20 @ 2.0 +/_ .5 in. of Hg for 5 minutes 2) Destructive-no leakage when sub-merged in sodium chloride solution at 2.0 +/- .5 in. of Hg for 4 hrs and sub merged at sea level for 16 hours	1) Lever seal - 20K operations at 6.5 lbs./in2 water pressure - seal only submerged 1/4" bushings only ③ 2) Environmental seal: A-Non dest.-mass spectr. B-Destructive-submerge sw. in ethylene glycol, temp. range -18 deg. C to +71 deg. C, 20K oper. Sws. checked for contact V drop & dielectric
19. **A) Toggle Seal** **B) Bushing Seal**	—	—	No Requirement See Sealing	1 hr ea. lever pos. @-55 deg C Toggle ICE
20. Temperature Operation	See Detail Sheet	-55 deg. C to +85 deg. C	See Mechanical Life	See Mechanical Life
21. Life Low Cur. Level	See Detail Sheet	See Detail Sheet	40K operations @25 deg. C; Method 311 of MIL-STD-202	when specified 20K operations @71 deg. C; 5 millivolt, 5 microamp
22. Fungus	Non-nutrient materials only	Non-nutrient materials only	No Requirement	No Requirement
23. Intermediate Current	See Detail Sheet	27 +3 -OV dc & Relay M5757/10-033	20K operations @35-40 mA res. load. Lowest rated dc V and 71 deg. C amb.	See Life Low Cur. Level
24. Thermal Shock	MIL-STD-202 Method 107	MIL-STD-202 Method 107	Method 107 of MIL-STD-202, Test Condition B; 5 cycles @ -65 deg. C/ +125 deg. C	Method 107 of MIL-STD-202, Test Cond. A, 5 cycles @ -55 deg. C/+85 deg. C

③ Toggle seal - 5 operations under 0.5 inches of H2O above top of bushing

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 mate-rial 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 (F.P.) - 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 serv-ing 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 pushbut-ton is at "normal" position for one circuit and latched down posi-tion 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 reach-ing 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 (P.T.) - 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 capabili-ties) caused by extreme ambi-ent temperatures.

AUTOMATIC RESET - Device that will automatically open an overload circuit. It will also automatically close or com-plete the circuit after a period of time. If the overload is still pres-ent, 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 cur-rent.

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

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

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 break-er 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 over-loads. 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 physi-cally 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 surg-es, 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 inter-rupt and remain in operable con-dition, capable of clearing addi-tional 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 break-ers that provides independence between the protection mecha-nism and the operating button or handle, such that a fault can-not be maintained manually (or held closed) against an overload.

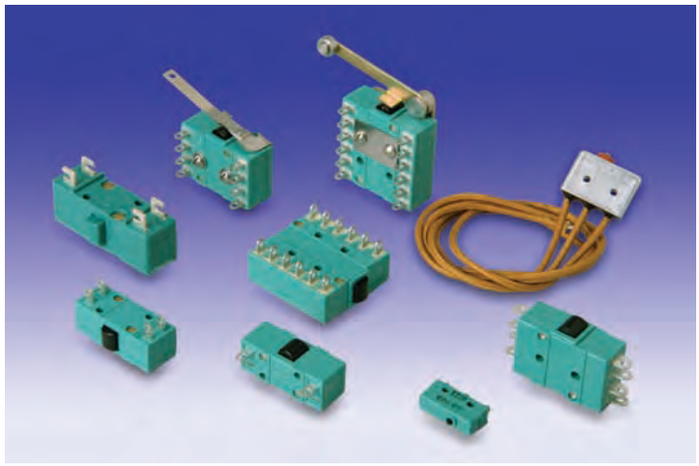
TRIP INDICATION - Visual sign the breaker has opened.

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

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 per-formance are valid only on devices which have not been subjected to unauthorized modifications or mis-applications. 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 Code for products manufactured by Safran Electrical & Power's manufacturing facilities are 81640 and 76374.



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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.

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FAST INFORMATION FINDER

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.
- **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.

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Safran Electrical & Power Part

Market Trends

Aircraft and commercial off-highway vehicle Original Equipment Manufacturers (OEMs) are continuously pursuing efficiencies associated with the design and manufacture of vehicle platforms. Additionally, the OEMs are working on increasing the functionality of system 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 SafranElectrical&Power. This supplier team will be required to design, develop, and manufacture performance rated products such as relays, "smart" contactors, high voltage DC contactors, and power distribution junction boxes that minimize cost, reduce weight, and limit product dimensions in order to support accomplishing OEM objectives.

What Problem Does Safran Electrical & Power Systems Solve?

Aircraft OEMs discovered that 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. To compliment this OEM strategy, Safran Electrical&Power formed the product divison, which combines the product pedigree of illuminated pushbutton switches, cockpit displays and keyboards, NVIS products, pilot controls, and a variety of MIL-qualified aerospace switches, relays, contactors, and circuit breakers, to broaden the product portfolio and support execution of a subsystem strategy. Safran Electrical&Power's objective is to be the leading candidate for the supply of aerospace power distribution components and subsystems.

The Safran Electrical & Power Solution

SafranElectrical&Poweris an attractive partner in the design and development of integrated relay and contactor components and subsystem power junction boxes. 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 the Aerospace Group division to be a single source supplier for power protection, distribution, and switching components. The system integrators have the option of sourcing pedigree relays and contactors for their power distribution box designs or subcontracting the entire power distribution subsystem 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, as well as competitive pricing and high quality levels.

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 SafranElectrical& Powermanufacturing to create successful products in a competitive marketplace.

Product Portfolio

SafranElectrical&Power's complete product portfolio allows flexibility to partner with customers having a variety of relay and contactor subsystem and component needs. Safran Electrical&Power's engineers design additional value into traditional power distribution components and subsystems through electronics, while balancing customer concerns for size, weight, cost, and performance. SafranElectrical& Power's Power Distribution

Boxes are a prime example of value-added engineering. Proven relay, contactor, and circuit breaker products are packaged into a single line replaceable assembly that offers the user a customized power module that significantly reduces overall system weight, improves system level reliability, and maintainability.

The Safran Electrical & Power product portfolio is recognized in the aerospace industry as MIL qualified for performance rated power distribution products. Safran Electrical & Power's experience in designing relays and contactors to MIL Spec requirements such as MIL-PRF-83383, MIL-R-6106/9, /10, /11, and MIL-R-6101/48 ensures the customer of relays and contactors that will operate in the most challenging environments and in accordance with the strictest performance requirements. These same component design considerations are incorporated into Safran Electrical & Power's latest designs such as High Voltage DC Contactors and also in subsystem designs such as a Power Distribution Box (PDB). These products are highlighted in the **Featured Products Article** on page 7-8.

CAPABILITIES

The product portfolio includes:

- Smart Contactors with cur rent sensing protection, Ground Fault Interrupt technology, or Arc Fault Circuit Interrupt technology.
- 28 Vdc Contactors (50 to 1000 amperes).
- 270 Vdc Contactors (25 to 350 amperes).
- 115/230 Vac 400 Hertz Contactors (30 to 430 amperes).
- 750 Vdc Contactors (100 to 600 amperes).
- Power Distribution Junction Boxes.
- A variety of aerospace switches (rocker, toggle, pushbutton and limit)
- Pilot Controls including customized flap controls, landing gear controls, throttle controls, trim controls (for mechanical pitch, roll and yaw), and fire emergency controls.
- Displays, readable in both direct sunlight and at night, including the popular Series 900 fiber optic displays, as well as displays with surface mount devices and programmable electronic arrays.
- Keyboards that are sunlight and night light readable and suited for virtually any application, including flight management panels, handheld data communications panels, shipboard computer control panels, fire system control panels, ground support equipment, and radar and telemetry control panels. Safran Electrical & Power keyboards also incorporate logic boards, photo sensors, rotary and toggle switches, and annunciators, and have features such as micro-processor interfacing and programmable logic control.
- NVIS products such as cockpit controls, displays and keyboards, and illuminated push button switches that conform to MIL and NVIS specifications and any unique customer needs.
- Illuminated Pushbutton switches with a multitude of options ranging from sunlight readable, NVIS-compatible, incandescent and LED lighting to various mounting and termination options for flexible installation and retrofit applications.
- 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).
- Electromechanical 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).

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 chamber simulating altitude to 80,000 feet and temperatures from -65°C to 125°C.
- Test capabilities of 115/200 Vac 400 Hz 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 and stereolithographic techniques, and PRO-E design.
- Model Shop flexibility to respond to design changes and rapid turn around of prototypes.

The Safran Electrical & Power Difference

There are a number of relay and contactor suppliers in the aerospace market. However, few possess the vertical integration needed to engineer and manufacture to both MIL Spec and OEM customer specifications to ensure consistency of quality operation in components and subsystems.

SafranElectrical&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 complements integrated subsystem 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 the "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 portfolio, its ability to design and manufacture components and subsystems, and customer centric strategy mitigates the risk associated with new aircraft electrical power distribution systems. Safran Electrical & Power is an ideal candidate to consider for engineering and manufacturing collaboration on all future commercial, General Aviation, and military programs.

Changing Aerospace Industry

In today's consolidating aerospace industry, Tier 1-System Integrators and Airframe Manufacturers desire more value from their component suppliers. A qualified supplier must not only have an extensive product portfolio, but must also display proven subsystem capabilities. These abilities include the capacity to design, manufacture, and test customized power distribution assemblies that consolidate multiple functions in a single package. Over the past decade, SafranElectrical& Power acknowledged this fact, and has focused its attention on developing these value-add competencies to become a recognized leader in integrated power distribution systems. Specifically, LSafranElectrical& Powerhas stayed at the forefront of product / technology development through the development of the following components and subassemblies: High-Voltage DC (HVDC) Contactors, Next-Generation Alternating Current (AC) Contactors, and Power Distribution Boxes.

High-Voltage DC Contactors

As electrical power systems of 270Vdc and greater become the application standard for high performance aircraft, the requirements for switching and protection components become increasingly demanding. DC switching has always posed greater design challenges versus AC applications. With AC, the current naturally passes through zero each half cycle resulting in quick arc extinction after contact separation.

Conventional 28Vdc switching can also be accomplished using single or double break contact sets. In this case, the inherent arc voltage generated by the anode and cathode of the arcing contact sets is capable of opposing and interrupting the current flow. The low voltage device counts little on the arc voltage generated in the actual arc column to drive the current to zero.

Once the system voltage is increased beyond the 48Vdc rating, the interruption scheme becomes more challenging. Although the arc voltage generated by the arc column is generally small compared to the anode and cathode voltages, it will increase as the open contact gap widens. The actual arc voltage generated is a function of contact materials, the gas or atmosphere in the contact region, application current, and contact gap. Unfortunately, there is zero crossover to facilitate interruption, and the design must rely on open gap or arc stretching to match the system voltage. Therefore, with a single or double break contact set, the ability to interrupt 270Vdc quickly becomes size impractical without a more involved interruption scheme.

Safran Electrical & Power Technical Approach

The technology chosen for use within the SafranElectrical& Powerline of 270Vdc contactors is splitting the arc into multiple series arcs under the influence of a constant magnetic field. This is accomplished by driving the arc column into a set of metallic plates housed within an insulated arc chute assembly. The multiple plates then provide the significant anode and cathode contribution to the arc voltage required for interruption. The plates also help to cool the arc column, causing the arc to exist at a higher potential and be stabilized in a predictable location in the plate. By placing multiple plates within the arc chute, the arc voltage generated during interruption can be increased resulting in less volume required by the arc chute.

With the use of permanent magnets for controlling the arc column, the interruption is consistent even at low levels of application current. This results in extended low-level contact life. This design allows for smaller device size and the ability to the mount the products in a compact power distribution subsystem.

Benefits of HVDC Technology

The Aerospace Group's ES&C division has long been involved in programs addressing requirements for High Voltage Direct Current (HVDC) applications. Few competitors rival SafranElectrical&Power's knowledge and experience in this technology over the past two decades. The proven air break technology used by the SafranElectrical&PowerHVDC contactor line provides the following benefits that competitive HVDC product offerings (hermetic) do not provide:

- Safran Electrical & Power was the first contactor manufacturer to complete product design and flight safety tests for 270Vdc aero space devices.
- Hermetic sealing material adds unnecessary device weight. Hermetic sealing material degrades over time compromising the controlled atmosphere within the arc chamber, potentially leading to device failures. Safran Electrical & Power devices have no requirement for a seal.
- Hermetic sealed devices are classified by an allowable leakage rate, suggesting they are inherently unstable over time and susceptible to "dormant" failures. The Safran Electrical & Power design increases reliability because the splitter plates eliminate single point of failure (inability to interrupt) associated with failed hermetic devices.
- Load Polarity - Safran Electrical & Power's devices are bi-directional without restriction. Safran Electrical & Power devices reliably switch small current loads as well as high current loads.
- Electrical Life - Safran Electrical & Power end of life characterized by contact voltage drop.
- Safran Electrical & Power's design is robust and operates well in harsh environments as demonstrated by past program performance and application of commercialized product.
- Safran Electrical & Power's device is a "Qualified" technology per MIL-R-6106 standard for all contactors.
- Safran Electrical & Power's device packaging easily tailored for application footprint.
- Increased capability todissipate energy for switching inductive loads.
- Consistent and controlled switching transients due to ramped build up of arc voltage upon interruption.
- Line Replaceable Unit packaging minimizes maintenance time.

The SafranElectrical&Power design does not require a hermetic seal, providing several advantages in application. In military applications, the use of splitter plate technology allows the device to function reliably throughout the life of the airframe while being subjected to harsh combat field environments and flight profiles that involve extreme levels of vibration and shock that can compromise competitors' hermetic seal product designs. The loss of a hermetic seal causes device failure as it relies on the sealed atmosphere within the device to interrupt high voltage. A failure of this nature could cause mission cancellation, mission abort, or even loss of aircraft. If installed in commercial aircraft applications, hermetically sealed devices would require periodic maintenance crew checks to prevent the risk of "dormant" failures associated with this design. The Safran Electrical&Power design reduces/eliminates the need for maintenance involvement and better supports Air Carrier objectives for maintenance-free devices.

Combining ongoing research with current product development, SafranElectrical& Powercontinually strives to be a premier supplier of High-Voltage DC components and subsystems.

Next Generation Contactors

SafranElectrical&Powerhas extensive experience in the research, design, and development of various AC Contactor product lines, including "Smart" contactors with integrated current sensing and Arc Fault Circuit interrupt (AFCI) technology, 28Vdc Lightweight Contactors, and Advanced Generator Contactors.

"Smart" Contactors

SafranElectrical&Poweris currently developing 175/60 amp packages for galleys, pumps, and primary load distribution. These contactors use the latest technologies, and can include current sensors for overcurrent protection and/or AFCI sensing. Internal / centralized electronics control are also features of these devices. SafranElectrical& Power is continually looking for lower weight / size product solutions; a prime example being the 60 amp "Smart" contactor that is currently no bigger than a SafranElectrical&Power3-phase motor circuit protection device.

28Vdc Lightweight Contactors

SafranElectrical&Poweris also developing a new 28Vdc, 50-400 Amp contactor family whose focus is on the reduction of weight and cost. Bolt-on designs combine power terminations and mechanical mounting, and contain captive hardware for all mounting fasteners. Both Single Pole Single Throw and Single Pole Double Throw configurations are available with features such as SubD or sealed in-line connectors.

Advanced Generator Contactors

Based upon the existing SM15 product line, a new AC Generator contactor line of products is emerging. These contactors have automatic control connector mating and either Three Pole Single Throw or Three Pole Double Throw main contacts. SafranElectrical&Poweroffers 115 VAC or 230 VAC (350-800Hz) generator contactors that are bolt-on designs with SubD connectors and rated at either 260 amps or 430 amps. They are currently one of the smallest and lightest AC contactors in the aerospace generator relay market, accommodate Variable Frequency and double voltage aircraft architectures, and are suitable for either stand-alone applications or power distribution boxes.

Power Distribution Boxes

Safran Electrical & Power's proven component expertise and packaging capabilities have allowed ES&C to become a subsystem supplier in both the commercial jet and military aircraft markets. An example of these competencies is evident in the development of ED&C Power Distribution Boxes. A Power Distribution Box provides the next generation of AC and DC power distribution and protection, whereby conventional relays, contactors, and circuit protection devices are incorporated into a densely packaged, single line replaceable assembly. Benefits of this type of bundled packaging include weight reduction, reduced maintenance labor time due to the line replaceable nature of these boxes, minimal program risk since commercially off the shelf components are incorporated as often as possible into the design, significantly lower on-aircraft test time since they are tested to the customer acceptance testing standards prior to shipment, and reduced overall aircraft build time since Power Distribution Boxes support a centralized power distribution architecture.

Power Distribution Boxes (PDBs) are typically designed and manufactured for each of the main generators onboard an aircraft in order to provide power to various bus lines and aircraft systems, while other, separate Battery/ External PDBs can provide switching power to a standby power bus and several components such as overhead panels, service lights, and the emergency locator transmitter.

Safran Electrical & Power has supplied customers with AC Power Distribution Boxes with features that direct outputs to high current loads, serve as power feeders to lower current circuit breakers, or act as current transformers to monitor all outputs. DC Power Distribution Boxes contain such features as Transformer Rectifier Units and Battery Contactors that direct outputs to high current loads, and incorporate Hall Effect sensors to monitor outputs. All Power Distribution Boxes can incorporate customized current carrying bus structures, and provide spare electrical power generation capacity to support future electrical systems growth.

Single Pole
- 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 #1500-052-05.

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, 60 Hz, 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 (Single Pole)	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.)
Weight (Three Phase)	2.0 lbs. max.

OVERLOAD CALIBRATION DATA

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

Engineering Data

Single Pole Single Throw (Double Break Contacts)

Catalog Number①	Rated Contact Load (Amperes)								MIL-PRF-83383 Part Number	Maximum Weight Oz/gm
	28 Vdc				115/200 V 400 Hz					
	Res.	Ind.	Motor	Lamp	Res.	Ind.	Motor	Lamp		
SM600BA5A1	5	5	5	5	5	5	5	5	M83383/02-01	11.75/332
SM600BA5N1									M83383/01-02	11.25/318
SM600BA10A1	10	10	10	10	10	10	10	10	M83383/02-03	11.75/332
SM600BA10N1									M83383/01-03	11.25/318
SM600BA15A1	15	15	15	15	15	15	15	15	M83383/02-04	11.75/332
SM600BA15N1									M83383/01-04	11.25/318
SM600BA20A1	20	20	20	20	20	20	20	20	M83383/02-05	11.75/332
SM600BA20N1									M83383/01-05	11.25/318
SM600BA25A1	25	25	25	25	25	25	25	25	M83383/02-06	11.75/332
SM600BA25N1									M83383/01-06	11.25/318
SM600BA35A1	35	35	35	35	35	35	35	35	M83383/02-07	12.00/339
SM600BA35N1									M83383/01-07	11.50/325
SM600BA40A1	40	40	40	40	40	40	40	40	M83383/02-08	12.00/339
SM600BA40N1									M83383/01-08	11.50/325
SM600BA50A1	50	50	50	50	50	50	50	50	M83383/02-09	12.00/339
SM600BA50N1									M83383/01-09	11.50/325
SM600BA60A1	60	60	60	—	60	60	60	—	M8338/02-10	12.25/346
SM600BA60N1									M83383/01-10	11.75/332
SM600BA75A1	75	75	75	—	75	75	75	—	M83383/02-11	12.25/346
SM600BA75N1									M83383/01-11	11.75/332
SM600BA100A1	100	100	100	—	100	100	100	—	M83383/02-13	12.25/346
SM600BA100N1									M83383/01-13	11.75/332

Three Pole Single Throw (Double Break Contacts)

Catalog Number①	Rated Contact Load (Amperes)				MIL-PRF-83383 Part Number
	115/200 V 400 Hz				
	Res.	Ind.	Motor	Lamp	
SM601BA10A1	10	10	10	10	M83383/04-03
SM601BA15A1	15	15	15	15	
SM601BA20A1	20	20	20	20	M83383/04-05
SM601BA25A1	25	25	25	25	
SM601BA35A1	35	35	35	35	M83383/04-07
SM601BA40A1	40	40	40	40	M83383/04-08
SM601BA50A1	50	50	50	50	
SM601BA60A1	60	60	60	60	M83383/04-10

① Contact factory on alternate amperage, trip times, control configurations, grounding, auxiliary switches, and mounting systems.

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 Electrical & Power P/N	MS P/N	Safran Electrical & Power P/N	MS P/N	Safran Electrical & Power 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 Factory
Note: Contact factory on alternate amperage, trip times, control configuations, grounding, auxilary switches, mounting systems, etc.

SINGLE POLE

OVERLOAD CALIBRATION DATA

Ratings	Percent Rated Current	Ambient Temperature Degrees C. ± 5°	Tripping Time
All	115%	25°C & 71°C	No Trip
	138%		1 Hour Max.*
	115%	-54°C	No Trip
	150%		1 Hour Max.*

* Must trip in one hour.

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

TRIP CURVE

Contact business unit for trip curve.

TRIPLE POLE

OVERLOAD CALIBRATION DATA

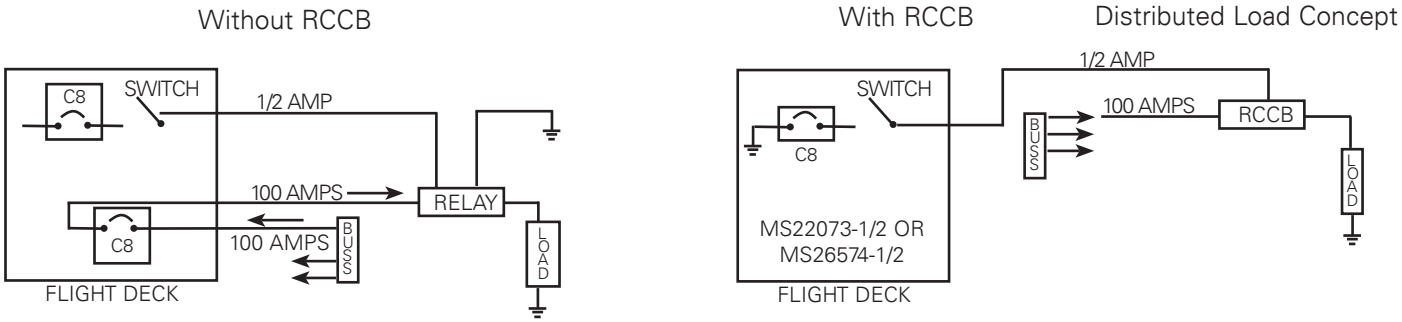
Ratings	Percent Rated Current	Ambient Temperature Degrees C. ± 5°	Tripping Time
All	115%	25°C & 71°C	No Trip
	138%		1 Hour Max.*
	115%	-54°C	No Trip
	150%		1 Hour Max.*

* Must trip in one hour.

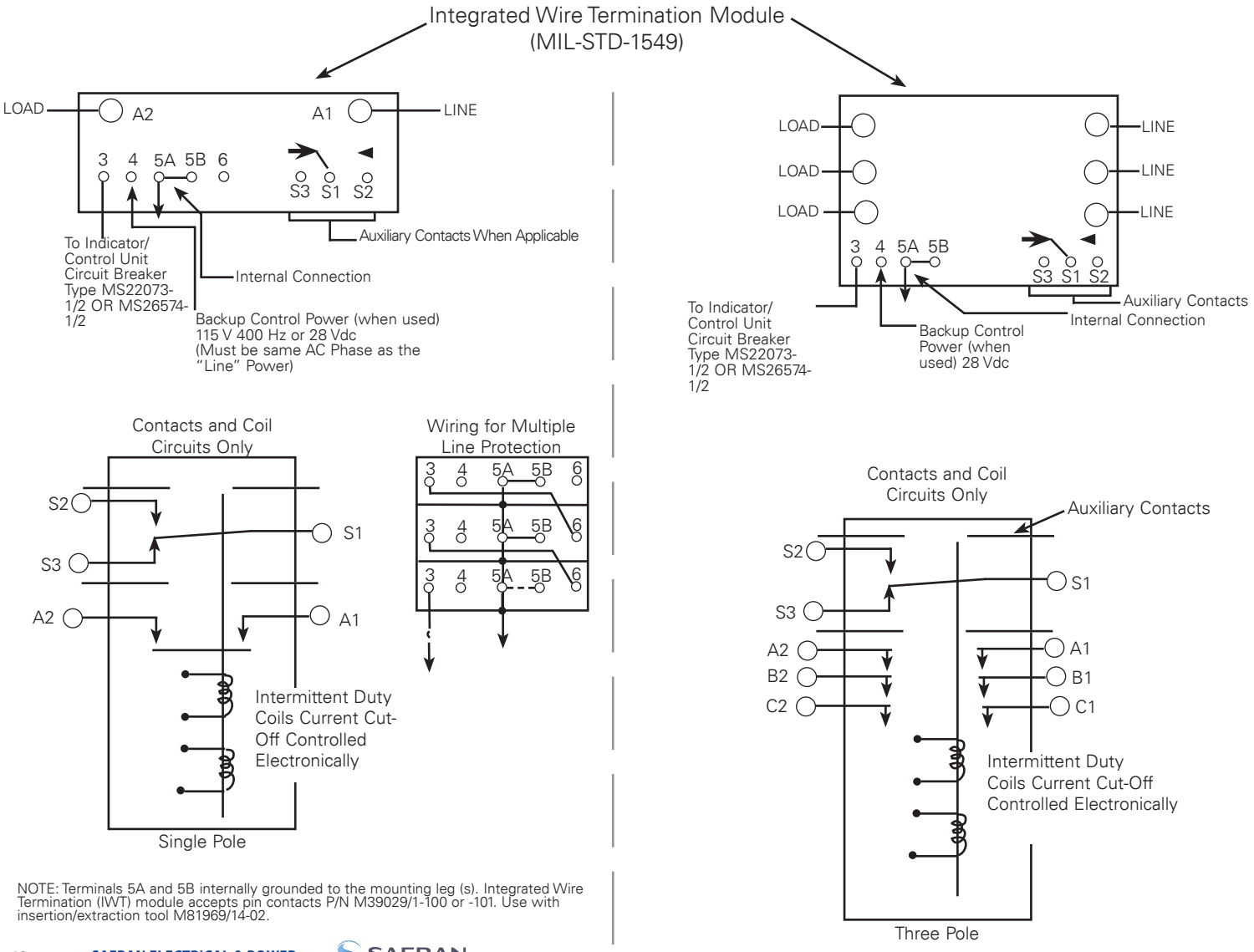
OVERLOAD CALIBRATION DATA — THREE POLE

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

Engineering Data
Application Note



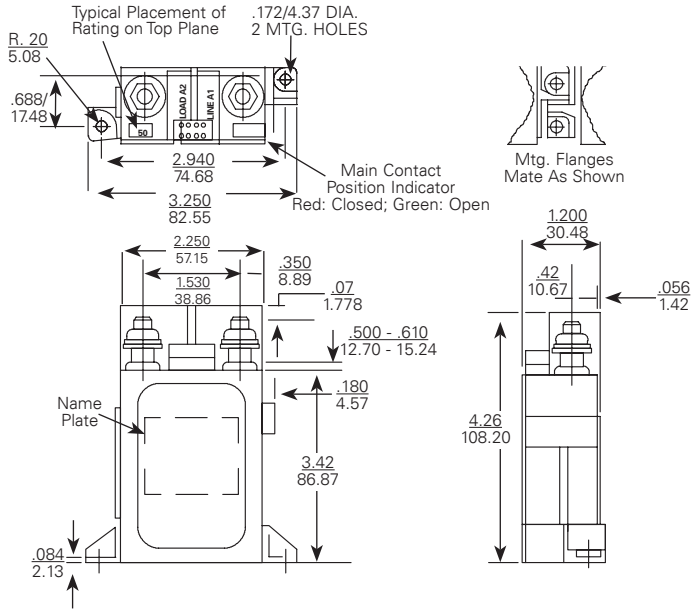
Typical Wiring Diagrams



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

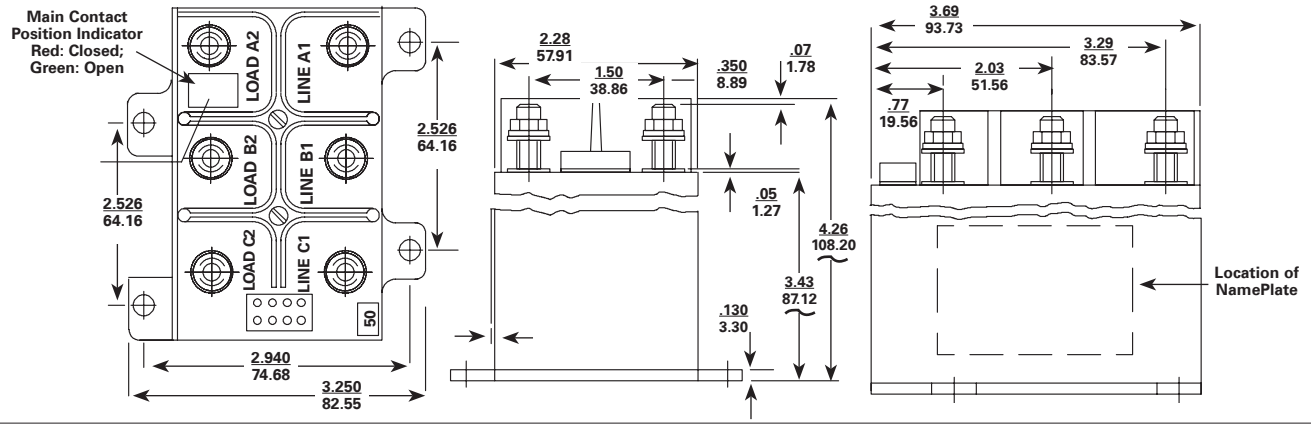
Approximate Dimensions - 1 Pole



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
- Moisture resistant sealing

Three Pole



Coil Operate Current/Set And Trip Time RCCB

Circuits	Nominal System Voltage	I/CU Set Current @ Nom Voltage (Mulliamp)	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.) 115 Vac	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
	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 7.5
** Average Half-Wave Rectified DC Current
Current Decreases w/Time so that I^2t
***Absolute Min. Value from -54° to +71°C

REMOTE CONTROLLED CIRCUIT BREAKER (RCCB) — 1 POLE AND 3 POLE

Engineering Data

Description

The Remote Control Circuit Breakers (RCCB) concept, as load controllers in distributed-load applications, provides for a more efficient power distribution system with less line loss at a lower cost and with less weight than the conventional relay-flight deck circuit protector method.

Designed to meet the requirements of MIL-PRF-83383, the RCCB's capability and advantages include:

- Fusible link fail safe
- Remote on/off operation from the flight deck
- Visual indicators for open (green) and closed (red) on top surface
- Substantial reduction in weight and size
- Most direct route from power source to load
- Single wire control line from I/CU to RCCB
- Double-break power contact assembly
- Indication of trip or set by position of the ½ ampere circuit breaker on the flight deck
- Elimination of long runs of heavy and costly cables
- Magnetically latched coils (low power consumption)
- Use as a relay or circuit breaker or both
- Flanges mate for in-line or side-by-side mounting
- 1PST for DC or single phase AC
- 3PST for three phase AC only

Application

The Remote Control Circuit Breaker (RCCB) is a combination relay and circuit breaker which can be released or set by applying a release or set coil current electronically controlled by a command from the Indicator/Control Unit (I/CU) (a ½ ampere fast trip, thermal circuit breaker).

With power available to terminal #4 and/or terminal A1 (28 Vdc or 115 V 400 Hz) on 1PST RCCB: to terminal #4 (28 Vdc) and/ or both terminals B1 and C1 (115 V 400 Hz) on 3PST RCCB, the RCCB will assume the state requested/indicated by the I/CU. If power is removed from terminal #4 and A1 on 1PST or from terminal #4 and both B1 and C1 on 3PST, the RCCB will remain in the state it was in prior to power removal. When power is reapplied to the terminals, the RCCB will assume the state indicated by the I/CU.

With the RCCB closed, an overload or fault current on any line or lines will cause the RCCB to trip and in turn will cause a controlled overload of the I/CU, causing it to trip also. A fault or overload on any power contact will cause the RCCB to trip open within the time limits specified regardless of the availability of coil power. To reclose the RCCB, the I/CU line (line 3 to ground) must be opened by the I/CU or series switch and reconnected to ground.

Other Performance Parameters For MIL-PRF-83383

- Coordination. An overload applied to two devices in series with a 2 to 1 current rating will result in only the lower rated device opening.
- Rupture capability to 3600A (115 Vac rms or 28 Vdc for SM600BA and 115 Vac rms for SM601BA series)
- Dielectric. 1500 V, 60 Hz, MIL-STD-202, Test Method 301, 0.5 MA maximum

- Explosion-proof. MIL-STD-202, Test Method 109
- Thermal Temperature Range. -54°C to 71°C (-65°F to 160°F). MIL-STD-202, Test Method 107
- Insulation Resistance. MIL-STD-202, Test Method 302, 100 Megohms minimum
- Aircraft Electrical Power. MIL-STD-704
- Vibration. 10 g's to 2000 Hz. MIL-STD-202, Test Method 204. Condition C (-54°C, 25°C, and 71°C). Maximum duration of contact transfer to uncommanded state: $10x10^{-6}$ seconds.
- Shock. 25 g's. MIL-TD-202, Test Method 213. Maximum duration of contact transfer to uncommanded state: $10x10^{-6}$ seconds.
- Altitude. 50,000 feet
- EMI, MIL-STD-461, Class 1D
- Moisture Resistance. MIL-STD-202, Test Method 106
- Fungus Resistance. MIL-STD-454, Guideline 4
- Sand and Dust Resistance. MIL-STD-202, Test Method 110, Test Condition A
- Salt Spray Resistance. MIL-STD-202, Test Method 101, Test Condition B

Single Pole

- 28 VDC
- 115/200 VAC 400 Hz

Three Phase

- 115/200 VAC 400 Hz
- Three Phase Only

Qualified

Meets MIL-PRF-83383

Weight and Cost Savings

Saves fuel by eliminating long runs of heavy, costly cables

Space Savings

Keeps larger breakers out of cockpit

RCCB System for Remote Operation

To form an RCCB system enabling remote On/Off operation from the flight deck, combine the Safran Electrical & Power RCCB with Indicator Control Unit (ICU) model #1500-053-05 on pg. 13.

Single Wire from Flight Deck

Control of the RCCB requires only one #22 AWG control wire from the ICU on the flight deck to the RCCB.

Use as a Relay, Circuit Breaker, or Both

Combines 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.

Design Concept

Introduction

Part of the weight of the modern jet aircraft comes from the electrical wires and power control systems needed to distribute the electrical energy. As these aircraft increase their passenger carrying capability, the electrical power management system becomes more complex and could become heavier. Wire runs of more than 300 feet from the flight deck circuit breakers to the load become common.

Utilization of SafranElectrical& Power'sRemote Controlled Circuit Breakers (RCCB) close to the load or power source will eliminate much of these long, heavy, and expensive wire/cable. Control of the RCCB requires only one #22 AWG control wire from the flight deck to the RCCB.

Weight reduction, directly from wire use and indirectly from (generator) line heat loss, and installation and maintenance cost reductions becomes significant.

The RCCB combines the best attributes of a circuit breaker and a relay. The RCCB automatically protects the wires and the load device during circuit/load breakdown, but allows flight deck control of the load during normal operation.

Operation

The RCCB is basically a relay and a circuit breaker and allows the utilization of each identity singularly or in combination, depending upon the application. All of the RCCB's capabilities apply in either application.

It can be employed as a relay located adjacent to its load and remotely operated much like relays are today through control wiring and a switching device in the flight deck.

It can also be utilized as a circuit breaker and mounted adjacent to the load, the power source, or even the flight deck.

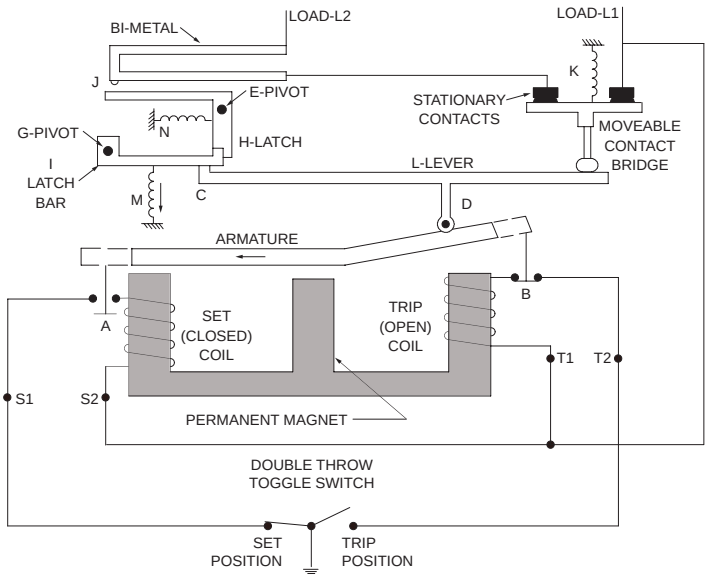


Figure 1

Single Pole RCCB

Motor Operation

Figure 1 depicts a simplified presentation of the RCCB.

Figure 2 describes the "motor", which when "energized", will result in typical armature transfer operation.

The magnetic circuit utilizes a permanent magnet as a fulcrum and latch for the rocking armature and uses electro-magnets (coils) at each end of the armature stroke for transfer purpose. In the set position **(Figure 2)**, the flux generated by the permanent magnet follows a patch from the top of the permanent magnet through the armature, through the left leg of the electro-magnet and back to the permanent magnet.

When the coil T1 -T2 is energized, the flux generated is such that it "flows" through the permanent magnet in the same direction as the flux generated by the permanent magnet itself. Its path now, however, is through the right leg of the electro-magnet. The flux generated by the electro-magnet increases in magnitude as power is applied, and as the flux builds up in the path through the right leg of the electro-magnet, the flux tending to latch the armature in the left leg of the electro-magnet becomes very small in comparison. The armature then "transfers" and seals at the pole face of the right leg of the electro-magnet.

The cutthroat contact B in series with coil T1 -T2 is opened by mechanical actuation due to the armature movement. In Figure 2, a "dotted extension" of the armature represents the mechanical actuator of the cutthroat contacts. In actual design, this is accomplished more conveniently through only one armature extension and an appropriate actuator which drives both contacts B and A.

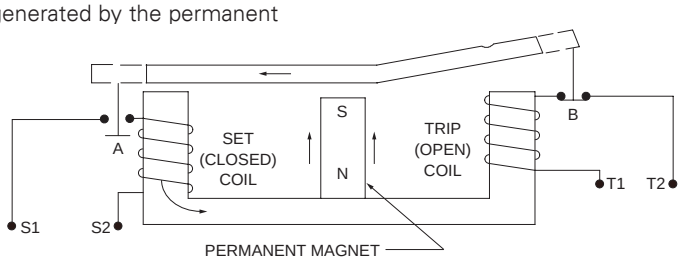


Figure 2

The opening of contact B occurs in the last several thousandths of an inch travel of the armature movement. After coil opening, the armature movement continues (until it seats i.e. seals), due in some degree to the inertia of the armature, but mostly due to the magneto-motive force of the permanent magnet in conjunction with the decreasing air gap at the right pole face.

The device now is again in a stable position, but the armature has transferred and the following conditions exist:

Contact A is closed and contact B is open, and the armature is sealed and latched at the right leg of the electro-magnet. To transfer the armature to its original position, energizing the coil S1-S 2 allows the process described above to occur in the opposite direction.

There are a number of advantages to this design approach of the "motor."

1. The coils open upon transfer of the armature; hence, the actual "on time" or duty cycle approximately equals the operate time of the relay. Accordingly, the coil can be driven hard without fear of burnout. The "hot coil" with the low timer constant results, in turn, in fast operate times.
2. Using intermittent duty coils (smaller coils with less copper) results in less weight and smaller sizes.
3. Power is conserved. This is important for two reasons. If a relay is to use power, it must be available. In some of the present day and future vehicles, power remains an expensive commodity, and elimination of coil power drawing (10-35 watts) in power devices can add up especially when vehicles sophistication requires use of a significant number of these devices. Also, it must be remembered that power utilized by relay coils generate heat which must be dissipated. The necessary elimination of this heat, in turn, requires the use of additional energy from the main power source.
4. As indicated, the cutthroat contacts are opened by the armature mechanically during the last several thousandths of an inch travel of armature movement. Note: In actual RCCB, the cutthroat contacts function is replaced by electronic control of coil on time.

RCCB Operation As A Relay

To examine the RCCB operation as a relay, refer to **Figure 3 and 4**. The device is shown in the set position in **Figure 3** and in the tripped position in **Figure 4**. The circuit path is from L2, through the bimetal to one of the stationary contacts. L1 is connected directly to the other stationary contact.

The movable bridge closes the circuit by bridging between the two stationary contacts.

As can be seen, movement of the armature about its fulcrum will determine the position of the contacts. When coil S1-S 2 has been energized such that the armature seals on the left-hand pole face **(Figure 3)**, the mechanical linkage system closes the contacts. Conversely, when coil T1-T 2 has been energized, such that the armature seals on the right-hand pole face **(Figure 4)**, the relay contacts will open due to the spring forces exerted by compression spring K.

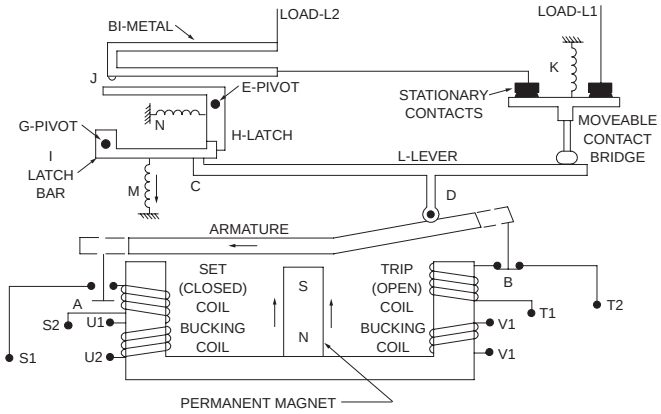


Figure 3

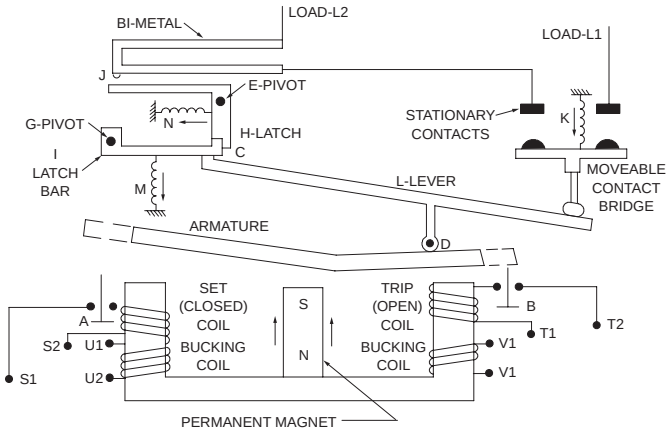


Figure 4

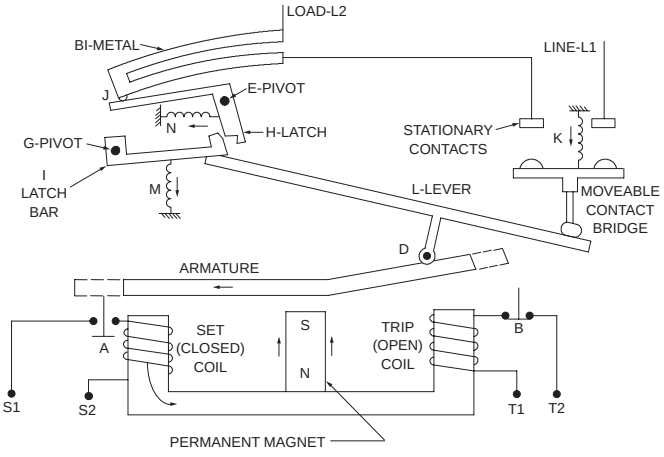


Figure 5

Note: there is an "upward force" directed on the lever L through the linkage tying into the armature at point D. During operation as a relay, point C (interface between lever L and latch bar I) is "fixed" in place, and the lever L actually rotates about point C when moving the contact structure from the opening to the closed, and from the closed to the open position.

Note that the coil U1-U2 is connected in parallel with T1-T2. It is wound on the left-hand core of the electro-magnet such that when energized along with T1-T2, the force it generates will be in a direction opposing the latching force generated in that core by the permanent magnet.

The utilization of a permanent magnet and intermittent duty coils, in conjunction with cutthroat contacts, allows a considerable reduction in copper and iron from that normally required in electro-magnets for continuous duty operation.

RCCB Operation as a Circuit Breaker

To examine the operation of the device as a breaker, refer to **Figures 3, 4, and 5**.

In **Figure 3**, the device is shown in the closed contact position (presumably) carrying rated current. Should an overload occur, currents greater than rated currents now "flow" through the device "entering" through L2, passing through the bimetal, through the connection of the bimetal to one stationary contact, through the bridging moveable contact structure, to the other stationary contact, and "out" through L1.

Depending upon the size of the overload, the bimetal will begin to deflect as shown in **Figure 5** until the actuating end of the bimetal engages latch H at point J.

Motion and force due to the deflection of the bimetal moves latch H such that it rotates in a counter-clockwise direction around its pivot point E.

When latch H has moved an adequate distance, the upward force of lever L, applied at point C to latch bar I, will rotate latch bar I counter-clockwise around its pivot point G. This allows the main lever L to rotate clockwise around point D (where it is engaged with the armature) due to the "contact return" spring (compression spring) force K acting upon the moveable contact bridge.

Note that when this overload occurs, the armature is not transferred to the "off" (tripped) position, but instead remains in the latched position normally associated with the "on" (set) position of the device.

To "reset" the device after the fault or overload clears could be readily accomplished by energizing the "trip" coil (T1-T2) through a toggle or push-button switch **(see Figure 1)** located in the flight deck. The armature would then transfer and seal on the right-hand core of the electro-magnet, which is the "open" position shown in **Figure 4**. At that time, springs M and N (tension springs) would reposition latch bar I and latch H to the position shown in **Figure 4**, providing that the bimetal has now cooled sufficiently and returned to its original position as shown in **Figure 4**. At this stage, the RCCB is still in an "open position" i.e. (the contacts are open), but as outlined above, the fault or overload has been cleared through action and operation of the device through bimetallic activity, i.e. "Circuit Breaker" operation.

To re-close the contacts, it is now only necessary to energize coils S1-S2 and re-establish a mechanism position similar to that shown in **Figure 3**. If the fault of overload condition is still in existence, the device would again trip through bimetallic activity as just described.

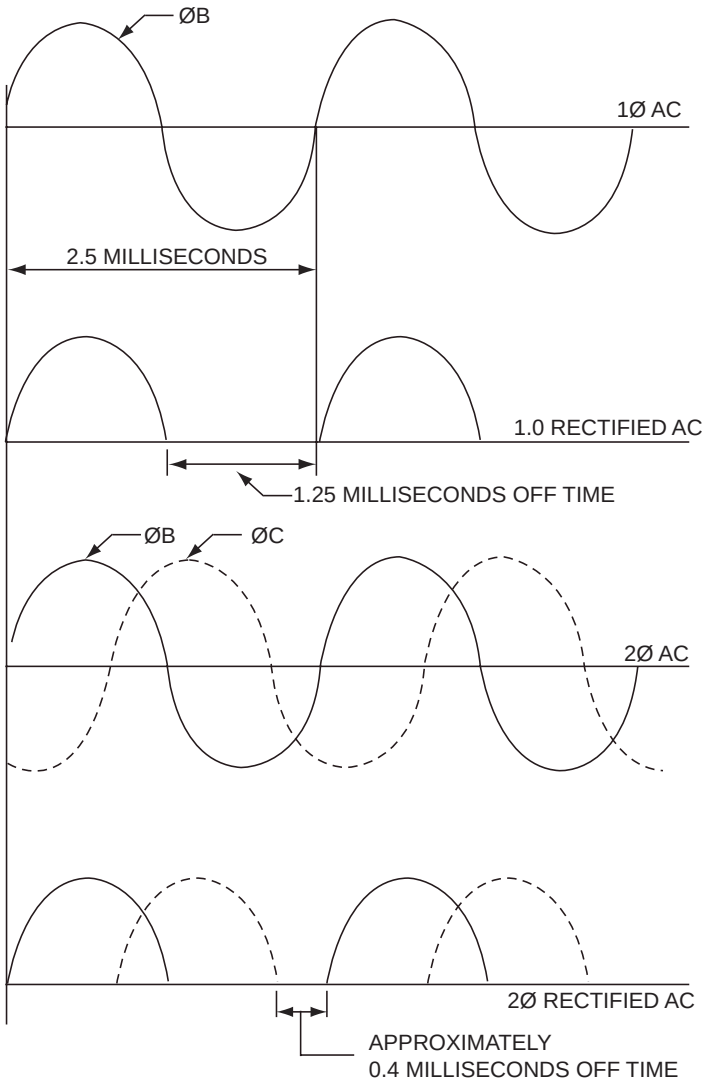


Figure 6

Three Pole RCCB

The design principles employed in the 3-pole RCCB have followed many of the same paths utilized in the 1-pole RCCB. Differences other than the obvious, such as size, weight, shape, etc., are explained below.

Motor Operation

The principles of motor operation and construction of the three pole devices are similar to those employed in the single pole RCCB. In the 3-pole device, the AC operating power is drawn from two of the three phases. The "off" time between current pulses during coil energization is approximately 0.4 milliseconds. In comparison, the "off" time for single-phase power is approximately 1.25 milliseconds. See **Figure 6**.

The timing circuit establishes a coil "on" time longer than the actual transfer time of the armature. The operation of the 3-pole RCCB is identical to the 1-pole.

Control Circuit

Refer to **Figure 7**. There is one minor difference in operating principles and parameters from the single pole devices.

The difference is the addition of a power junction area in the electronics. (**see Figure 7**). The 3-pole RCCB is designed for use in 3-phase circuits and is a 400 Hz AC load controller. The power junction is designed to use AC power only. DC operate (coil) power may be used even though AC loads are to be controlled. This connection is made at terminal 4 of the IWTS connector. In **Figure 7**, two separate power junctions are shown: one for AC and one for DC. In the event both AC and DC are connected to the RCCB, only AC would be utilized by the logic circuit. Should AC power be lost, the DC connection would automatically take over the control function.

The other differences between 1-phase and 3-phase control circuitry, i.e. timer addition, is directly related as described in the above Motor Operation section.

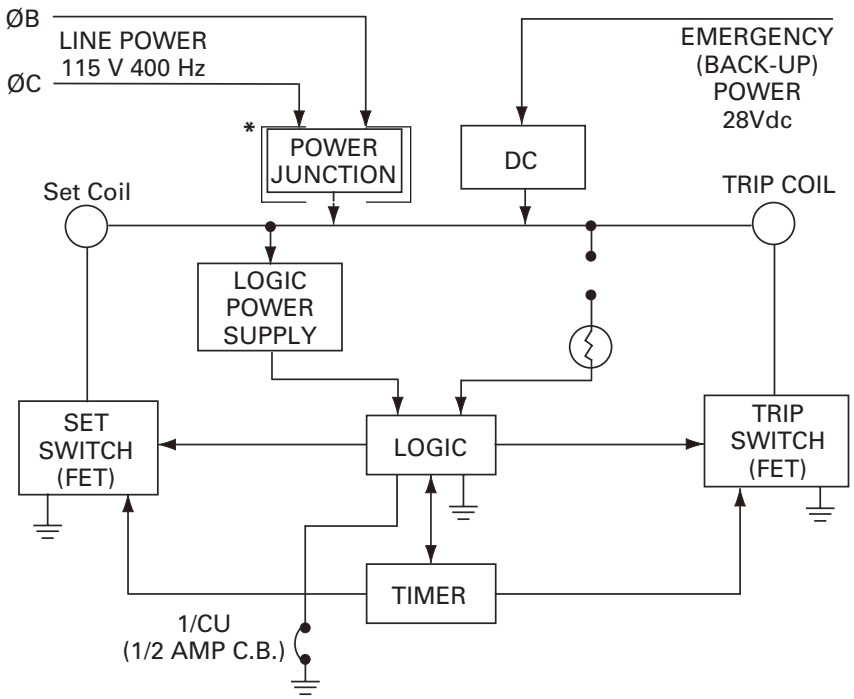


Figure 7

*Indicates In 3 Phase Electronics

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 (28VDC)
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

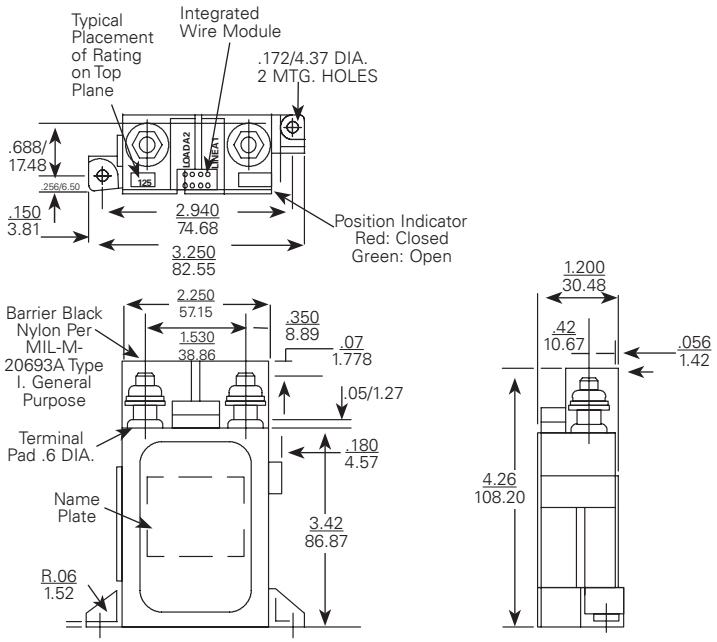
Single Pole Single Throw (Double Break Contacts)

AMPERE RATING	Safran Electrical & Power P/N	Rated Contact Load (Amperes) 28 VDC			
		Res.	Ind.	Motor	Min.
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.

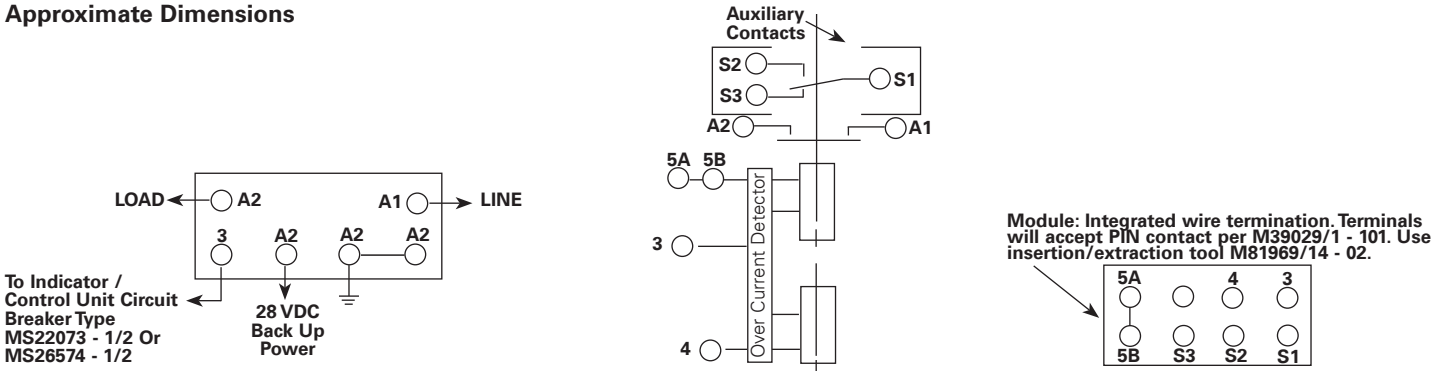
Engineering Data

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 $I^2t \geq 2$

Typical Characteristics

Specifications

- Design to meet the general requirements of MIL-R-6106 Type II continuous Duty Unsealed
- Contacts are covered & gasketed
- Double break contacts
- All units are thermal breaker compatible at rated relay resistive load
- Some models available with auxiliary circuits
- Gold-plated auxiliary contacts for low-level applications available
- Auxiliary contacts ratings:
  28 Vdc: 5 amps resistive
  3 amps inductive
  2.5 amps lamp

Ratings Per MIL-R-6106:

- Salt spray, humidity, accelera tion, sand & dust, intermediate current
- Vibration:
  5 to 10 Hz -.08 DA
  10 to 55 Hz -.05 DA
  55 to 500 Hz -2.0 g's
- Shock: 25 g's (6-9 MS ½ sine wave)
- Life: (-55 to 71°C)
  50,000 cycles electrical at full rated load
  100,000 cycles mechanical tested at 25% rated load
- Altitude: 50,000 feet

Part Number	Rated Contact Load 28 Vdc				Rupture Current	Contact Rating Intermittent Power 28 Vdc			
	Res.	Ind.	Motor	Intermediate		15 Minute	5 Minute	1 Minute	Max.⑥ Inrush
SM100D2	100	80	100	4	1000	130	150	200	600
SM100D3	100	80	100	4	1000	130	150	200	600
SM150D1	150⑤	50	150①	15	1200	195	225	300	900
SM150D2	150③	50	150①	15	1200	195	225	300	900
SM150D3	150⑤	50	150①	15	1200	195	225	300	900
SM150D4	150③	50	150①	15	1200	195	225	300	900
SM150D5③	150	50	150①	15	1200	195	225	300	900
SM200D1	200	100	200	20	2000	260	300	400	1200
SM200D2	200	100	200	20	2000	260	300	400	1200
SM200D3	200	100	200	20	2000	260	300	400	1200
SM400D1	400	100	400	40	4000	520	600	800	2400
SM400D2	400	100	400	40	4000	520	600	800	2400
SM400D3	400	100	400	40	4000	520	600	800	2400
SM1000D11⑨	1000	—	—	50	6000	1200	1500	2000	2500⑩

① 600 Amp make, 200 Amp break

②Duty cycle: 1 minute on, 1 minute off; 1 minute on, 20 minutes off

③Maximum vibration 2000 Hz 2 g's

④Duty cycle: 1.5 minutes on, 3 minutes off

⑤Will carry 200 Amps at 20% on duty cycle per minute

⑥Maximum inrush provided coil voltage as noted is maintained

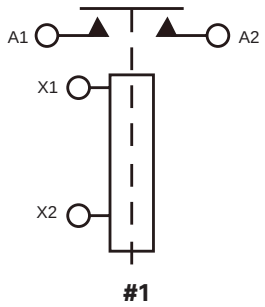
⑦Operate time at 28 Vdc & 25 deg. C.

⑧Contact bounce is average of 5 conse cutive ratings.

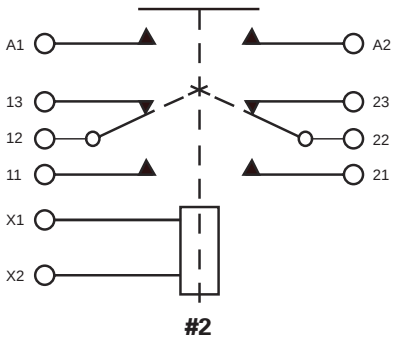
⑨Available in normal closed circuit.

⑩ 1 sec. on, 60 sec. off

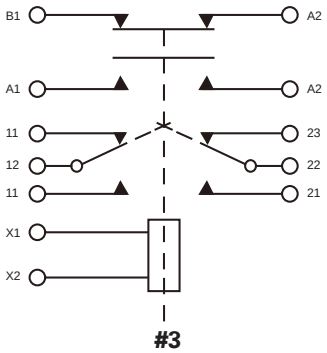
Circuit Diagrams



#1



#2



#3

Typical Characteristics

(Figures 1 through 8)
(For additional details, contact your local Safran Electrical & Power Technical Sales Representative)

- Power Contact Voltage Drop: Initial 0.15 V After Life Test: 0.175 V
- Insulation Resistance: Initial 200 Meg ohm.
- After Life Test: 100 Meg ohm

Dielectric Withstanding Voltage:

2.5 Seconds Sea Level
Initial: 1250 V
After Life Test: 1000 V
Power Contacts: 650 V

50,000 Feet 60 Seconds
Initial & After Life Test: 500 V

POWER RELAYS — GASKET SEALED – 100 AMPS TO 1,000 AMPS

Contact Transfer Milliseconds, Max.							Coil Data						
Op.⑥ Time	Rel. Time	Contact Bounce⑧	Poles & Throw	Weight Lbs./gm	Circuit Dia.	Dimension Fig.	Res. (OHMS)	Max. Volts Pick Up	Max Volts-Drop Out	Duty Cycle	Mounting	Auxiliary Termination	Part Number
35	15	6	SPST/NO	0.6/272	1	1	94.2	18	7 to 1.5	Cont	Side	—	SM100D2
35	15	6	SPST/NO	0.6/272	1	2	94.2	18	7 to 1.5	Cont	Top	—	SM100D3
40	15	5	SPST/NO	0.95/430	2	3	82.7	16.5	1 to 7	Cont	B	Screw	SM150D1
40	15	5	SPST/NO	0.95/430	2	3	82.7	16.5	1 to 7	Cont	B	IWTS	SM150D2
15	12	5	SPDT	1.25/567	3	4	6.6	6.5	0.2 to 3	Inter②	B	Screw	SM150D3
15	12	5	SPDT	1.25/567	3	4	6.6	6.5	0.2 to 3	Inter②	B	IWTS	SM150D4
40	15	5	SPDT	1.25/567	3	4	60	18	0.6 to 8.5	Cont	B	Screw	SM150D5
25	10	2.5	SPST/NO	1.3/588	2	5	66	18	1.5 to 7	Cont	Side	Lug	SM200D1
25	10	2.5	SPST/NO	1.3/588	2	6	66	18	1.5 to 7	Cont	B	Lug	SM200D2
25	18	5	SPST/NO	1.3/588	2	6	10	7.5	0.5 to 3	Inter④	B	Lug	SM200D3
40	15	10	SPST/NO	2.6/1177	2	7	60	18	1.5 to 7	Cont	Side	Lug	SM400D1
40	15	10	SPST/NO	2.6/1177	2	8	60	18	1.5 to 7	Cont	B	Lug	SM400D2
20	15	10	SPST/NO	2.6/1177	2	8	10	7.0	0.5 to 3	Inter④	B	Lug	SM400D3
60	30	3	SPST/NO	4/1810	1	9	38	18	1 to 7	Cont	Side	—	SM1000D11

①600 Amp make, 200 Amp break

②Duty cycle: 1 minute on, 1 minute off; 1 minute on, 20 minutes off

③Maximum vibration 2000 Hz 2 g's

④Duty cycle: 1.5 minutes on, 3 minutes off

⑤Will carry 200 Amps at 20% on duty cycle per minute

⑥Maximum inrush provided coil voltage as noted is maintained

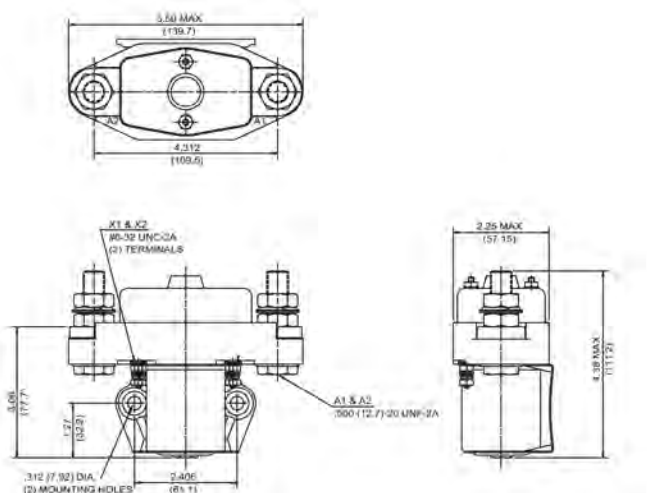
⑦Operate time at 28 Vdc & 25 deg. C.

⑧Contact bounce is average of 5 consecutive ratings.

⑨Available in normal closed circuit.

Dimensions (See next page for other dimension figures)

Figure 9



Insulation Resistance:
Initial: 100 Meg ohms
After Life Test: 50 Meg ohms

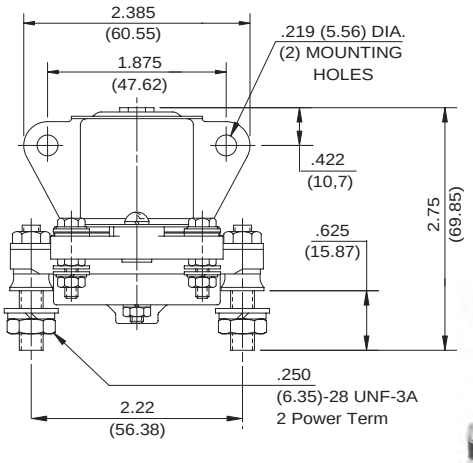
Dielectric Withstanding Voltage:
(2.5 Seconds Sea Level)
Initial: 1250 V
After Life Test: 1000 V

Unit Shown Without Auxiliary Contacts

Life at 1000 Amps limited to 10,000 cycles. Life at 50 Amps is 50,000 cycles minimum. Rupture life is 20 cycles at 6000 Amps. This unit is available with inverted terminals, bottom mounting, available with normally closed power contacts, and DPDT auxiliary circuits.

Dimension Figures

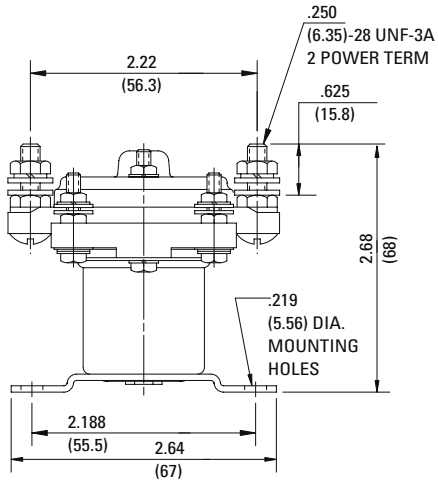
Figure 1



Unit Shown Without Auxiliary Contacts

SM100D2

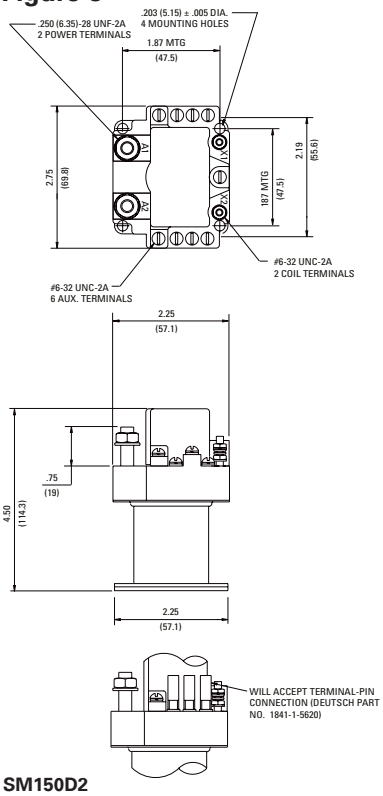
Figure 2



Unit Shown Without Auxiliary Contacts

SM100D3

Figure 3

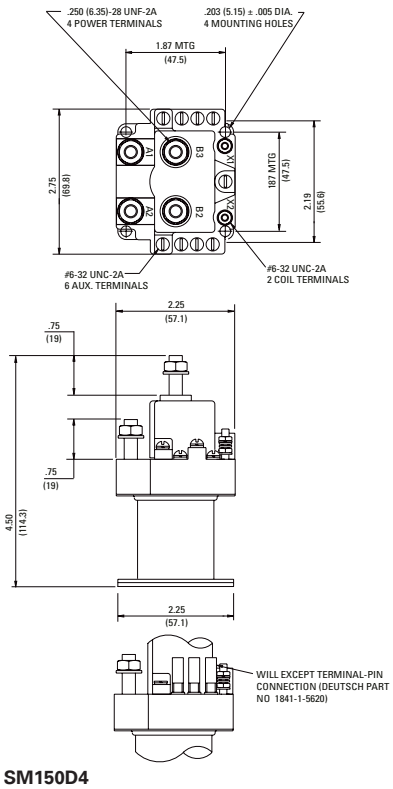


SM150D2

SM150D1

SM150D2

Figure 4



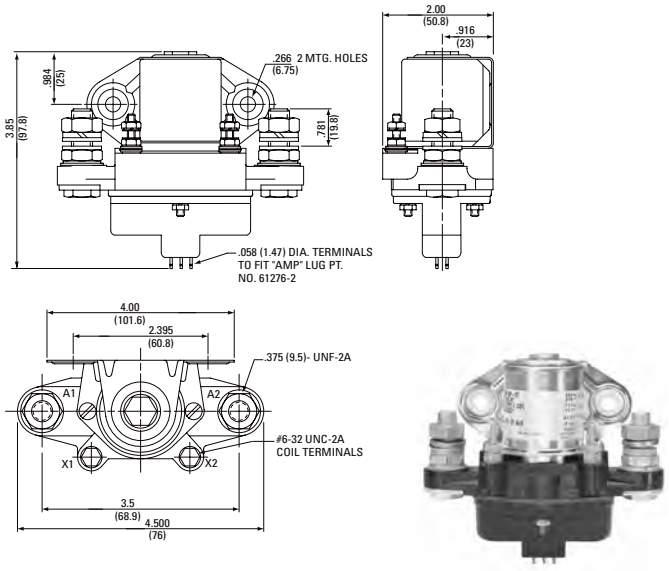
SM150D4

SM150D3
SM150D5

SM150D4

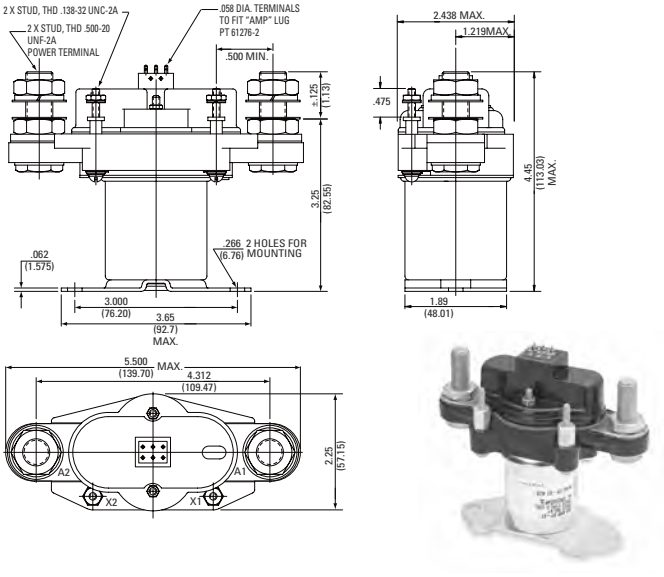
Dimension Figures

Figure 5



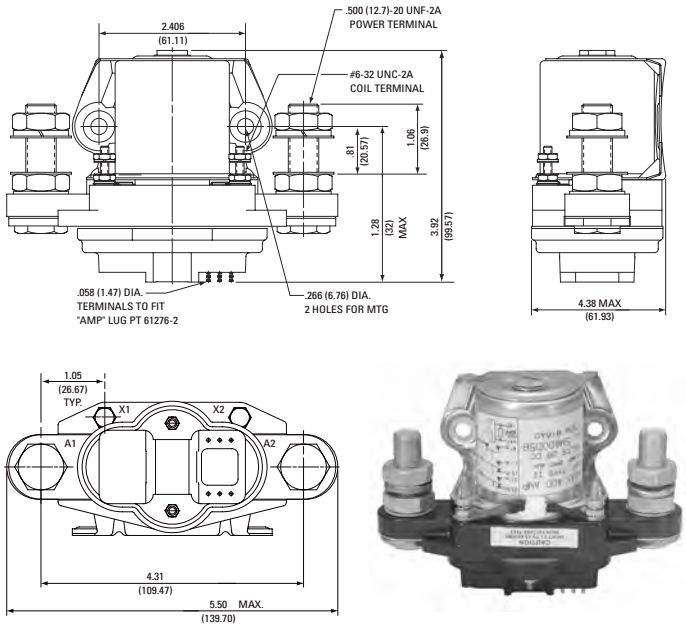
SM200D1

Figure 6



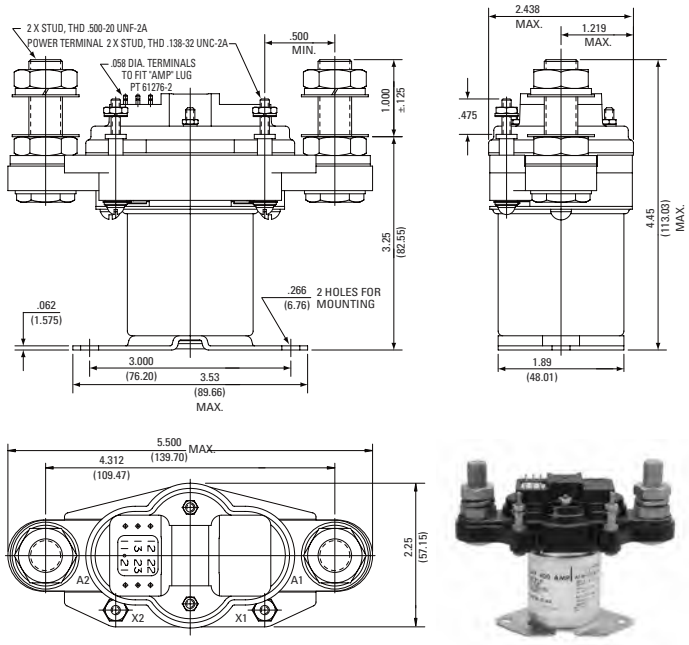
SM200D2
SM200D3

Figure 7



SM400D1

Figure 8



SM400D2
SM400D3

General Specifications

- Designed to MIL-R-6106
  - Type II Unsealed Continuous Duty
  - Type III Unsealed Intermittent Duty
  - Covered/Gasketed Contact Area
  - Twin-break Silver Alloy Contacts
- Meets Explosion, Humidit, Salt, Spray, Sand, and Dust requirements.
- Altitude: 50,000 feet
- Shock: 25 g's ½ Sine 6 to 9 milliseconds
  - Maximum contact opening: 2 milliseconds
- Acceleration: 10 g's
- Vibration Limits:
  - 5 to 10 Hz: 0.8 in DA
  - 10 to 55 Hz: 0.6 in DA
  - 55 to 2000 Hz: 2 g's
- Temperature Range: -55°C to 71°C
- Insulation Resistance:
  - 100 megohm minimum initially
  - 50 megohm minimum after tests
- Dielectric:
  - 1250 Vac minimum initially
  - 1000 Vac minimum after tests
- Life:
  - Electrical Operations: 50,000 cycles
  - Mechanical Operations at 25% of Rated Resistive Load: 100,000 cycles
- Minimum Current: 10% of Rated DC Resistive Load
- Intermittent Duty Ratings:
  - % of Rated Resistive
  - Time On in Minutes
  - Cooling time is required between successive over load applications.

Intermittent Duty Ratings

Minutes			
15	5	1	Inrush
130%	150%	200%	600%
Rupture Time Per MIL-R-6106			

(Coil Voltage must be maintained at rated value)

- Options:
  - Other Coil Voltage
  - Alternate Mountings

- MIL-STD-461 applies to AC operated coils.
- See drawing for additional applicable details.

Special Service Use

Mechanical Interlock/Type Service

Part Number	Reversing	Transfer	Dynamic Braking
9565H29	X	X	—
6046H39	X	—	X
6046H46	X	X	—
6046H53	X	X	—

Cat N. 6041H217
- SPST rated 400 Amp resistive and motor at 28 Vdc continuous duty with top mounting.
- MS24185-D1 - 2.6 Lbs/ 1179gm

Cat N. 6041H202
- SPST rated 200 Amp resistive and motor at 28 Vdc continuous duty with side mounting.
- MS24171-D2 - 1.25 Lbs/ 567gm

Cat N. 6041H209
- 2 PST rated 100 Amp resistive at 28 Vdc and 75 amperes 115/200 V 400 Hz intermittent duty with top mounting.
- AN-3392-1 - 1.5 Lbs/ 680 gm

Cat N. 6041H201
- SPST rated 50 Amp resistive, inductive and motor at 28 Vdc continuous duty with side mounting.
- MS24166-D2 - 0.5 Lbs/ 225 gm

Cat N. 9565H2
- 3 PST rated 25 Amp resistive, inductive and motor at 28 Vdc and 115/200 V 400 Hz continuous duty cycle with base mounting.
- MS24192-D1 - 1.1 Lbs/ 499 gm

Reversing and Dynamic Braking Relay

Cat N. 6046H39
- Control of split field series motors.
- SPST see circuit diagram 6 for details.
- Rated 28 Vdc 50 Amp N.O., 25 Amp N.C
- 2.9 Lbs./1315 gm

POWER RELAYS — CONTINUOUS DUTY, TYPE II, UNSEALED
INTERMITTENT DUTY, TYPE III, UNSEALED

Safran Electrical & Power Part Number	Government Part Number	Continuous Power Contacts, Ratings						Contacts Operate Milliseconds, Maximum					Coil Data							
		28VDC			115/200 VAC 400 Hz.															
		RES.	IND.	MOTOR	RES.	IND.	MOTOR	OP. TIME	REL TIME	Contact Bounce	Poles & Throw④	Weight Lbs./GMS	Circuit Dia./ Dim. Figure	Resistance (OHMS)± 10% Pickup/ Sealed	Volts Pickup⑤	Volts Drop-out⑥	Duty Cycle	Mounting	Coil Voltage Nominal
9565H2	MS24192-D1	25	25	25	25	25	25	20	15	6	3PST	1.1/498	10 / 11	/ 60	18	1.5 to 7	CONT	BASE	28 dc
9565H29	MS24152-D1	25	25	25	25	25	25	20	15	6	3PDT	2/909.09	16 / 11	22 / 92	18	1.5 to 7	CONT	BASE	28 dc
9565H95	—	25	25	25	25	25	25	20	15	6	3PST	1.06/482.95	10 / 11	/ 1160	70	8 to 38	CONT	BASE	120 dc
6041H53②	—	50/25	50/25	50/25	25/25	—	—	20	15	5 N.O./10 N.C.	SPDT	.54/245.45	4 / 2	16.9	8.2	0.8 to 4.8	CONT	TOP	12 dc
6041H220②	MS24187-D1	50/25	50/25	50/25	25/25	—	—	20	15	5 N.O./10 N.C.	SPDT	.54/245.45	4 / 2	94.2	18	1.5 to 9	CONT	TOP	28 dc
6041H230	MS24187-D2	50/25	50/25	50/25	25/25	—	—	20	15	5 N.O./10 N.C.	SPDT	.54/245.45	4 /2	94.2	18	1.5 to 9	CONT	TOP	29 dc
6046H39②	—	50/25	50/25	50/25	—	—	—	—	—	—	SPDT	2.9/1318.18	6 / 7	26	18	7		TOP	28 dc
6041H201	MS24166-D2	50	50	50	—	—	—	20	10	5	SPST	.50/225	1 / 4	94.2	18	1.5 to 7	CONT	SIDE	28 dc
6041H149	—	50	50	50	—	—	—	20	15	5	SPST	.56/254.55	1 / 4	16.9	8.2	0.8 to 4.8	CONT	SIDE	12 dc
6041H200	MS24166-D1	50	50	50	—	—	—	20	10	5	SPST	.50/225	1 / 4	94.2	18	1.5 to 7	CONT	TOP	28 dc
9565H94	MS24193-D1	50	50	50	50	50	50	20	15	4	3PST	1.51/685	10 / 11	13.5 / 71.5	18	1.5 to 7	CONT	BASE	28 dc
6041H219	MS24178-D1	55	40	40	55	—	35	—	—	—	DPST	.75/340.91	2 / 2	66	18	1.5 to 7	Note①	TOP	28 dc
6041H80	—	100	80	80	—	—	—				SPST	1.4/636.36	1 / 3	66.3	18	1.5 to 7	CONT	SIDE	28 dc
6041H144	—	100	80	80	—	—	—				SPST	1.4/636.36	1 / 3	66.3	18	1.5 to 7	CONT	SIDE	28 dc
6041H11	—	100	80	80	—	—	—				SPST	1.4/636.36	1 / 1	66.3	18	1.5 to 7	CONT	TOP	28 dc
6041H209	AN3362-1	100	80	80	75	—	65	35	10	3.5	DPST	1.5/685	2 / 2	43	20	1.5 to 7	Note①	TOP	28 dc
6046H53	MS25031-D1B	100	80	80	75	—	65				DPDT	3.5/1590.91	9 / 7	43	18	1.5 to 7	CONT	TOP	28 dc
9565H13	—	100	75	75	100	—	75	22	15	4	3PST	2.5/1136.36	12 / 11	9 / 53	18	1.5 to 7	CONT	BASE	28 dc
6041H202	MS24171-D2	200	100	200	—	—	—	25	10	50	SPST	1.25/568.18	1 / 5	66	18	1.5 to 7	CONT	SIDE	28 dc
6041H105	—	200	100	200	—	—	—	—	—	—	SPST	1.25/868.18	1 / 5	10 (+15/-10)	9	3.5	CONT	SIDE	12 dc
6041H123	—	200	100	200	—	—	—	40	15	5	SPST	1.3/590.91	1 / 5	66	18	1.5 to 7	CONT	SIDE	28 dc
6041H203	MS24172-D2	200	100	200	—	—	—	25	18	5	SPST	1.23/560	1 / 5	10 (+15/-10)	7.5	0.5 to 3.0	INTER③	SIDE	28 dc
6041H212	—	200	100	200	—	—	—	40	15	5	SPST	1.3/590.91	1 / 5	66	18	1.5 to 7	CONT	SIDE	28 dc
6041H215	MS24171-D1	200	100	200	—	—	—	25	10	5	SPST	1.33/604.55	1 / 1	66	18	1.5 to 7	CONT	TOP	28 dc
6041H216	MS24172-D1	200	100	200	—	—	—	25	10	5	SPST	1.33/604.55	1 / 1	10(+15/-10)	7.5	0.5 to 3.0	INTER③	TOP	28 dc
6046H46	MS25032-D1	200	100	150	150	—	100	40	15	5	DPDT	5.5/2500.00	8 / 7	41	18	1.5 to 7	CONT	TOP	28 dc
6041H205	MS24185-D2	400	100	400	—	—	—	40	15	5	SPST	2.6/1181.82	1 / 5	60	18	1.5 to 7	CONT	SIDE	28 dc
6041H217	MS24185-D1	400	100	400	—	—	—	40	15	5	SPST	2.6/1181.82	1 / 1	60	18	1.5 to 7	CONT	TOP	28 dc
					—	—	—			5									
					—	—	—												

① Coil will exceed 95° C temperature rise when left on continuously in 25° ambient, but will not be damaged. At maximum ambient temperture of 71°C, the duty cycle should be limited to 15 minutes "on" time per half hour to obtain maximum coil life.

② Continuous and intermittent duty ratings shown are for N.O. pole rated at 1/2 the listed continuous DC duty ratings. N.C. pole on 6041H53 and H220 limited to 15 g's shock.

③ Time on 1 1/2 minutes at 29 Vdc. Minimum time off is 3 minutes.

④ All continuous duty resistive and motor load ratings and all intermittent duty ratings for all 3 pole relays listed under 28 Vdc apply for 120 Vdc systems with all 3 poles of the relay connected in the series.

⑤ Pick-up voltage below values shown may cause relay to rapidly cycle on and off (chatter).

⑥ Relay must drop-out at voltage value or less and may drop-out at any voltage below the higher voltage noted.

MS Part Number Summary

AN3362-1*	6041H209		
MS24152-D1*	9565H29*	MS24185-D2	6041H205
MS24166-D1	6041H200	MS24187-D1	6041H220
MS24166-D2	6041H201	MS24187-D2	6041H230
MS24171-D1	6041H215	MS24192-D1	9565H2
MS24171-D2	6041H202	MS24193-D1	9565H94
MS24172-D1	6041H216	MS25031-D1B	6046H53
MS24172-D2	6041H203	MS24185-D1	6041H217
MS24178-D1	6041H219	MS25032-1	6046H46

*Inactive for new design

Conversion Part Number

AN Part Number	Use MS Part Number	Safran Electrical & Power Part Number
3343-1	—	9565H13
3350-1	MS24166-D2	6041H201
3362-1	—	6041H209
3370-1	MS24171-D2	6041H202
3371-1	MS24172-D2	6041H203
3380-1	MS24185-D2	6041H205
—	MS25030-D1B	6041H51

Approximate Dimensions and Weights

			Dimensions in Inches								Dimensions in Millimeters						
Catalog Number	Ampere Ratings	Figure Number	Wide A	High B	Deep C	Mounting D	Mounting E	Hole F	Net Stud G Power	Coil	Weight Lbs.	Wide A	High B	Deep C	Mounting D	Mounting E	Hole F	Weight Grams
6041H11	100	1	3.27	3.13	2.08	—	2.75	0.27	.250-28 UNF	.138-32 UNC	1.4	83.06	79.5	52.83	—	69.85	6.86	636.36
6041H53	50/25	2	2.63	3.14	2.062	—	2.2	0.214	.190-32 UNF-2A	.138-32 UNC-2A	0.54	66.8	79076	52.37	—	55.88	5.44	245.45
6041H80	100	3	2.91	3	2.08	—	2.26	0.276	.250-32 UNC	.138-32 UNC-2A	1.4	73.91	76.2	52.83	—	57.4	7.01	636.36
6041H105	200	5	4.406	3.28	1.99	—	2.395	0.276	.375-24 UNF-2A	.138-32 UNC-2A	1.25	111.92	83.31	50.55	—	60.83	7.01	568.18
6041H123	200	6	4.5	3.575	2	—	2.395	0.276	.375-24 UNF-2A	.138-32 UNC-2A	1.3	112.01	90.81	50.8	—	62.83	7.01	590.91
6041H144	100	3	3.33	3	2	—	2.26	0.276	.250-28 UNF	.138-32 UNC	1.4	84.58	76.2	50.8	—	57.4	7.01	636.36
6041H149	50	4	2.75	2.5	2.125	—	1.875	0.229	.190-32 UNC-2A	.138-32 UNC-2A	0.562	69.85	63.5	53.98	—	47.63	5.82	255.68
6041H200	50	2	2.75	2.625	2.125	—	2.188	0.219	.191-32 UNC-2A	.138-32 UNC-2A	0.5	69.85	66.68	53.98	—	55.58	5.56	225
6041H201	50	4	2.75	2.5	2.125	—	1.875	0.229	.190-32 UNC-2A	.138-32 UNC-2A	0.5	69.85	63.5	53.98	—	47.63	5.82	225
6041H202	200	5	4.41	3.28	1.99	—	2.395	0.276	.375-24 UNF-2A	.138-32 UNC-2A	1.25	112.01	83.31	50.55	—	60.83	7.01	568.18
6041H203	200	5	4.5	3.313	2	—	2.395	0.276	.375-24 UNF-2A	.138-32 UNC-2A	1.23	114.3	84.15	50.8	—	60.83	7.01	560
6041H205	400	5	5.5	3.92	2.438	—	2.406	0.276	.500-20 UNF-2A	.138-32 UNC-2A	2.6	139.7	99.57	61.93	—	61.11	7.01	1181.82
		5				—									—			
6041H209	100	2	3.469	3.406	2.656	—	2.948	0.276	.250-28 UNF-2B	.138-32 UNC-2B	1.5	88.11	86.51	67.46	—	74.88	7.01	681.82
6041H212	200	5	4.48	3.313	2.466	—	3.717	0.27	.375-24 UNF-2A	.138-32 UNC-2A	1.3	113.79	84.15	62.64	—	94.41	6.86	590.91
6041H215	200	1	4.406	3.75	2	—	3.01	0.276	.375-24 UNF-2A	.138-32 UNC-2A	1.33	111.91	95.25	50.8	—	76.45	7.01	604.55
6041H216	200	1	4.406	3.75	2	—	3.01	0.276	.375-24 UNF-2A	.138-32 UNC-2A	1.33	111.91	95.25	50.8	—	76.45	7.01	604.55
6041H217	400	1	5.5	4.5	2	—	3.01	0.276	.500-20 UNF-2A	.138-32 UNC-2A	2.6	139.7	114.3	50.8	—	76.45	7.01	1181.82
		1			2	—									—			
6041H219	55	2	2.922	2.844	2.031	—	2.385	0.223	.190-32 UNC-2B	.138-32 UNC-2B	0.75	74.22	72.24	51.59	—	60.58	5.66	340.91
6041H220	50/25	2	2.812	3.13	2.062	1.395	2.2	0.214	.190-32 UNF-2A	.137-32 UNC-2A	0.54	71.42	79.5	52.37	35.43	55.88	5.44	245.45
6046H39	50/25	7	4.82	3.45	2.25	2.01	4.301	0.228	.190-32	.138-32 UNC	2.9	122.43	87.63	57.15	51.05	109.25	5.79	1318.18
6046H46	200	7	7.688	4.125	3.468	1.76	6.895	0.266	.375-24 UNF	.138-32 UNC	5.5	195.28	104.78	88.09	44.7	175.13	6.76	2500
6046H53	100	7	6.688	3.75	2.656	2.125	6.02	0.266	.250-28 UNF	.138-32 UNC	3.5	169.88	95.25	67.46	53.98	152.91	6.76	1590.91
9565H2	25	11	3.063	2.75	2.75	2.688	2.49	0.229	.190-32 UNF-2B	.138-32 UNC-2B	1.062	77.8	69.85	69.85	68.28	63.25	5.82	482.95
9565H13	100	11	3.812	3.546	3.28	2.468	3.102	0.225	.250-28 UNF-2B	.164-32 UNC-2B	2.5	96.82	90.07	83.31	62.69	78.79	5.72	1136.36
9565H29	25	12	4.75	2.75	4.125	2.75	4.187	0.218	.190-32 UNF-2B	.164-32 UNC-2B	2.25	120.65	69.85	104.78	69.85	106.35	5.54	1022.73
9565H94	50	11	3.625	3.188	3.312	2.135	2.322	0.219	.190-32 UNF-2B	.164-32 UNC-2B	1.5	92.08	80.98	84.12	54.23	58.98	5.56	681.82
9565H95	25	11	3.063	2.75	2.75		2.494	0.229	.190-32 UNF-2B	.164-32 UNC-2B	1.06	77.8	69.85	69.85		63.35	5.82	481.82

Note: All coils and auxiliary terminals are 6-32, except for Catalog Number 9565 relays which have 8-32 coil terminals.
Dimensions are approximate and should not be used for construction purposes.

Dimension Figures

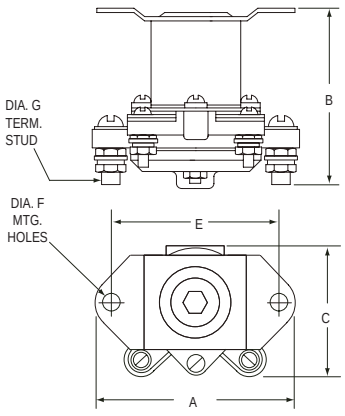
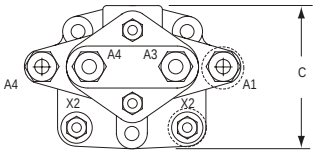


Figure 1



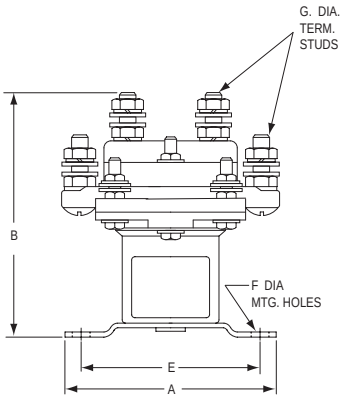


Figure 2

Dimension Figures (cont.)

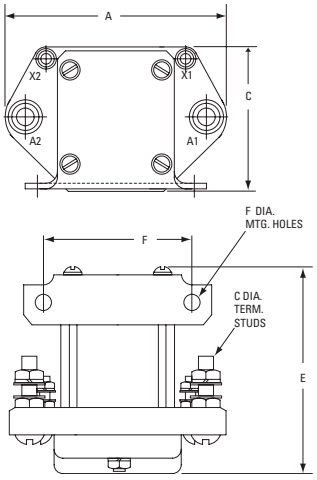


Figure 3

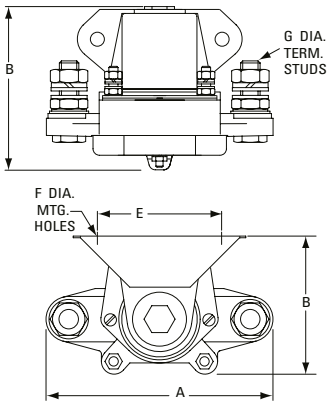


Figure 4

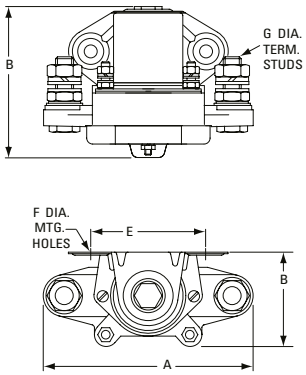


Figure 5

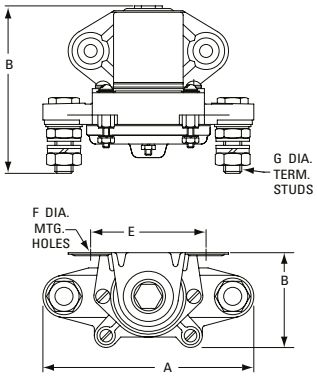


Figure 6

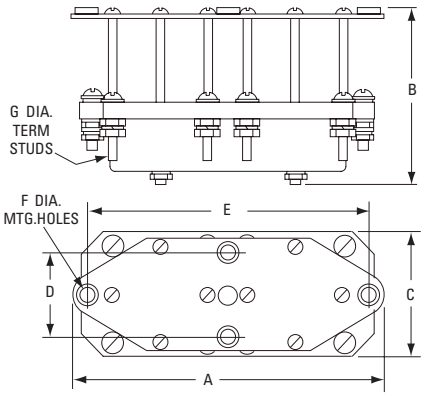


Figure 7

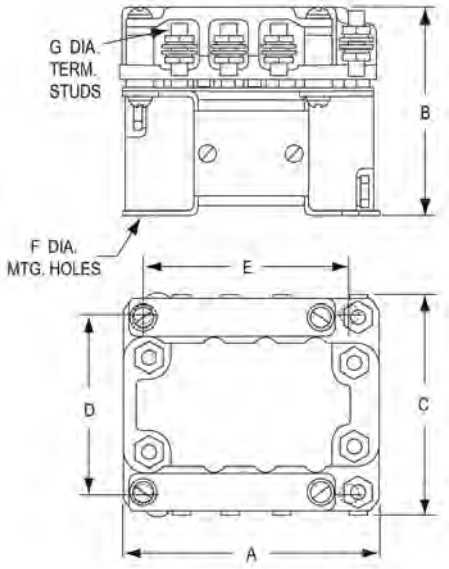


Figure 11

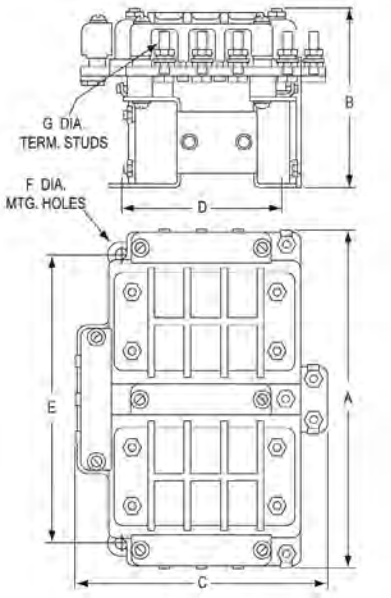


Figure 12

Typical Wiring Diagrams

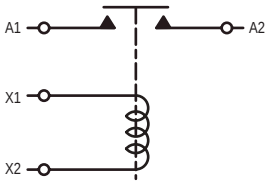


Diagram 1

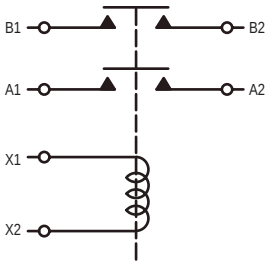


Diagram 2

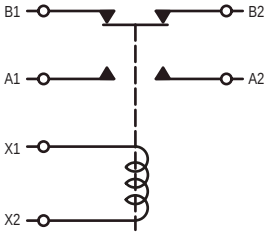


Diagram 3

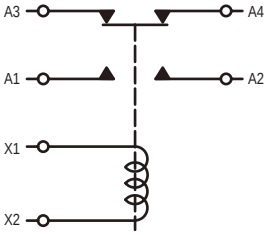


Diagram 4

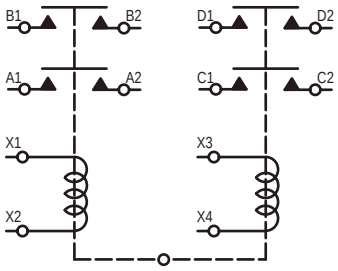


Diagram 8

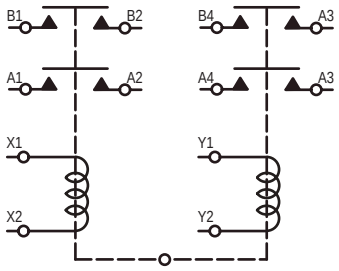


Diagram 9

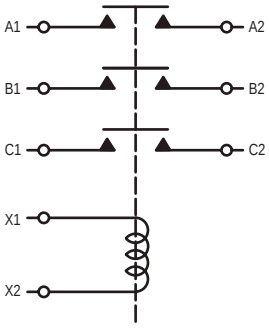


Diagram 10

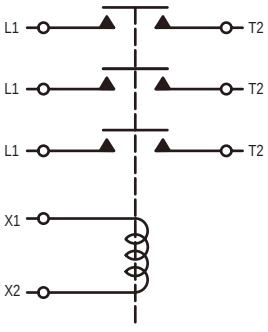


Diagram 12

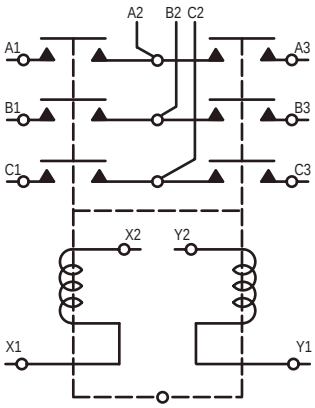


Diagram 16

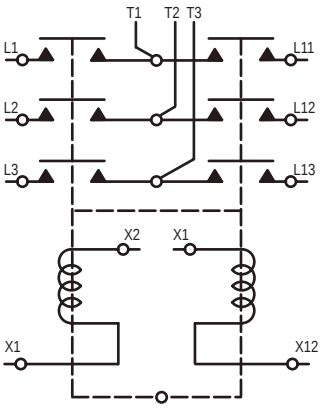


Diagram 18

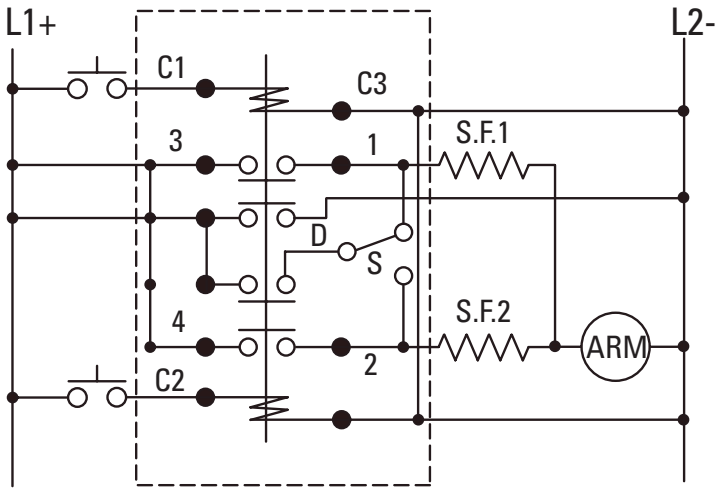
P/N 6046H39

Typical Operation:
All items shown within dotted lines are part of the relay. All other parts external to dotted lines, including switches connected to C1 & C2 customer supplied.

Internal Mechanical Interlocks
Prevents the opposite contacts from transferring when either one of the coils is energized and the respective contacts are closed.

Reversing Operation
Closing either external start/stop switch at C1 or C2 will cause the motor to turn in either direction.

Dynamic Braking Operation
Internal switch provides for dynamic braking current flow through the motor shunt-fields series (SF) 1 and 2. Switch S is mechanically closed when either coil is energized and maintains that position until the alternate coil is energized. Switch S is shown in the last position commanded by external start/stop switch at C1.



Dia. No. 6
6046H39

(Items shown outside dotted line are customer supplied)

Characteristics:

- Electrical Life: 50,000 cycles (sea level to 80,000 feet)
- Mechanical Life: 100,000 cycles
- Acceleration: 15 g's
- Shock: 25 g's
- Ambient Temperature Class:
  - B -70°C to 125°C
  - D -70°C to 71°C
- Hermetically sealed/ MIL-PRF-6106
- Twin Break Silver Alloy Main Contacts
- Vibration Levels (Typical):

5 - 10 CPS .08 DA	10 - 55 CPS .06 DA	55 - 200CPS 10 g's
250 - 500 CPS 5 g's		500 - 1500 CPS 3 g's

Typical Configurations

Catalog Number	Continuous Ampere Contact Rating	Poles and Throw	Operating Coil Voltage	Number Aux① Contacts	Dimension Drawing Figure Number	Wiring Diagram Figure Number	Government Type Number	Temp Class/ Note
6042H110-2	12	3PST	28 Vdc	1	2	8	MS24143-D3	B②
6042H141-2	25	3PST	28 Vdc	—	2	6	MS24143-D1	B
6042H142-2	25	3PST	28 Vdc	1	2	8	MS24143-D2	B⑦
6042H290-2	25	3PST	115 Vac 60 or 400 Hertz	—	2	6	MS24143-A3	D
6042H291-2	25	3PST	Built In Rectifiers	1	2	8	MS24143-A4	D
6042H155-2	50	SPST	28 Vdc	—	1	9	MS24140-D1	B
6042H156-2	50	SPST	28 Vdc	1	1	10	MS24140-D2	B
6042H145-2	50	3PST	28 Vdc	—	2	6	MS24376-D1	B
6042H146-2	50	3PST	28 Vdc	1	2	8	MS24376-D2	B
6042H147-2	50	3PST	115 Vac 60 or 400 Hertz	—	2	6	MS24376-A1	B⑩
6042H148-2	50	3PST	115 Vac 60 or 400 Hertz	1	2	8	MS24376-A2	B⑩
6042H285-2	50	3PST	115 Vac 60 or 400 Hertz	1	2	8	MS24376-A4	B⑩
6042H288-2	50	3PST	Built In Rectifiers	—	2	6	MS24376-A3	B⑩

Cat. No. 6042H285
3PST, 50 Amp w/Auxiliary

Cat. No. 6042H155
SPST, 50 Amp

Cat. No. 6042H46
SPST, 50 Amp w/Auxiliary

Ratings

Power Contact Ratings - Continuous Duty ⑥						Coil Data					Catalog Number
28 Vdc			115/200 Vac 400 Hz			Max. Coil Power		Max. Volts Pick Up at Amb. Temp.	Volts		
Amperes			Amperes						Hold	Drop Out	
Res.	Ind.	Motor	Res.	Ind.	Motor	Amps	Volts				
12	12	6	12	12	6	0.6	29 dc	18 dc	7 dc	1.5 dc	6042H110-2
25	25	25	25	25	25	0.6 0.6	29 dc	18 dc	7 dc	1.5 dc	6042H141-2 6042H142-2
						0.225	124 ac	90 ac	40 ac⑨	10 ac	6042H290-2 6042H291-2
			50④	50④	50④	0.50 0.50	29 dc	18 dc	7 dc	1.5 dc	6042H155-2 6042H156-2
50	50	50	50	50	50	0.6 0.6	29 dc	18 dc	7 dc	1.5 dc	6042H145-2 6042H146-2
			50	50	50	0.225	124 ac	90 ac	40 ac	10 ac	6042H147-2 6042H148-2 6042H285-2 6042H288-2

① Auxiliary Switch: SPDT rated 28 Vdc and 115 V 400 Hz, 5 Amp Res. & Ind. & 0.75 Amp Lamp
② Rated 100,000 operations electrical and mechanical life; Auxiliary switch rated 1,25 Amp Res. & 0.75 Amp Ind.
④ These Ratings for 115 V 400 Hz only
⑤ See MS Sheets for details
⑥ Intermittent duty ratings for general applications. (See chart below)
⑦ Ratings for 50/60 Hz only @ 115/200 Vac
⑨ 400 Hz only
⑩ Temperature Class D for 60 Hz AC Operation

Intermittent Duty Ratings

Continuous	15 Minutes	5 Minutes	1 Minute	Max. Inrush
100%	130%	150%	200%	600%

In general, these power relays can withstand the above intermittent duty overcurrent.

Options:

Internal Coil Suppression

Typical Configurations

Catalog Number	Continuous Ampere Contact Rating	Poles and Throw	Operating Coil Voltage	Number Aux.① Contacts	Dimension Drawing Figure Number	Wiring Diagram Figure Number	Government Type Number	Temp Class/ Note	Power Contact Ratings — Continuous Duty⑥ 28 Vdc Amperes			115/200 Vac 400 Hz Amperes			Max. Time In Seconds		Coil Data Max. Coil Power		Max. Volts Pick-up @	Volts	
									Res.	Ind.	Motor	Res.	Ind.	Motor	Operate	Release	Amps	Volts	Amb Temp.	Hold	Drop Out
6042H159-2	100	SPST	28 Vdc	—	1	9	MS24141-D1	B	100	100	100	100④	—	75④	0.025	0.01	0.5	29 dc	18 dc	7 dc	1.5 dc
6042H160-2				1	1	10	MS24141-D2	B	100	100	100	100④	—	75④	0.025	0.01	0.5	29 dc	18 dc	7 dc	1.5 dc
6042H166-2				—	1	9	MS24182-D1	D	100	100	100	100④	—	75④	0.02	0.01	0.5	29 dc	18 dc	7 dc	1.5 dc
6042H161-2		3PST		—	2	6	MS24168-D1	B	100	100	100	100④	50⑧	100④	0.06	0.015	0.6	29 dc	18 dc	7 dc	1.5 dc
6042H162-2				1	2	8	MS24168-D2	B	100	100	100	100	50⑧	100	0.06	0.025	0.6	29 dc	18 dc	7 dc	1.5 dc
6042H286-2			115 Vac	—	2	8	MS24168-A4	D	100	100	100	100	50⑧	100	0.06	0.11	0.25	120 ac	90 ac	40 ac	10 ac
6042H289-2				1	2	6	MS24168-A3	D	100	100	100	100	50⑧	100	0.06	0.08	0.25	120 ac	90 ac	40 ac	10 ac
6042H151-2	200	SPST	28 Vdc	—	1	9	MS24142-D1	B	200	100	200	200	—	150	0.035	0.015	0.6	29 dc	18 dc	7 dc	1.5 dc
6042H152-2				—	1	10	MS24142-D2	B	200	100	200	200	—	150	0.035	0.015	0.6	29 dc	18 dc	7 dc	1.5 dc
6042H167-2				1	1	9	MS24183-D1	D	200	100	200	200	—	150	0.03	0.01	0.5	29 dc	18 dc	7 dc	1.5 dc
6042H153-2	300			—	1	9	MS24184-D1	D	300	100	250	300	—	150	0.035	0.015	0.6	29 dc	18 dc	7 dc	1.5 dc
6042H154-2				1	1	10	—	D	300	100	250	300	—	150			0.6	29 dc	18 dc	7 dc	1.5 dc
SM400H2-2	400			—	1	9	—	D	400	100	250	400	—	150	0.035	0.015	0.6	29 dc	18 dc	7 dc	1.5 dc
SM400H3-2				1	1	10	—	D	400	100	250	400	—	150	0.035	0.015	0.6	29 dc	18 dc	7 dc	1.5 dc

①Auxiliary switch: SPDT rated 28 Vdc and 115 V 400 Hz, 5 Amp Res. & Ind. & 0.75 Amp Lamp.
②Rated 100,000 operations electrical and mechanical life. Auxiliary switch rated 1.25 Amp Res. & 0.75 Amp Ind.
③Rated 50 g shock.
④These ratings for 115 V 400 Hz only.
⑤See MS Sheets for details.
⑥Intermittent duty ratings for general applications (see chart below).
⑧Ratings for 50/60 Hz only @ 115/200 Vac.

Cat. No. 6042H286
3 PST, 100 Amp

Cat. No. 6042H151
SPST, 200 Amp

Cat. No. 6042H153
SPST, 300 Amp

Characteristics:

- Electrical Life:
  50,000 cycles
  (sea level to 80,000 feet)
- Mechanical Life:
  100,000 cycles
- Acceleration: 15 g's
- Shock: 25 g's
- Ambient Temperature Class:
  - B -70°C to 125°C
  - D -70°C to 71°C
- Hermetically sealed/ MIL-PRF-6106
- Twin Break Silver Alloy Main Contacts
- Vibration Levels (Typical):

5-10 CPS .08 DA	10-5 CPS .06 DA	55-200CPS 10 g's
250-500 CPS 5 g's	500-1500 CPS 3 g's	

Intermittent Duty Ratings:

Continuous	15 Minutes	5 Minutes	1 Minute	Max. Inrush
100%	130%	150%	200%	600%

In general, these power relays can withstand the above intermittent duty overcurrent.

Options:

Internal Coil Suppression

Approximate Dimensions and Weights

Catalog Number	Ampere Rating	Dimensions in Inches	Dimensions in Inches						Net Term. Stud Dia. G		Weight	Dimensions in Millimeters						Weight
			Wide	High	Deep	Mounting		Hole			Lbs.	Wide	High	Deep	Mounting		Hole	Grams
			A	B	C	D	E	F	Power	Coil		A	B	C	D	E	F	
6042H110-2	12	2	3.305	4.485	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.60	83.95	113.92	93.98	82.55	68.25	5.54	727.27
6042H141-2	25	2	3.305	3.250	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.50	83.95	82.55	93.98	82.55	68.25	5.54	681.82
6042H142-2	25	2	3.305	4.513	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.60	83.95	114.63	93.98	82.55	68.25	5.54	727.27
6042H145-2	50	2	3.305	3.200	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.60	83.95	81.28	93.98	82.55	68.25	5.54	727.27
6042H146-2	50	2	3.305	4.485	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.70	83.95	113.92	93.98	82.55	68.25	5.54	771.11
6042H147-2	50	2	3.305	3.200	3.700	3.250	2.687	0.218	.19O-32 UNF-2B	.138-32 UNC-2B	1.70	83.95	81.28	93.98	82.55	68.25	5.54	771.11
6042H148-2	50	2	3.305	4.485	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.82	83.95	113.92	93.98	82.55	68.25	5.54	825.54
6042H151-2	200	1	3.640	3.700	3.315	—	3.000	0.266	.375-24 UNF-2B	.138-32 UNC-2B	2.30	92.46	93.98	84.20	—	76.20	6.76	1043.26
6042H152-2	200	1	3.640	4.972	3.315	—	3.000	0.266	.375-24 UNF-2B	.138-32 UNC-2B	2.50	92.46	126.29	84.20	—	76.20	6.76	1133.98
6042H153-2	300	1	3.640	3.700	3.315	—	3.000	0.266	.375-24 UNF-2B	.138-32 UNC-2B	2.40	92.46	93.98	84.20	—	76.20	6.76	1088.62
6042H154-2	300	1	3.640	4.973	3.315	—	3.000	0.266	.375-24 UNF-2B	.138-32 UNC-2B	2.50	92.46	126.31	84.20	—	76.20	6.76	1133.98
6042H155-2	50	1	2.700	2.665	2.835	—	2.188	0.218	.190-32 UNF-2B	.138-32 UNC-2B	0.90	68.58	67.69	72.01	—	55.58	5.54	408.23
6042H156-2	50	1	2.700	3.947	2.835	—	2.188	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.10	68.58	100.25	72.01	—	55.58	5.54	498.95
6042H159-2	100	1	3.640	3.250	2.925	—	3.000	0.266	.250-28 UNF-2B	.138-32 UNC-2B	1.40	92.46	82.55	74.30	—	76.20	6.76	635.03
6042H160-2	100	1	3.640	4.532	2.925	—	3.000	0.266	.250-28 UNF-2B	.138-32 UNC-2B	1.60	92.46	115.11	74.30	—	76.20	6.76	727.27
6042H161-2	100	2	4.250	4.280	4.220	3.697	3.510	0.218	.250-28 UNF-2B	.138-32 UNC-2B	3.30	107.95	107.57	107.19	93.90	89.15	5.54	1496.86
6042H162-2	100	2	4.250	5.615	4.220	3.697	3.510	0.218	.250-28 UNF-2B	.138-32 UNC-2B	3.45	107.95	142.62	107.19	93.90	89.15	5.54	1568.18
6042H166-2	100	1	3.640	3.063	2.925	—	3.000	0.266	.250-28 UNF-2B	.138-32 UNC-2B	1.10	92.46	77.80	74.30	—	76.20	6.76	498.95
6042H167-2	200	1	3.672	3.282	2.957	—	3.000	0.266	.375-24 UNF-2B	.138-32 UNC-2B	1.70	93.27	83.36	75.11	—	76.20	6.76	771.11
6042H285-2	50	2	3.305	4.485	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.90	83.95	113.92	93.98	82.55	68.25	5.54	861.83
6042H286-2	100	2	4.235	5.553	4.218	3.697	3.510	0.218	.250-28 UNF-2B	.138-32 UNC-2B	3.70	107.57	141.05	107.14	93.90	89.15	5.54	1678.29
6042H288-2	50	2	3.305	3.200	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.80	83.95	81.28	93.98	82.55	68.25	5.54	816.47
6042H289-2	100	2	4.235	4.280	4.218	3.697	3.510	0.218	.250-28 UNF-2B	.138-32 UNC-2B	3.60	107.57	108.71	107.14	93.90	89.15	5.54	1636.36
6042H290-2	25	2	3.305	3.250	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.70	83.95	82.55	93.98	82.55	68.25	5.54	771.11
6042H291-2	25	2	3.305	4.513	3.700	3.250	2.687	0.218	.190-32 UNF-2B	.138-32 UNC-2B	1.90	83.95	114.63	93.98	82.55	68.25	5.54	861.83
SM400H2-2	400	1	3.640	3.700	3.315	—	3.000	0.266	.375-24 UNF-2B	.138-32 UNC-2B	2.40	92.46	93.98	84.20	—	76.20	6.76	1088.62
SM400H3-2	400	1	3.640	4.973	3.315	—	3.000	0.266	.375-24 UNF-2B	.138-32 UNC-2B	2.50	92.46	126.31	84.20	—	76.20	6.76	1133.98

NOTE: All coils and auxiliary terminals are 6-32. Dimensions are approximate and should not be used for construction purposes.

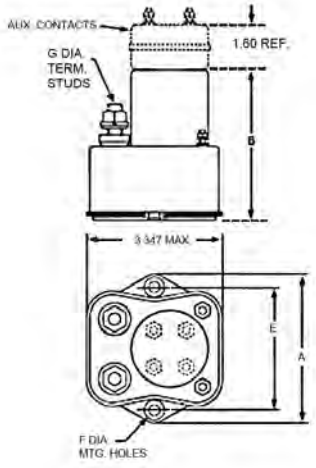


Figure 1

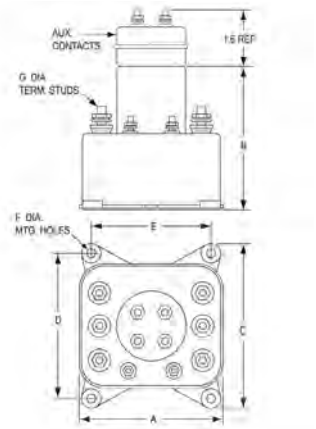
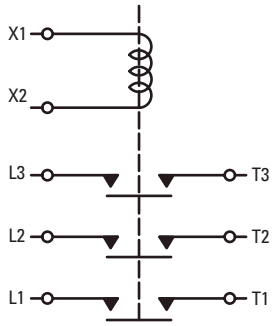
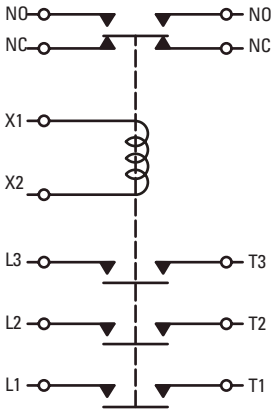


Figure 2

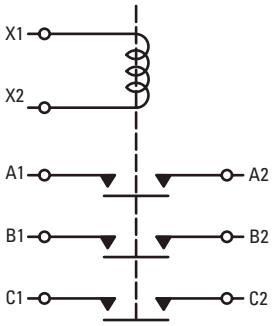
Typical Wiring Diagrams (See Selection Table for Diagram No. Reference)



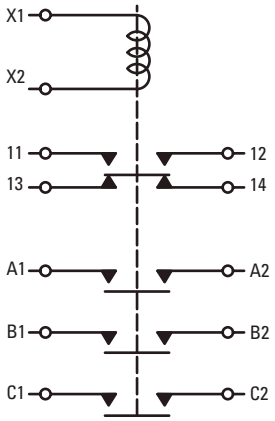
Dia. No. 1



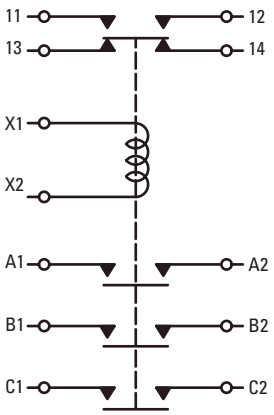
Dia. No. 2



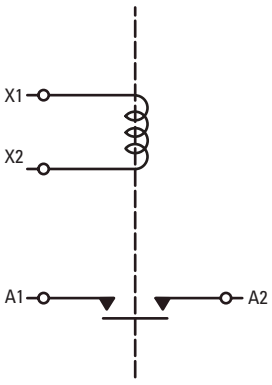
Dia. No. 6



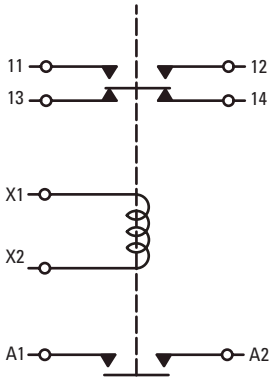
Dia. No. 7



Dia. No. 8



Dia. No. 9



Dia. No. 10

Specifications

- Molded of unbreakable nylon
- Ambient temperature ranges: -70°C to 125°C
- Secured by coil terminal hardware
- Part number molded into cover
- Positive protection between power stubs

Part No. 49-2665
MS27242-1

Part No. 49-2672
MS27243-5

Part No. 49-2667
MS27243-3

Part No. 49-2661
MS27243-1

Part No. 49-2670
MS27243-4

Terminal Covers Application

Safran Electrical & Power Relays	Relay MS Numbers	Terminal Cover Part Number	MS27243
6042H110-2	MS24143-D3	49-2661	-1
26042H141-2	MS24143-D1	49-2661	-1
6042H142-2	MS24143-D2	49-2661	-1
6042H145-2	MS24376-D1	49-2661	-1
6042H146-2	MS24376-D2	49-2661	-1
6042H147-2	MS24376-A1	49-2661	-1
6042H148-2	MS24376-A2	49-2661	-1
6042H151-2	MS24142-D1	49-2672	-5
6042H152-2	MS24142-D2	49-2672	-5
6042H153-2	MS24184-D1	49-2672	-5
6042H154-2	MS24184-D2	49-2672	-5
6042H155-2	MS24140-D1	49-2667	-3
6042H156-2	MS24140-D2	49-2667	-3
6042H159-2	MS24141-D1	49-2665	-2
6042H160-2	MS24141-D2	49-2665	-2
6042H161-2	MS24168-D1	49-2670	-4
6042H162-2	MS24168-D2	49-2670	-4
6042H166-2	MS24182-D1	49-2667	-3
6042H167-2	MS24183-D1	49-2665	-2
6042H286-2	MS24168-A4	49-2670	-4
6042H288-2	MS24376-A3	49-2661	-1
6042H289-2	MS24168-A3	49-2670	-4
6042H290-2	MS24143-A3	49-2661	-1
6042H291-2	MS24143-A4	49-2661	-1
SM400H2-2	—	49-2672	-5
SM400H3-2	—	49-2672	-5

Approximate Dimensions and Weights

Part Number	Figure Number	Dimensions in In./Mill.			Ship Wt. Lbs./ gm
		A	B	C	
49-2661	1	2.32/58.93	0.75/19.05	2.94/74.68	.025/11.31
49-2665	1	2.56/65.02	1.17/29.72	2.12/53.85	.026/11.77
49-2667	1	2.66/67.56	1.11/28.19	2.05/52.07	.027/12.22
49-2670	1	2.75/69.85	1.06/26.92	3.81/96.77	.044/19.91
49-2672	1	3.00/76.20	1.17/29.72	2.50/63.50	.030/13.57

NOTE: Dimensions are approximate and should not be used for construction purposes.

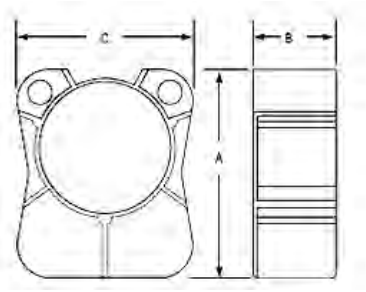


Figure 1

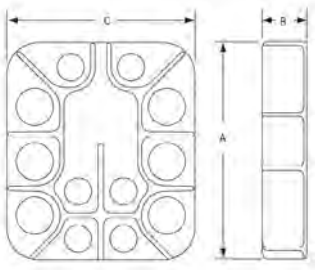


Figure 2

Engineering Data

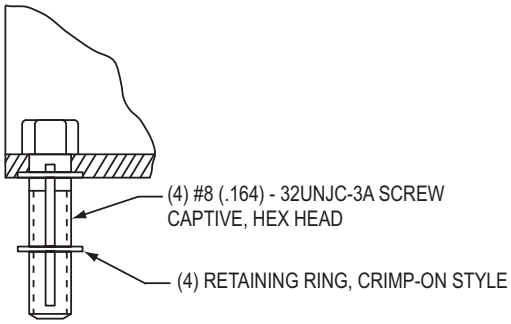
- MIL-R-6106 Type I
  - Hermetically Sealed
  - Continuous Duty
- Weight - 11.3 oz. (320 grams)
- Seal - 1x10-6 STD CC/SEC Max
- Altitude: 80,000 Feet
- Double Break Contacts

Vibration Random	**15 Minutes Each Plane**	**Vibration Random**	**15 Minutes Each Plane**
M6106/48-001		**M6106/48-002①**	
Frequency (Hz)	Level (g^2/Hz)	Frequency (Hz)	Level (g^2/Hz)
10 - 125	0.037	15 - 50	0.012
125 - 250	+4 dB	120 - 200	0.364
250 - 1000	0.1	250 - 400	0.194
1000 - 2000	-3 dB	600 - 1000	0.060
		1300 - 2000	0.097

①Test to be performed with 5 ampere load on main contact.

Selection Table

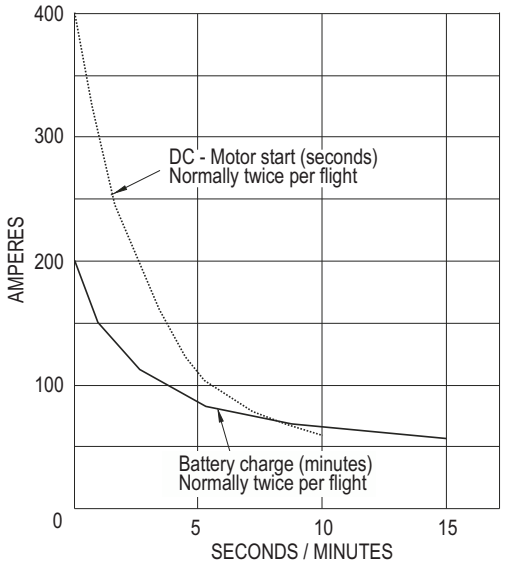
- **SM100H1**
- **M6106/48-001**



- **SM100H15**
- **M6106/48-002**

Application Notes

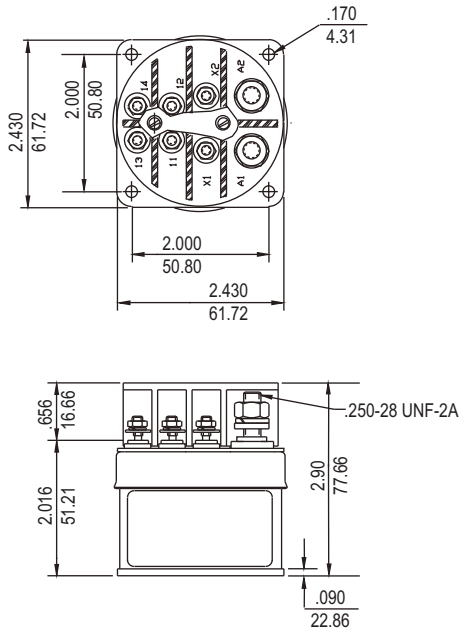
The curve shows a typical motor/generator requirement. The SM100H1 can withstand up to 400 Amps for several seconds during motor start - dropping to 100 Amps within 5 seconds. The SM100H1 can withstand the generator output up to 200 Amp for several minutes - dropping to 100 Amps within 3.5 minutes. These cycles can be repeated once every 90 seconds. The SM100H1 will meet applications requiring a reliable and robust contactor.



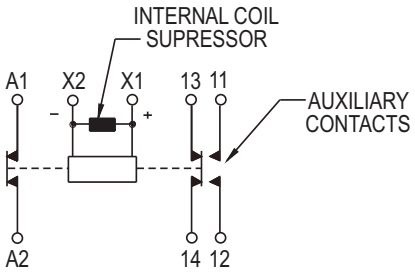
Engineering Data

- Meets MIL-R-6106/48
  Type I Hermetically Sealed Continuous Duty
- Power Contacts SPST:
  - 28 Vdc
  - Load Ratings:
    Resistive: 100 Amps
    Inductive: 100 Amps (10,000 cycles)
    Motor: 50 Amps -001; 25 amps -002
    Lamp: 50 Amps (25,000 cycles)
    Minimum: 10 Amps
    Overload: 800 Amps (See application curve)
    Rupture: 1000 Amps
  - Contact Voltage Drop:
    Initial 0.100 V
    After Test - 0.150 V
- Life:
  - Electrical: 50,000 cycles
  - Mechanical: 100,000 cycles
- Auxiliary Contacts SPDT Form "Z":
  - Voltage: 28 Vdc
  - Resistive: 5 Amps
  - Inductive: 5 Amps (10,000 cycles)
  - Lamp: 1 Amp (25,000 cycles)
  - Minimum: 2 MA at 28 Vdc.
  - Contact Voltage Drop: Maximum: 5 MV +/- 100 MA and 6V
- Current above 125 MA negates minimum current capability.
- Operating Temperature: -55°C to 125°C
- Shock: ½ Sine 50 g's 6-9 MS:
  - Contact Opening: 2 millisec. max.
- Insulation Resistance Minimum:
  - Initial: 100 Megohms
  - After Test: 50 Megohms
- Vibration: Sinusoidal (-001 only)
  - 5 to 10 Hz 0.08 DA
  - 10 to 55 Hz 0.05 DA
  - 55 to 2000 Hz 10 g's
- Vibration (Gun Fire) 15 minutes each plane:
  - 0.0375 g/Hz for 10 to 125 Hz
  - 4DB/Octave inc 125 to 250 Hz
  - 0.1 g/Hz for 250 to 1000 Hz
  - 3DB/Octave decrease 1000 to 2000 Hz
- Dielectric Strength Sea Level 2-5 sec. Voltage=VRMS 60 Hz:
  - All points: 1250 V Initial, 1000 V After Tests
- Dielectric Strength Altitude 1 min. 60 Hz:
  - Coil & contacts: 500 V Initial & After Test
  - All other points: 500 V Initial & After Test

Dimensions



Schematic



Coil Data

- Duty Cycle: Continuous
- Maximum Voltage: 30 Vdc
- Pick up: 18 Vdc (15 Vdc at 25°C)
- Hold-in: Unit must drop out at 1.5 Vdc & below and can drop out at any voltage below 7 Vdc.
- Operate Time: 30 MS maximum
  Release Time: 20 MS maximum
- Contact Bounce: 3 MS maximum main and auxiliary contacts
- Coil Resistance: @-25°C; 100 Ohms minimum (- 002); 90 Ohms Minimum (-001)
- Coil Suppression: 0.42 V max. Peak Inverse Voltage

Engineering Data

- Meets MIL-R-6106 Type IV
- Weight: 10.5 ounces (284 g)
- Altitude:
  - -Rated: 50,000 feet
  - -Extended: 80,000 feet with encapsulated terminals
- Ratings:
  - -Voltage: 115/200 V, 400 Hz, 3Æ
  - -Load Ratings:
    - Resistive: 60 Amps
    - Inductive: 60 Amps
    - Motor: 40 Amps
    - Minimum Current: 4 Amps
    - Rupture: 400 Amps
- Environmental Seal: MIL-STD-202, METHOD 112 Test Condition C Procedure IV
- Seal: 6 x 10-4 STD CC/SEC
- Economizer Coil: 30 Vdc
  - -Inrush: 1.25 Amps (20 milliseconds max)
  - -Steady State: 0.25 Amps

Power Contact Ratings (Continuous Duty)①

	115/200 Vac 400 Hz	28 Vdc
• Resistive	60 A.	20 A.
• Inductive	60 A.	10 A.
• Motor	40 A.	....
• Minimum Current	4 A.	....
• Rupture	400 A.	....
• Contact Drop		
- Initial	0.150 V Max.	....
- After Life Test	0.175 V. Max.	....
• Contact Bounce	2 Milliseconds	

① DC ratings are maximum overload capability. By wiring two poles in series, 28 Vdc rating can be increased to the same as the full AC ratings.

Options

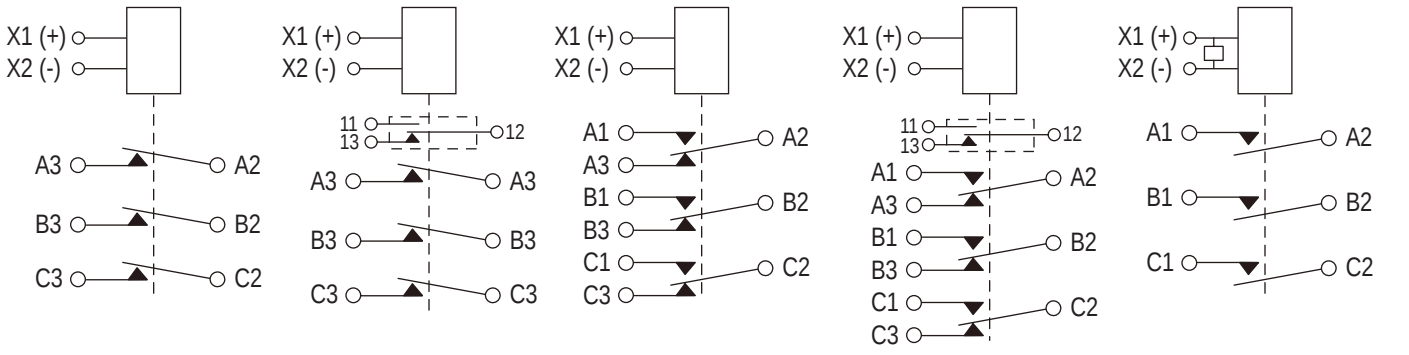
- AC operated coils
- Encapsulated terminals
- Internal coil suppression
- Suitable for synchronized power supplied transfer

Selection Table

Poles and Throw-Circuit	Number of Auxiliary Contacts 1 P.D.T.	Government Type Number M6106	Catalog Number
3 P.S.T.-N.O.	—	/10-001	SM15AWD1
	1	/10-002	SM15AXD1
3 P.S.T.-N.C.	—	/11-001	SM15BWD1
	1	/11-002	SM15BXD1
3 P.D.T.	—	/9-001	SM15CWD1
	1	/9-002	SM15CXD1
3 P.S.T.-N.O.	—	10-005*	SM15AWD3

* Unit supplied with internal coil suppression. 45 V max. peak inverse voltage.

Typical Wiring Digrams



3 P.S.T. - N.C. Auxiliary Contact

3 P.S.T. - N.C. Auxiliary Contact

3 P.D.T. Without Auxiliary Contact

3 P.D.T. With Auxiliary Contact

3 P.S.T. N.O. Without Auxiliary Contact With Internal Coil Suppression

Engineering Data

Specifications

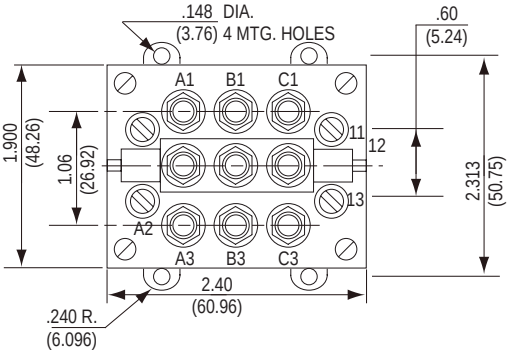
- Meets MIL-R-6106/9, /10, /11 Type IV Environmentally Sealed
  - Continuous Duty Operation
- Power Contacts 400 Hz:
  - Voltage: 115 V Single Phase
    115 V/ 200 V Three Phase
  - Load Ratings per Pole:
    Resistive: 60 Amps
    Inductive: 60 Amps
    Motor: 40 Amps
    Minimum Current: 4 Amps
    Overload: 320 Amps
    Rupture: 400 Amps
  - Electrical Life at Rated Loads: 100,000 operations (50,000 motor)
  - Mechanical Life at 15 Amps: 200,000 operations
- Auxiliary Contacts 115 V 400 Hz/ 28 Vdc:
  - Resistive: 3 Amps
  - Inductive: 1.5 Amps
  - Mechanical: 0.5 Amps
- Operating Temperature: -55°C to 71°C
- Shock: ½ Sine, 25 g's 6 to 9 MS
  - Contact Opening: 1 millisecond maximum
- Acceleration: 15 g's
- Insulation Resistance Minimum
  - Initial: 200 Megohms
  - After Test: 100 Megohms
- Vibration:
  - 5 to 10 Hz 0.08" DA
  - 10 to 55 Hz 0.06" DA
  - 55 to 400 Hz 10 g's
  - 400 to 800 Hz 8 g's
  - 800 to 2000 Hz 8 g's (-55°C to 25°C) 7 g's at 71°
- Dielectric Strength Sea Level 2-5 sec. 60 Hz:
  - Coil & Auxiliary Contacts: 1250 V Initial, 1000 V After Test,
  Across open power contacts: 1250 V Initial 625 V After Life.
  - All Other Points: 1800 V Initial, 1350 V After Test
- Dielectric Strength Altitude 1 minute 60 Hz:
  - Coil & Auxiliary Contacts: 500 V Initial & After Test
  - All Other Points: 700 V Initial & After Test

Coil Data

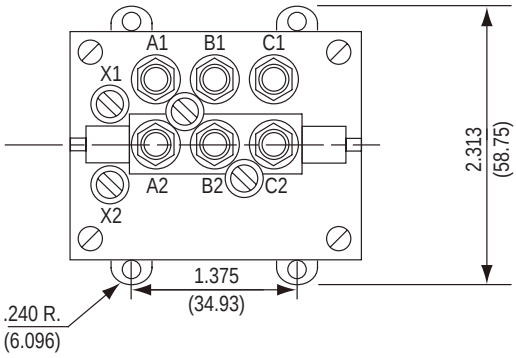
- 28 Vdc: Inrush 1.25 Amps (20 MS Max); Steady State 0.25 Amps
- Pick-up: 17 Vdc. Hold in: 7.0 Vdc
  Drop-out: 1.5 Vdc Unit must drop out at 1.5 Vdc and below and can drop out at any voltage below 7 Vdc.
- Operate Time: 25 MS. Release Time: 25 MS
- Contact Bounce: 2 MS maximum main and auxiliary contacts

Dimensions Drawings

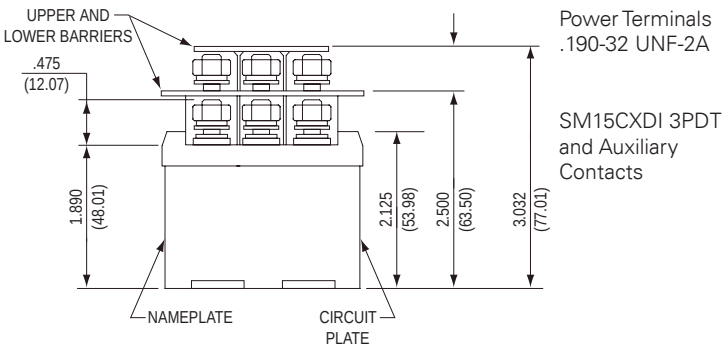
Top View - SM15CXD1 3PDT and Auxiliary Contacts



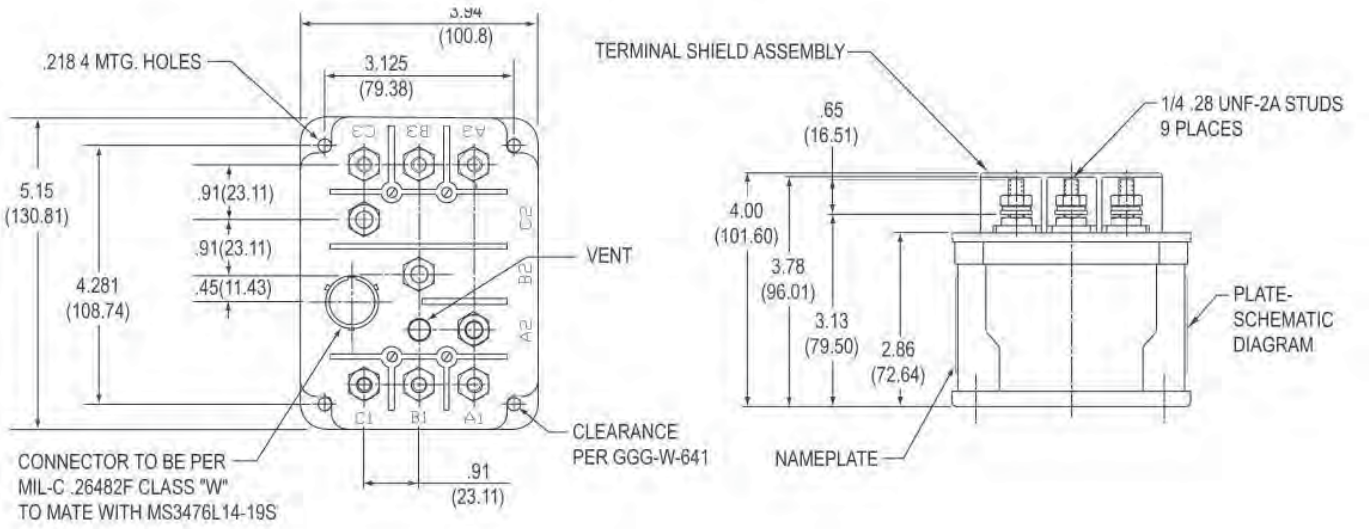
Top View - SM15AWD1 3 PST N.O. Contacts. Without Auxiliary Contacts



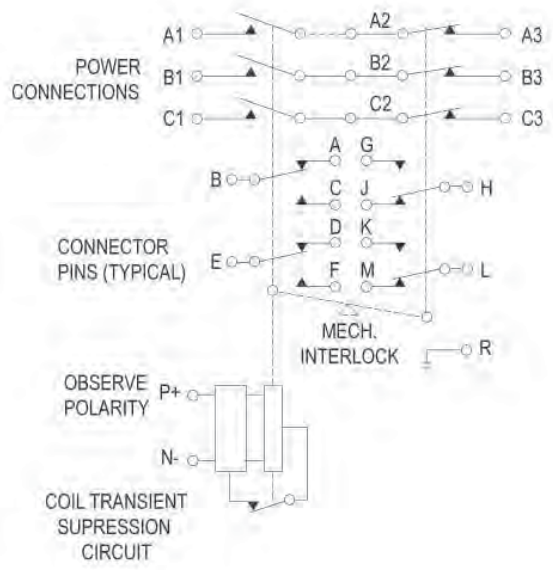
Side View



Approximate Dimensions



Options



SM135B2

Wiring Diagram

Unit shown in normal position. Operation of the single coil will open power contacts A3, B3, C3 and close power contacts A1, B1, C1.

Engineering Data

Specifications

- Designed to MIL-R-6106/42
- All moving parts, contacts, and magnet coil gasket sealed & vented
- Operable at altitudes to 50,000 feet
- Operating Temperature: -55°C to +71°C
- Altitude: 50,000 ft. Max.
- Vibration:
  - Per MIL-E-5400
  - Curve IV, 5-2000 Hz
- Shock: 30 g's, Half Sine, 11 MS Duration
- Acceleration: 6 g's
- Maximum weight: 3.15 Lbs/ 1425.31 gm
- Overload Current: 1080 Amps
- Rupture Current: 1350 Amps

Application Notes

Mechanically interlocked contact circuits prevent inadvertent operation of the alternate contact circuits. These units are suitable for load transfer typically from ground support to on-board power.

Electrical Characteristics

Insulation Resistance (Initial): ..... 200 Megohms
After Life or Environmental Tests: ..... 100 Megohms

Contact Voltage Drop (Initial): ..... MAIN 0.175 V max. - .150 V avg
After Life Test ..... 0.200 V max. - .175 V avg

Contact Voltage Drop (Initial) ..... AUX 0.400 V max. - .300 V avg
After Life Test ..... 0.450 V max. - .400 V avg
At 5 Amps

Overload Current (Main) ..... 1080 amp

Rupture Current (Main) ..... 1350 amp

Duty Rating ..... Continuous

Coil Suppression to meet requirements of MIL-E-6051D(1)

Dielectric Strength

Description	Test Voltage Vrms					
	At Sea Level (2-5 Sec.)				At Altitude (60 Sec.)	
	Initial		After Life			
	28 Vdc	115 Vac	28 Vdc	115 Vac	28 Vdc	115 Vac
Coil to Case	1250	—	1000	—	500	—
Aux. Contacts	1250	1500	1000	1125	500	500
All Other Points	NA	1800	NA	1350	NA	700

Operating Characteristics

Coil Data							** Drop-Out Voltage	Time Milliseconds Max.				
Nominal	Max *	Amp		Pick-Up Volts				Coil Voltage			Bounce Time at 28 Vdc	
Volts	Volt	In Rush	Cont.	At 25°C	Hi Temp	Count Cur.		18 Vdc	23 Vdc	30 Vdc		
								Operate	Release	Transfer	Main	Aux.
28DC	30	5	1	15DC	18DC	22.5 DC	7+0/-6	50	35	10	2	4

* Pick-Up: Coil will operate at the voltages shown and higher.

** Drop-Out: Coil will drop out at 1 Vdc and may drop out at any voltage from 7 Vdc and below.

Rated Contact Load — (Amps per pole) Case Grounded

Type of Load	Life Operating Cycles X10^3	28 Vdc				115 Vac 1 Phase 400 Hz				115/200 Vac 3 Phase 400 Hz			
		Main		Aux.		Main		Aux.		Main		Aux.	
		N.O.	N.C.	N.O.	N.C.	400 Hz	60 Hz	400 Hz	60 Hz	400 Hz	60 Hz	400 Hz	60 Hz
Resistive	50	120*	—	5	5	135	—	5	—	135	—	5	—
Inductive	50	—	—	3	3	135	—	3	—	135	—	3	—
Motor	50	—	—	—	—	80	—	—	—	80	—	—	—
Lamp	—	—	—	2	2	—	—	2	—	—	—	2	—
Transfer Load	10	—	—	—	—	135	—	—	—	135	—	—	—
Mech. Life Reduced Amps													
	100	—	—	1.25	1.25	33.75	—	1.25	—	33.75	—	1.25	—
Interm. Current	50	13.5	13.5	Per MIL-R-6106									

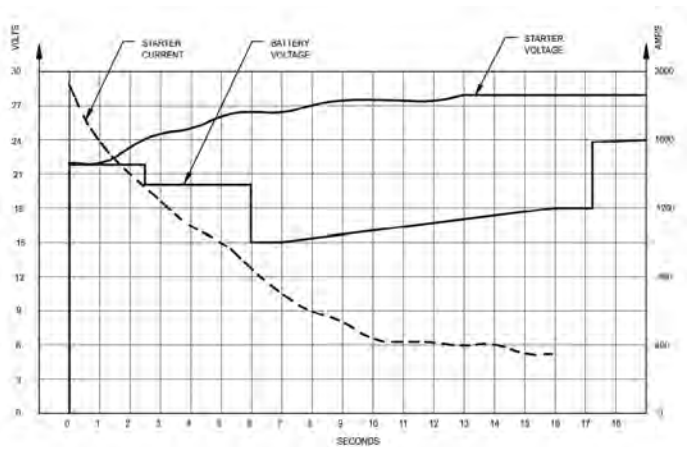
* Room Ambient conditions 100,000 operations.

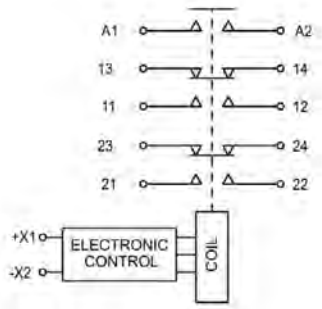
Engineering Data

- Construction: Gasket Sealed (vented) - MIL - R - 6106 Type III, except as noted
- Ratings:
  - Main Contacts
    - Configuration: SPST N.O.
    - Voltage (Nominal): 28 Vdc
    - Current
      - Resistive: 400 Amp (Terminal Temperature Rise 85°C above 71°C Ambient)
      - Inductive: 100 Amps
      - Motorload: 400 Amps
      - Overload: 2,000 Amps
      - Custom Motor Current: See Graph 20,000 cycles (Min.)
      - Motor Current test to be run 5 cycles per hour maximum with 90 seconds off time between cycles
- Life:
  - Electrical: 50,000 Cycles Minimum
  - Mechanical: 100,000 Cycles
  - Weight: (Max.): 2.25 Lbs/ 1020.58 gm
- Environmental Data
  - Ambient Temp: -55°C to +71°C
  - Altitude: 50,000 Feet Maximum
  - Vibration: 5 to 14 Hz 0.2" Double Amplitude
    14 to 33 Hz 2 g
    33 to 52 Hz 0.036" Double Amplitude
    52 to 500 Hz 5 g (peak)
  - Acceleration: 12 g Maximum (Steady State Load)
  - Shock:
    - G-Level: 25 g's
    - Duration: 6 to 9 Milliseconds
  - Max. Duration Contact Opening: 2 Milliseconds
- Coil Data:
  - Duty Cycle: Continuous, Economizing
  - Nom. Operating Voltage: 28 Vdc
  - Pick-Up Voltage: 18 Vdc Max. at 25°C
  - Drop-Out Voltage: 0.75-3.50 Vdc at 25°C
  - Hold Voltage: 9 Vdc
  - Operating Time: 35 Milliseconds Maximum
  - Inrush Current: 3.0 Amps Max for 50 Milliseconds Max. at 25°C
  - Hold Current: 1.2 Amps Max. at 25°C
- Auxiliary Contacts:
  - Voltage: 28 Vdc or 115 V, 400 Hz
  - Current: 5 Amp Resistive

Options

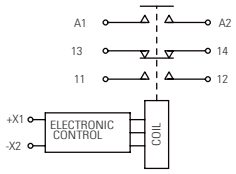
- Low Level Auxiliary Contacts
- Auxiliary Terminal Size and Length

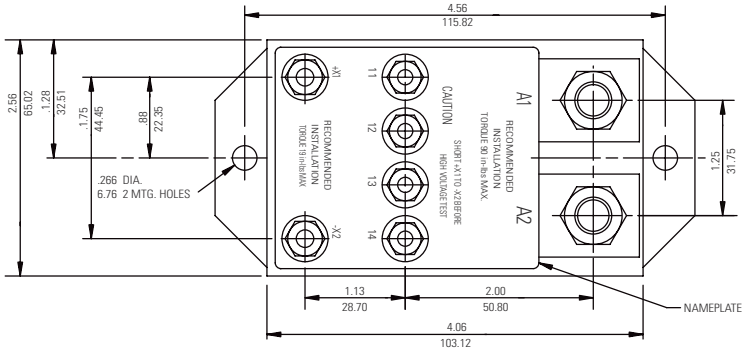


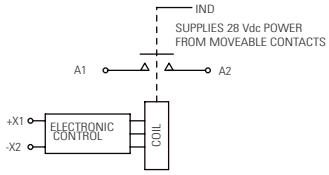


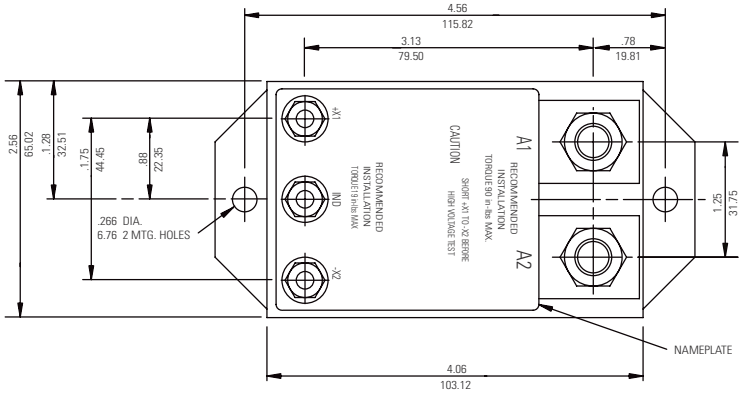
Electronic Control will add coil turns to compensate for low battery voltage during starter operation.

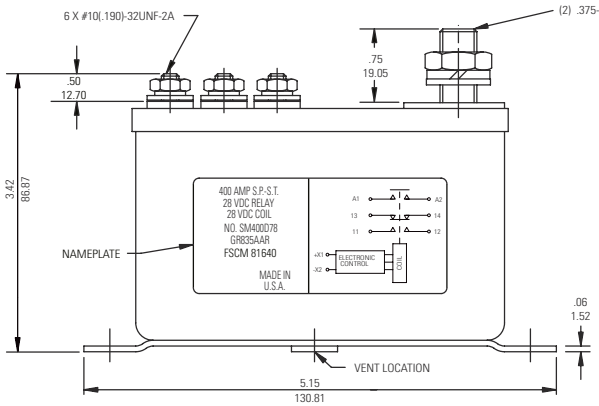
Typical Configurations — 400 Amp

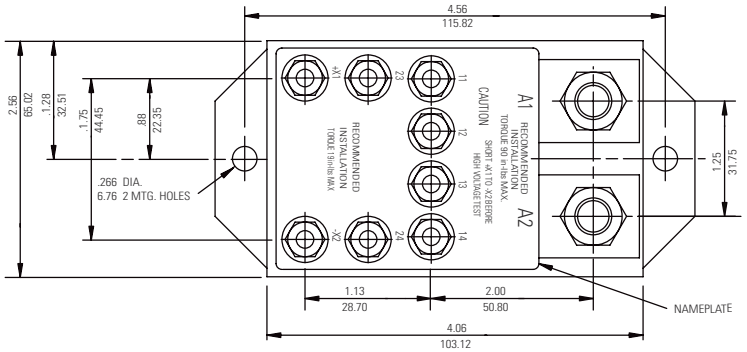












MIL P/N Cross Reference

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M6106/10-001	SM15AWD1	36	M83383/02-08	SM600BA40A1	3	MS24168-A3	6042H289	24/26	MS24376-A4	6042H285	24/26
M6106/10-002	SM15AXD1	36	M83383/02-09	SM600BA50A1	3	MS24168-A4	6042H286	24/26	MS24376-D1	6042H145	24/26
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M83383/01-08	SM600BA40N1	3	MS24141-D1	6042H159	24/26	MS24184-D1	6042H153	19	MS27243-6	49-3179	23
M83383/01-09	SM600BA50N1	3	MS24141-D2	6042H160	24/26	MS24184-D2	6042H154	19	MS27997-D1	6042H91	24/26
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M83383/01-13	SM600BA100N1	3	MS24143-A3	6042H290	24/26	MS24187-D1	6041H220	19			
M83383/02-01	SM600BA5A1	3	MS24143-A4	6042H291	24/26	MS24187-D2	6041H230	19			
M83383/02-03	SM600BA10A1	3	MS24143-D1	6042H141	24/26	MS24192-D1	9565H2	19			
M83383/02-04	SM600BA15A1	3	MS24143-D2	6042H142	24/26	MS24193-D1	9565H94	19			
M83383/02-05	SM600BA20A1	3	MS24143-D3	6042H110	24/26	MS24376-A1	6042H147	24/26			

Product Application Information and Warranty Disclaimer
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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 Code for products manufactured by Safran Electrical & Power are 81640 and 76374.

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CIRCUIT BREAKERS

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DESCRIPTIVE INDEX

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

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 (For Interrupting Capacity)	120 VAC, 400 Hz; 30 VDC	115 VAC, 400 Hz; 28 VDC	120 VAC, 400 Hz; 30 VDC	0.5 to 10 Amperes 120 VAC, 400 Hz;	120 VAC, 400 Hz; 30 VDC
Calibration @25° C (percent of amperage rating)	105% Hold 138% within one hour	100% Hold 125% within one hour	115% Hold 138% within one hour	30 VDC 115% Hold 138% within one hour	115% Hold 150% within one hour
Trip Time (in seconds at 25° C)	All amperages	All amperages	All amperages		All amperages
200% Overload	15.0 to 65.0	15.0 to 70.0	15.0 to 55.0	0.5-3A / 4.5-10A	2.0 to 20.0
500% Overload	1.3 to 6.0(2)	1.5 to 6.5(2)	1.4 to 5.0(2)	0.4 to 3.0 / 0.8 to 3.6	0.16 to 2.0
1000% Overload	0.5 to 2.0(3)	0.5 to 2.5(3)	0.5 to 1.5(3)	0.06 to 0.4 / 0.08 to 0.5(2)	0.046 to 0.5
Interrupting Capacity (Rating Dependent)	3500A @ 120V AC 6,000A @ 30V DC	2500A @ 115V AC 3,000A @ 28V DC	3500A @ 120V AC 6,000A @ 30V DC	0.02 to 0.18 / 0.02 to 0.2(3) 600 to 1000A @ 120V AC 6,000A @ 30V DC	500 to 3500A @ 120V AC 2,000 to 6,000A @ 30V DC
Weight g (lb.)	113g (.250lb)	130g (.286lb)	43g (.095lb)	45g (.099 lb)	33g (.073 lb)
Major Dimensions LxWxH (inches)	2.250 x 1.812 x 0.750	2.250 x 1.812 x 1.00	1.860 x 1.094 x 0.750	1.843 x 1.137 x 0.750	1.852 x 0.703 x 0.593
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.	Meets requirements for use as an RCCB ICU. I^2t 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

CIRCUIT BREAKER PRODUCT OVERVIEW

PLEASE CONSULT DETAILED PRODUCT DESCRIPTIONS FOR MORE INFORMATION.

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 (For Interrupting Capacity)	120 VAC, 400 Hz; 28 VDC	120 VAC, 400 Hz; 28 VDC	120 VAC, 400 Hz	120 VAC, 400 Hz	120 VAC, 400 Hz	120 VAC, 400 Hz
Calibration @25 C (percent of amperage rating)	115% Hold 150% within one hour	115% Hold 138% within one hour	105% Hold 138%(1) within one hour	115% Hold 138% within one hour	105% Hold 138%(1) within one hour	110% Hold 145% within one hour
Trip Time (in seconds at 25 C)	All amperages	All amperages	All amperages	1-7.5A / 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 (Rating Dependent)	500A to Unlimited @ 120V AC 2000A to Unlimited @ 28V DC	2000 to 3500A @ 120V AC 6,000A @ 28V DC	1200A @ 120V AC	0.02 to 0.15 / 0.15 to 0.5(3) 300A @ 120V AC	1000A @ 120V AC	2000A @ 120V AC
Weight g (lb.)	22g (.048 lb)	25g (.055lb)	388g (.854 lb)		130g (.290 lb)	68g (.150 lb)
Major Dimensions LxWxH (inches)	1.525 x 0.780 x 0.593	1.343 x 0.781 x 0.593	2.437 x 2.187 x 2.631	154g (.340lb)	2.170 x 2.160 x 1.312	1.381 x 1.840 x 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

SafranElectrical&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 SafranElectrical& 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, test ing, 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 test ing 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, stereolitho- graphic 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 port folio 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, it's 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.

ARC FAULT CIRCUIT INTERRUPT

The Aging Aircraft Dilemma

Today, in the Unites 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 arc-ing 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 circuit-ry 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 electri-cal 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

SERIES 160 COMPACT PROTECTION FOR HIGHER CURRENT RATINGS

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

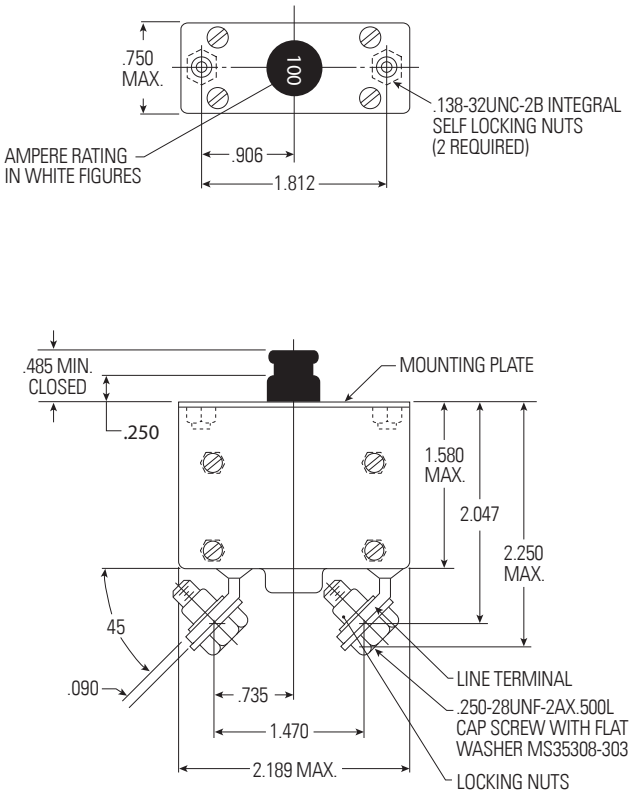
Trip curve available

ORDERING INFORMATION

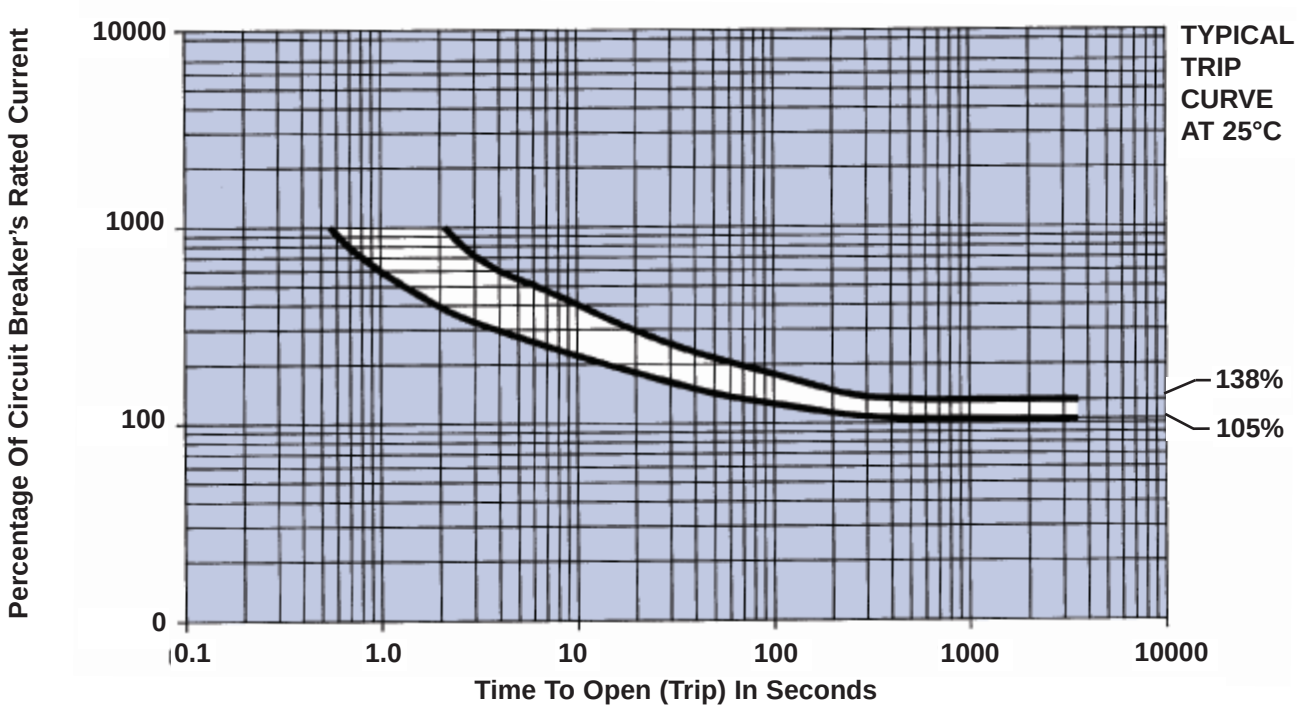
			STANDARD		HIGH VIBRATION	
MS APPROVAL STATUS	AMPERE RATING	VOLTAGE DROP MAX. *	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N
MS Approved	50	0.15	MS25361-50	160-012-50	MS25361-50V	160-086-50
MS Approved	60	0.15	MS25361-60	160-012-60	MS25361-60V	160-086-60
MS Approved	70	0.15	MS25361-70	160-012-70	MS25361-70V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

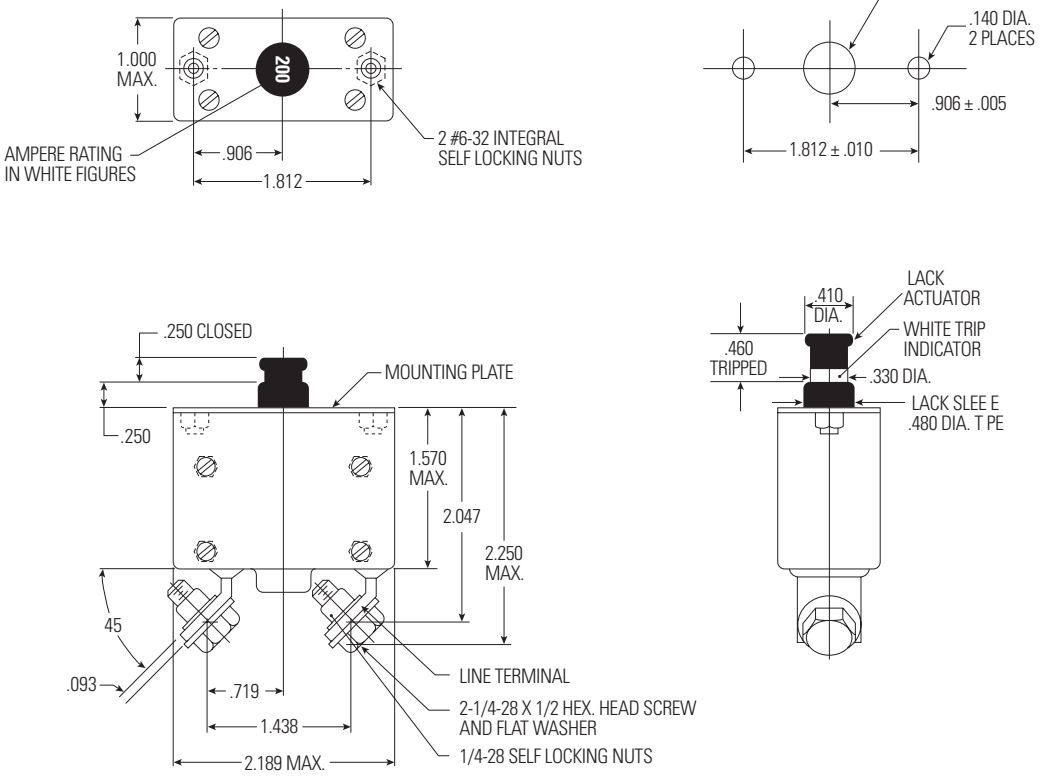
Ampere Rating	Voltage Drop Max.*	Part Number
125	.100	170-001-125
140	.100	170-001-140
150	.100	170-001-150
160	.100	170-001-160
180	.100	170-001-180
200	.100	170-001-200

* At rated nominal current.

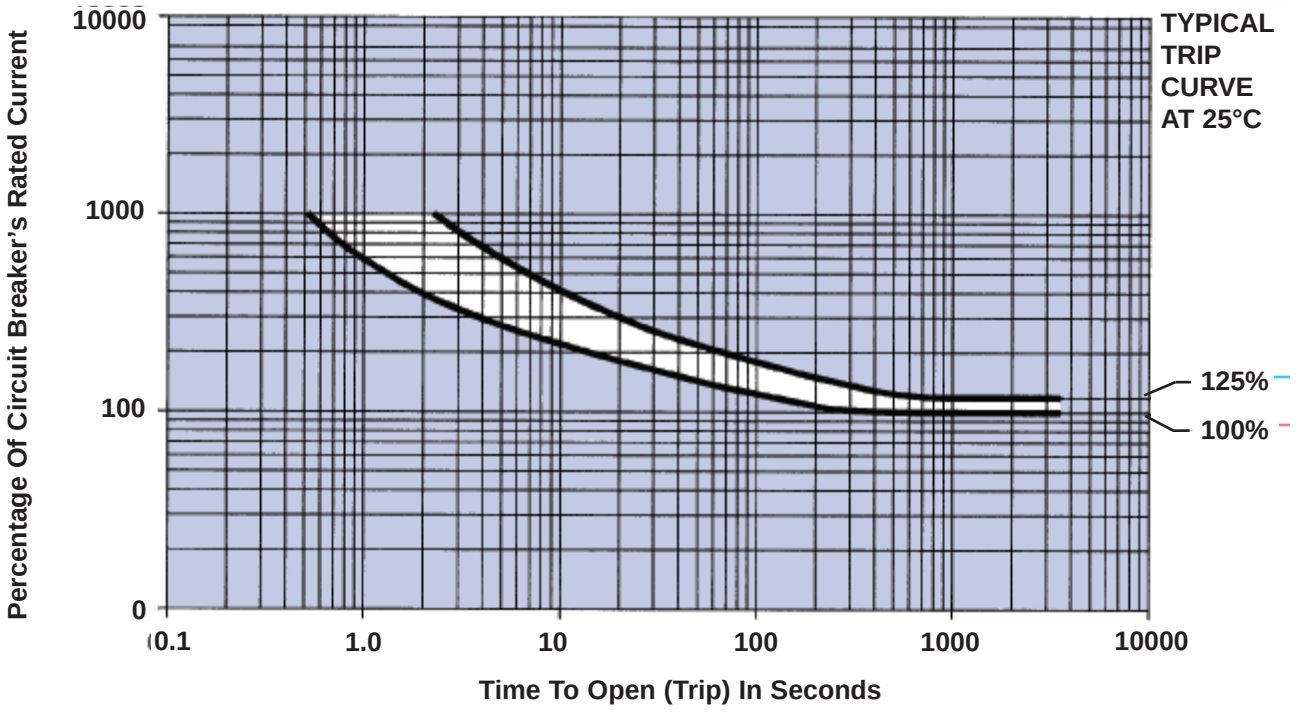
Three phase variants are available as a 970 Series. Also available as a 180 Series device for ratings up to 300 amperes.

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

	@ 25°C		@ +71°C				@ -40°C				
			0.5 – 7 1/2A		10 – 50A		0.5 – 7 1/2A		10 – 50A		
Specification Table	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**Test Time Parameters**
Must Hold	115	—	60	—	70	—	156	—	148	—	% For 1 Hour
Must Trip	—	138	—	108	—	114	—	178	—	178	% Within 1 Hour
200% Overload	15	55.0	—	—	—	—	—	—	—	—	Seconds
400% Overload	2	7.0	—	—	—	—	—	—	—	—	Seconds
600% Overload	1	3.5	—	—	—	—	—	—	—	—	Seconds

Trip curve available.

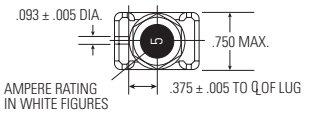
ORDERING INFORMATION

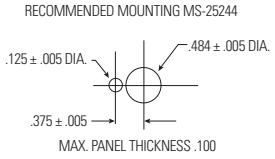
					ADAPTER FLUSH MOUNTING PLATE			
			STANDARD		BASE & TERMINAL CONFIGURATION STYLE "P"		ALTERNATE BASE & TERMINAL CONFIGURATION STYLE "PT"	
MS APPROVAL STATUS	**AMPERE RATING**	**VOLTAGE DROP MAX. ***	**MS P/N**	**SAFRAN MP P/N**	**MS P/N**	**SAFRAN MP P/N**	**MS P/N**	**SAFRAN MP P/N**
MS Approved	5	0.25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

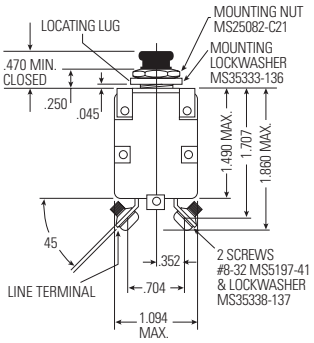
* AT RATED NOMINAL CURRENT
Three phase variants are available as a 930 Series.
For other amperage ratings and configurations, consult the Business Unit.

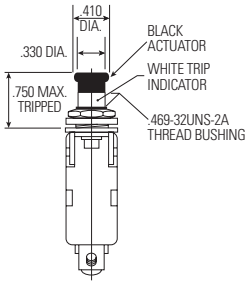
DIMENSIONS

700-001 (MS25244)



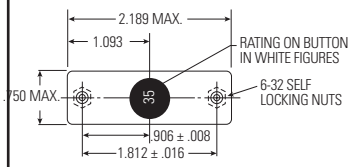


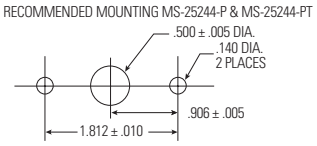




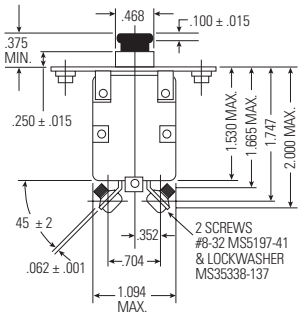
700-089 (MS25244-P) 700-092 (MS25244-PT)

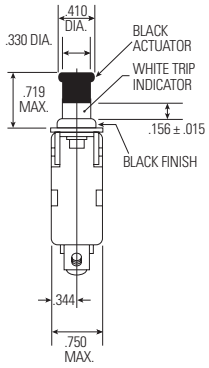
Dimensions Different Base & Terminal



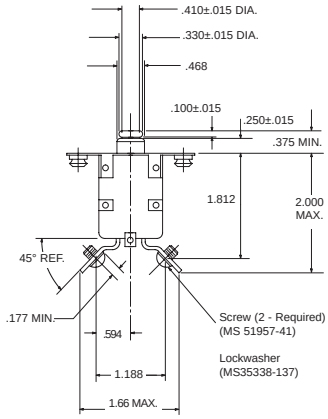


MS25244-P Base & Terminal

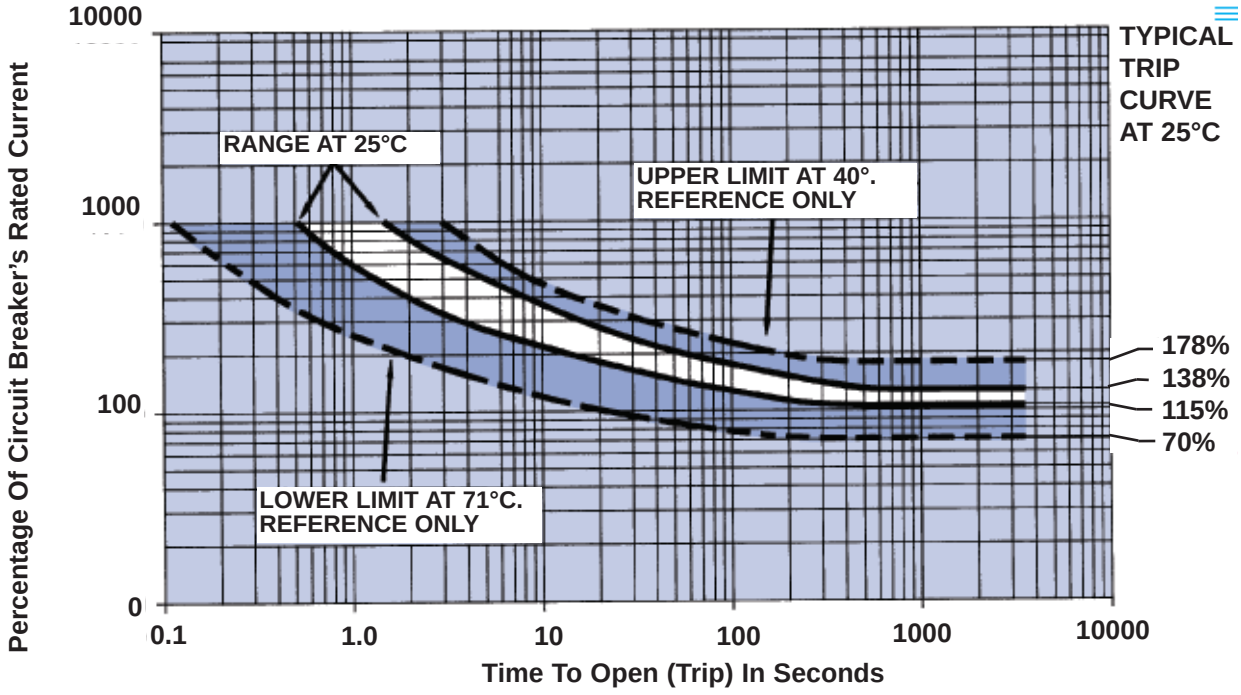




MS25244-PT Base & Terminal



TRIP CURVE



FAST TRIP PROTECTION FOR LOW-CURRENT EQUIPMENT

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

	@ 25°C				@ +71°C		@ -40°C		
	0.5 – 3A		4.5 – 10A						
Specification Table	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**Test Time Parameters**
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

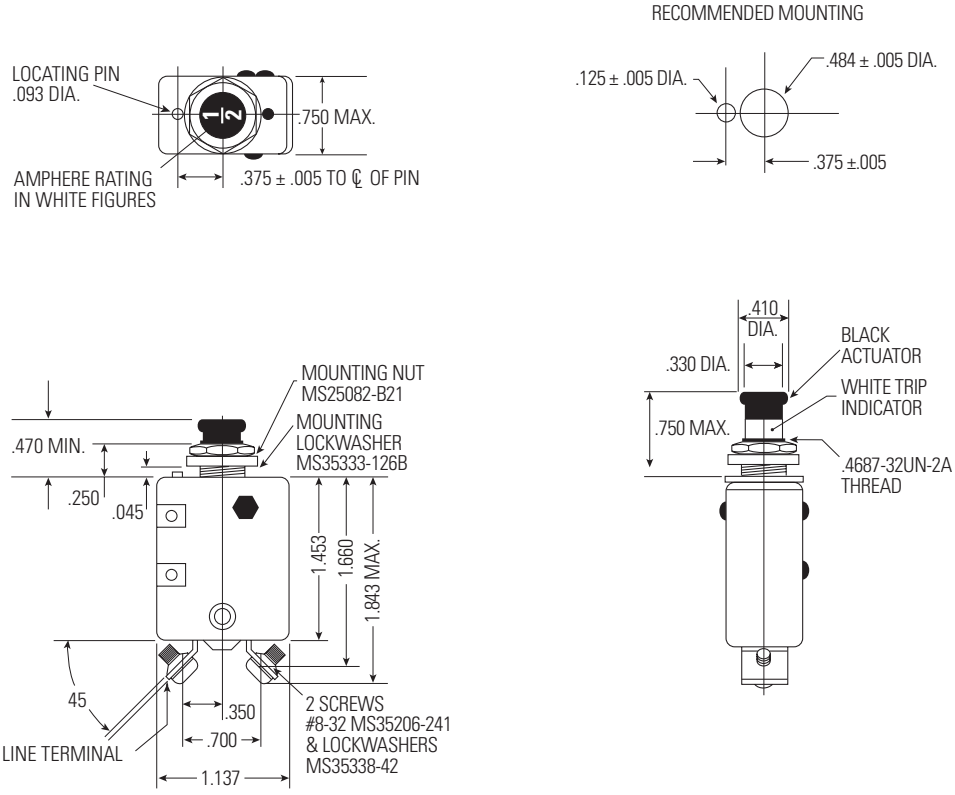
Trip curve available

ORDERING INFORMATION

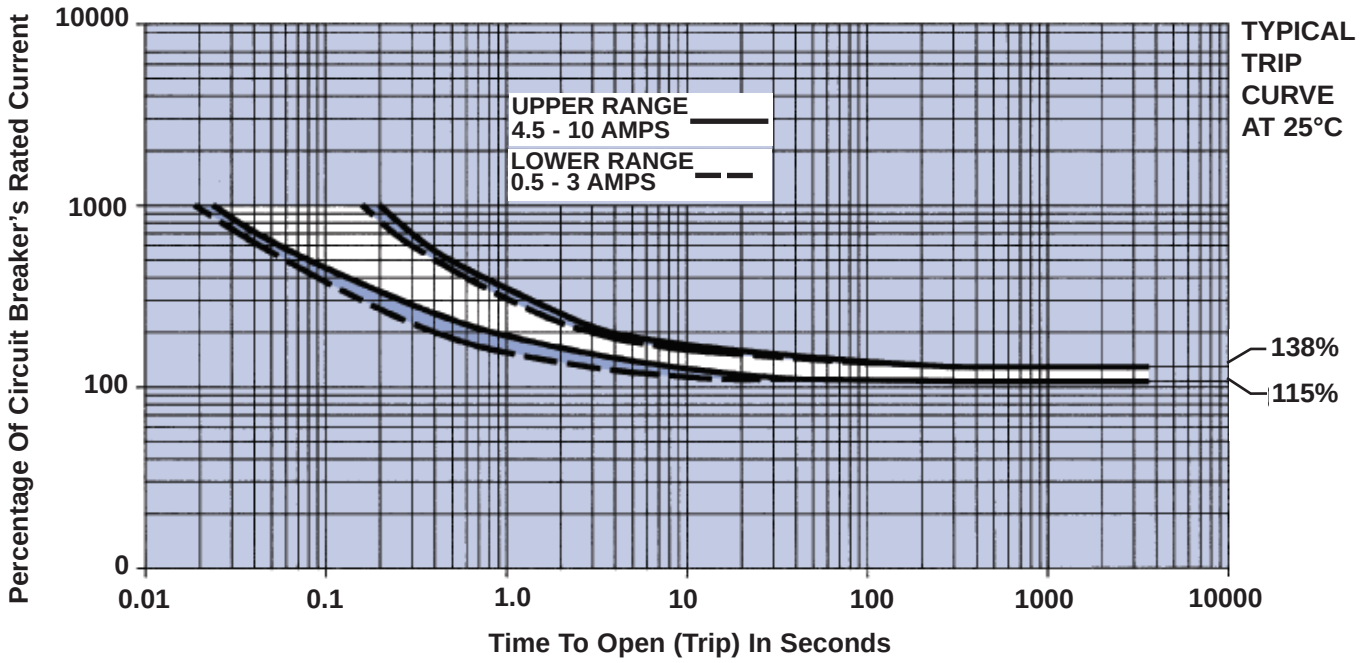
Ampere Rating	Voltage Drop Max.*	Part Number
1/2	1.21	1500-052-05
3/4	1.21	1500-052-075
1	1.20	1500-052-1
1 1/2	1.10	1500-052-105
2	0.95	1500-052-2
2 1/2	0.85	1500-052-205
3	0.81	1500-052-3
4	0.72	1500-052-4
5	0.65	1500-052-5
10	0.55	1500-052-10

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

DIMENSIONS



TRIP CURVE



SERIES 4001 SUB-MINIATURE PRECISION CIRCUIT BREAKER

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.)

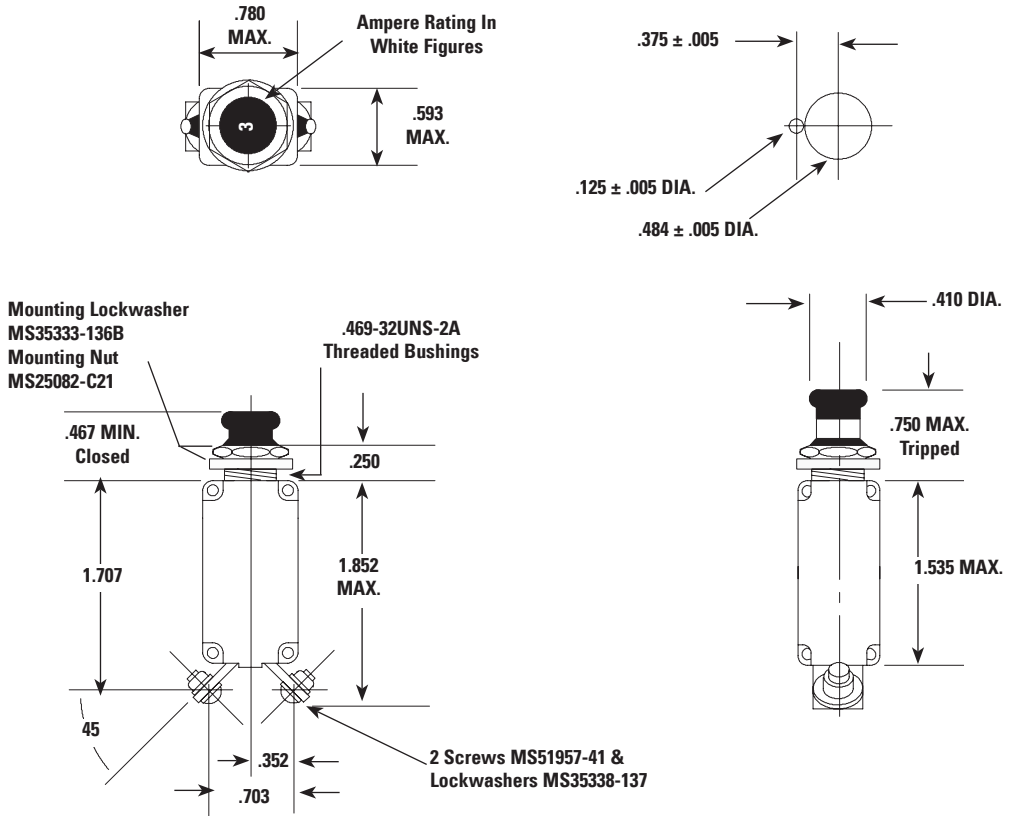
* Variations of these circuit breakers are capable of exceeding the standard Mil specification for endurance, vibration, and shock. Consult the business unit for more information.

OVERLOAD CALIBRATION DATA

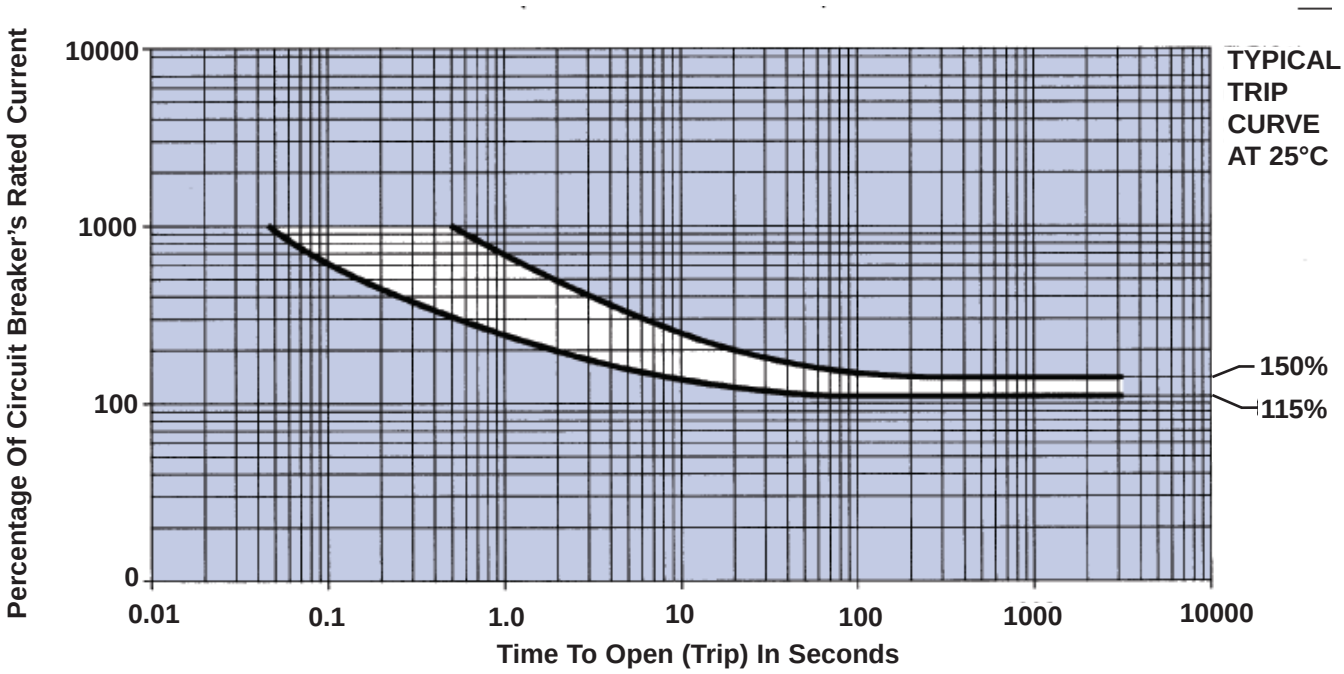
Specification Table	@ 25°C		@ +71°C		@ -55°C		Test Time Parameters
	MIN	MAX	MIN	MAX	MIN	MAX	
Must Hold	115	—	90	—	135	—	% For 1 Hour
Must Trip	—	150	—	130	—	180	% Within 1 Hour
200% Overload	2.000	20.0	—	—	—	—	Seconds
500% Overload	0.160	2.0	—	—	—	—	Seconds
1000% Overload	0.046	0.5	—	—	—	—	Seconds

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 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 P/N	SAFRAN MP 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	4200-00 6-1	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 I/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

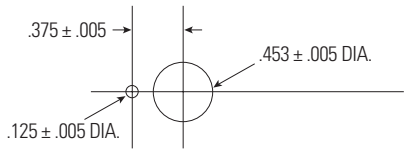
* AT RATED NOMINAL CURRENT
For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS

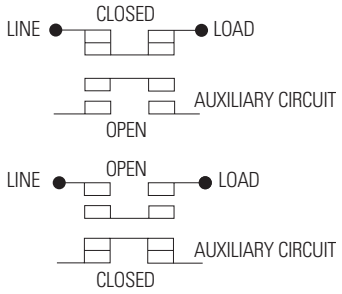
Part No.	A*Max.	B*Min.
4200-001	0.759	0.407
4200-003	1.134	0.782
4200-004	0.759	0.407
4200-006	0.759	0.407
4200-007	10134	0.782

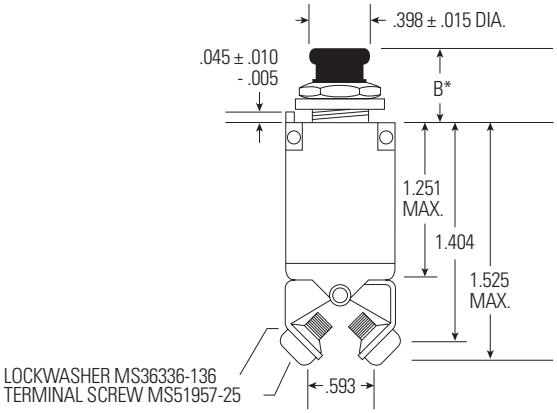
Min. Panel Thickness .025
Max. Panel Thickness .100

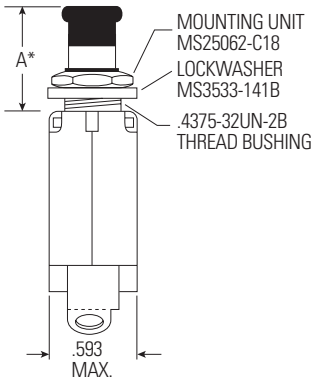
RECOMMENDED MOUNTING

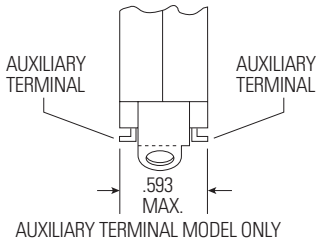


AUXILIARY SWITCH OPERATION



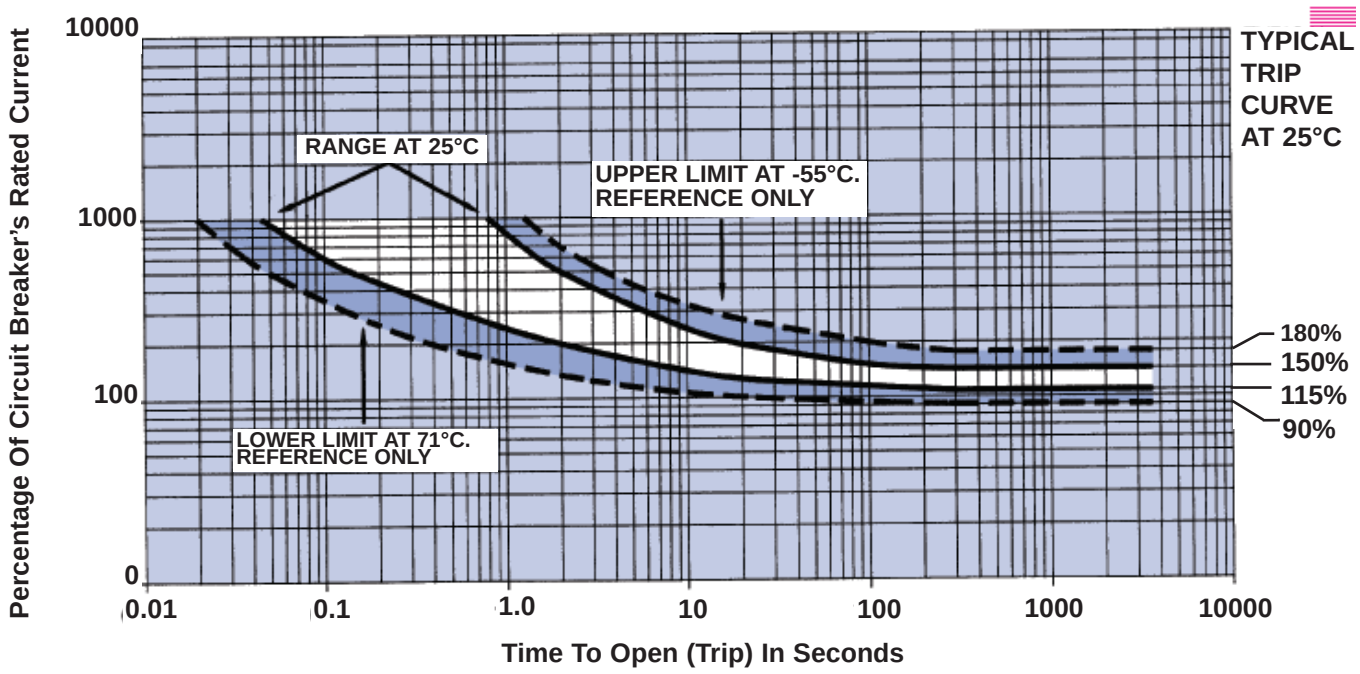






AUXILIARY TERMINAL MODEL ONLY

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.

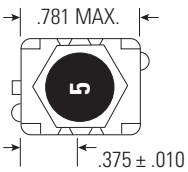
ORDERING INFORMATION

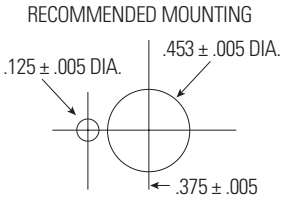
			STANDARD		LONG BUTTON		HIGH VIBRATION		LONG BUTTON VIBRATION	
MS Approval Status	AMPERE RATING	VOLTAGE DROP MAX.*	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N
MS Approved	1	1.10	MS3320-1	4310-001-1	MS3320-1L	4310-005-1	MS3320-1V	4310-019-1	MS3320-1VL	4310-024-1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

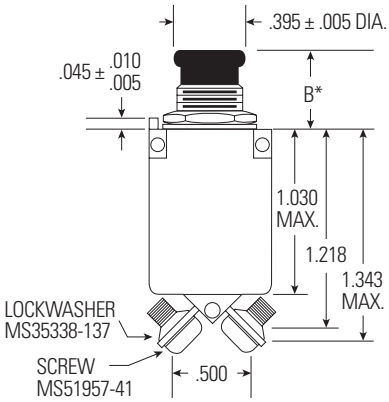
DIMENSIONS

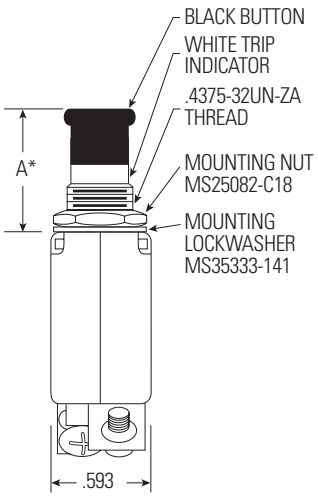
MIL Spec	Part No.	A*Max.	B*Min.
MS3320	4310-001	0.750	0.470
MS3320L	4310-005	1.125	0.845
MS3320V	4310-019	0.750	0.470
MS3320VL	4310-024	1.125	0.845

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

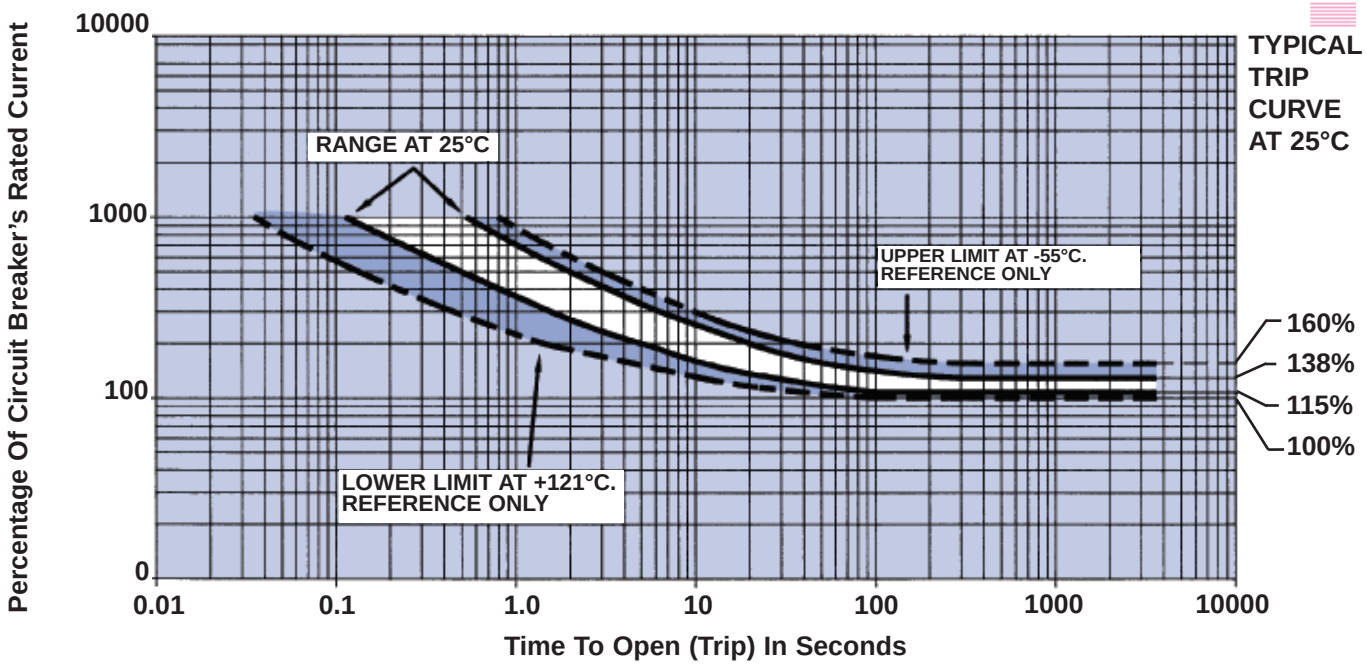








TRIP CURVE



Heavy-Duty Three-Pole High Performance

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

Interphase Insulation

Insulating interphase barriers separate adjacent terminals.

Common Trip Bar

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

Performance Rated Circuit Breaker

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

PERFORMANCE DATA

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

OVERLOAD CALIBRATION DATA

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

Tip curve available.

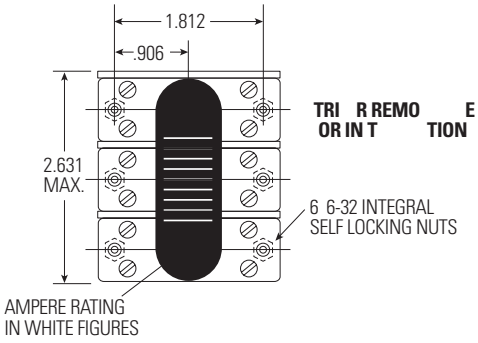
ORDERING INFORMATION

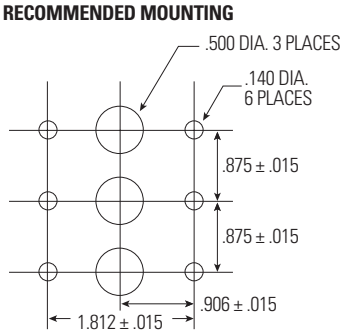
Ampere Rating	Voltage Drop Max.*	Part Number
50	0.15	940-006-50
60	0.15	940-006-60
70	0.15	940-006-70
75	0.15	940-006-75
80	0.15	940-006-80
90	0.15	940-006-90
100	0.15	940-006-100

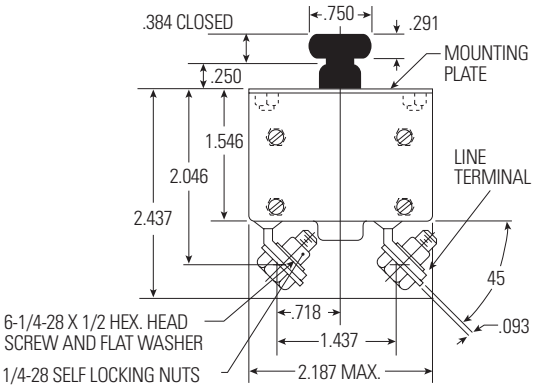
* At rated nominal current.

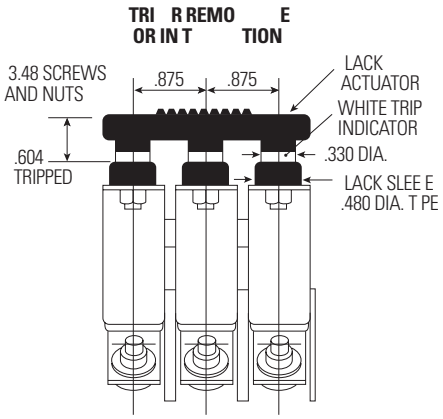
Data depicted is for the 940 Series. Also available to order are 920, 930, 960, and 970 Series devices.
For other amperage ratings and configurations, consult the Business Unit.

DIMENSIONS

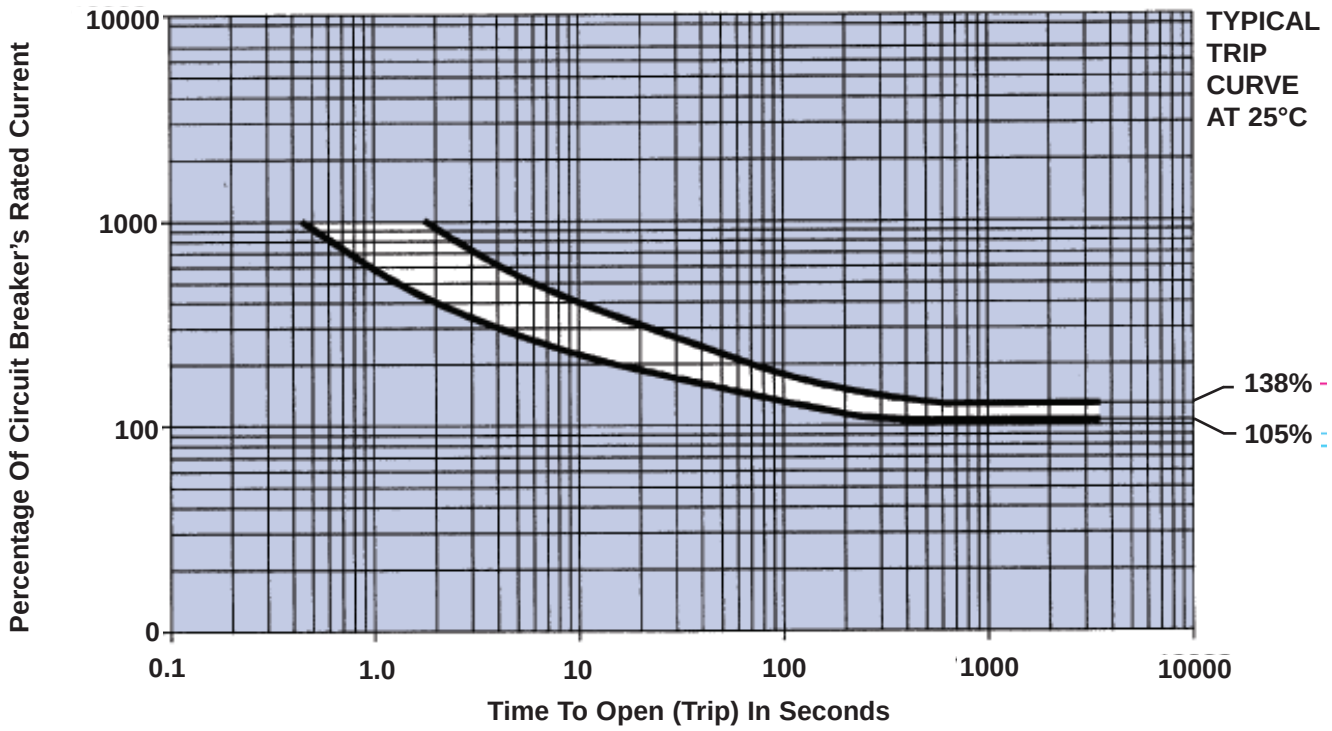








TRIP CURVE



SERIES 1526 FAST TRIP PROTECTION FOR DELICATE EQUIPMENT

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

	@ 25°C				@ +71°C		@ -65°C		
Specification	**1– 7.5A**		**10 – 15A**						**Test Time**
Table	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**MIN**	**MAX**	**Parameters**
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

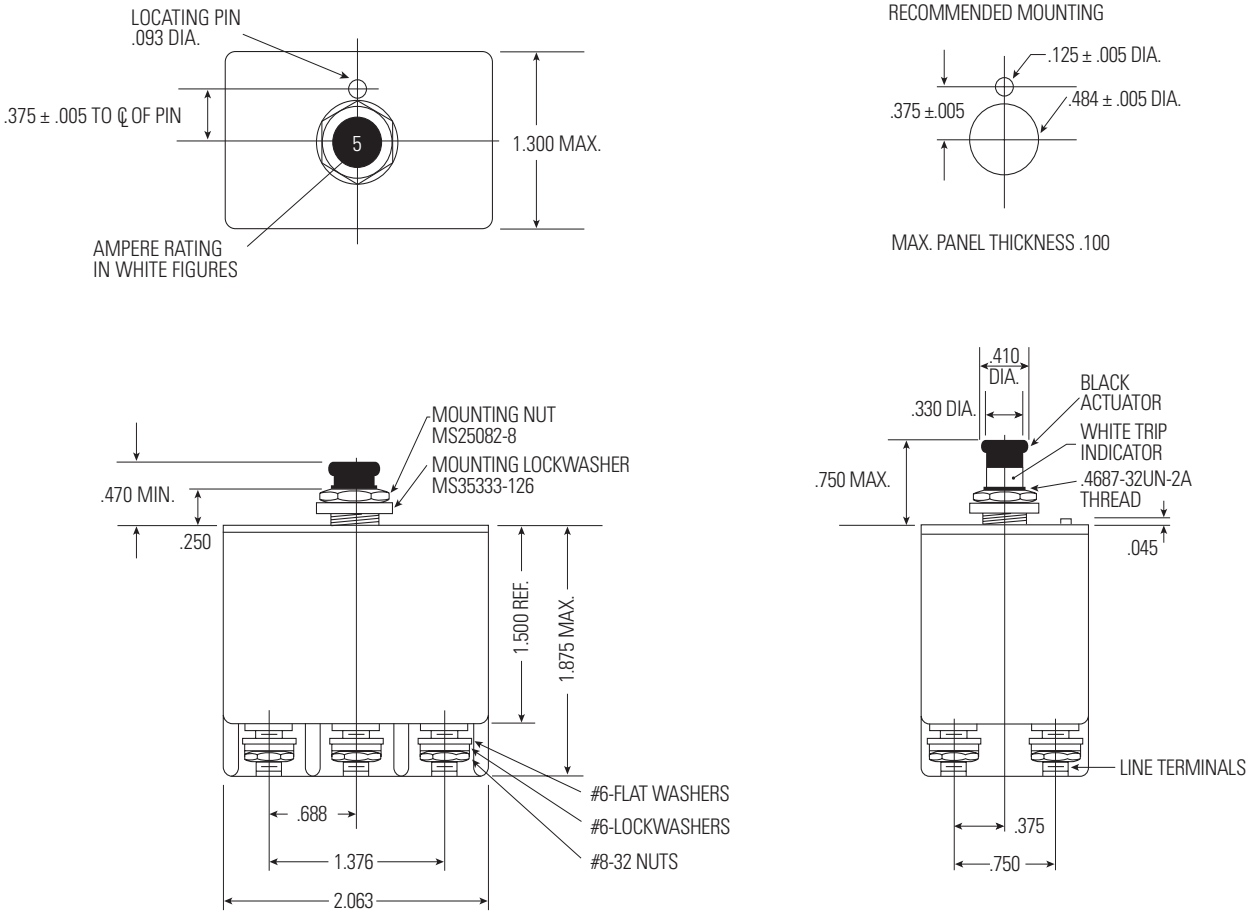
Trip curve available.

ORDERING INFORMATION

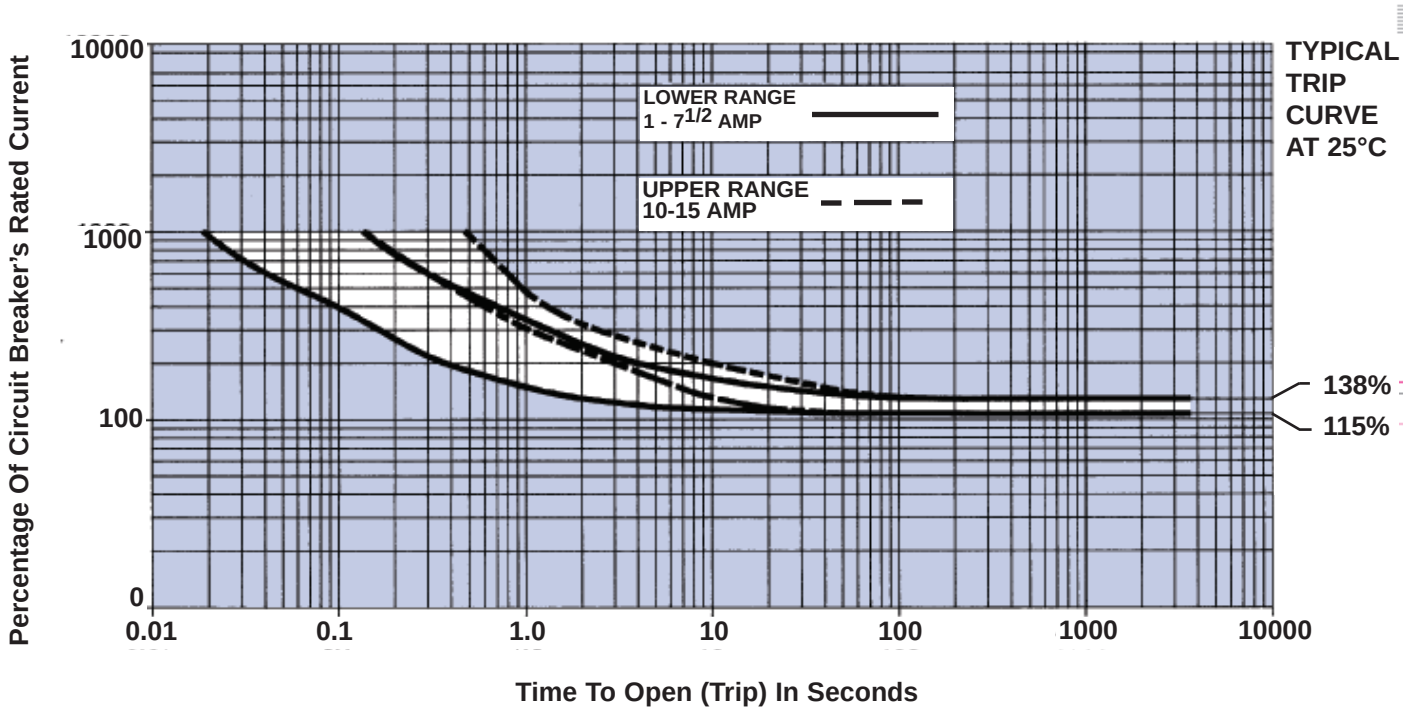
Ampere Rating	Voltage Drop Max.*	Part Number
1	1.20	1526-005-1
1 1/2	1.20	1526-005-105
2	0.95	1526-005-2
2 1/2	0.85	1526-005-205
3	0.85	1526-005-3
3 1/2	0.75	1526-005-305
4	0.72	1526-005-4
5	0.65	1526-005-5
7 1/2	0.60	1526-005-705
10	0.55	1526-005-10
15	0.50	1526-005-15

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

DIMENSIONS



TRIP CURVE



Three-Pole High Performance

Three-Phase Protection

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

Integral Barriers

Terminals are separated by barriers molded into the case.

Single-Hole Mounting

For quick, easy installation.

Shock And Vibration Resistant Construction

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

Performance Rated Circuit Breaker

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

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

PERFORMANCE DATA

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

OVERLOAD CALIBRATION DATA

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

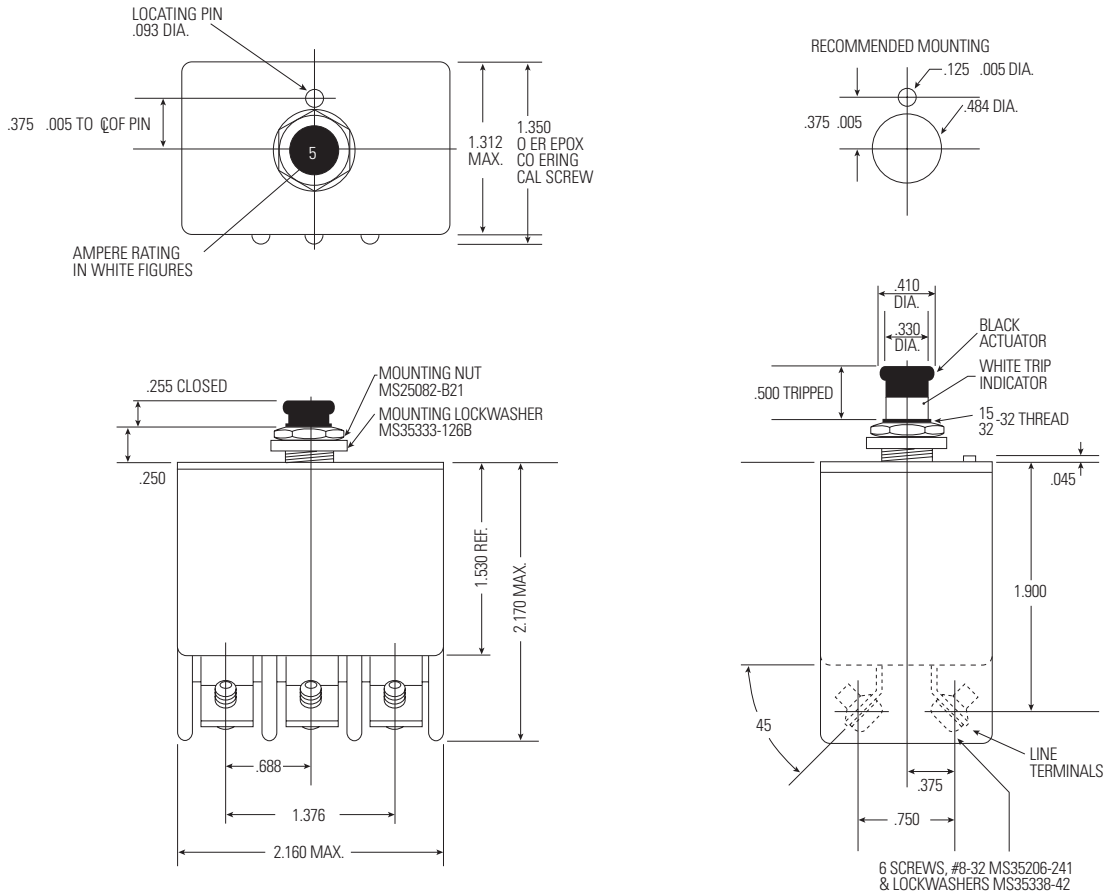
*Unbalanced load, individual phases: 145%
Trip curve available.

ORDERING INFORMATION

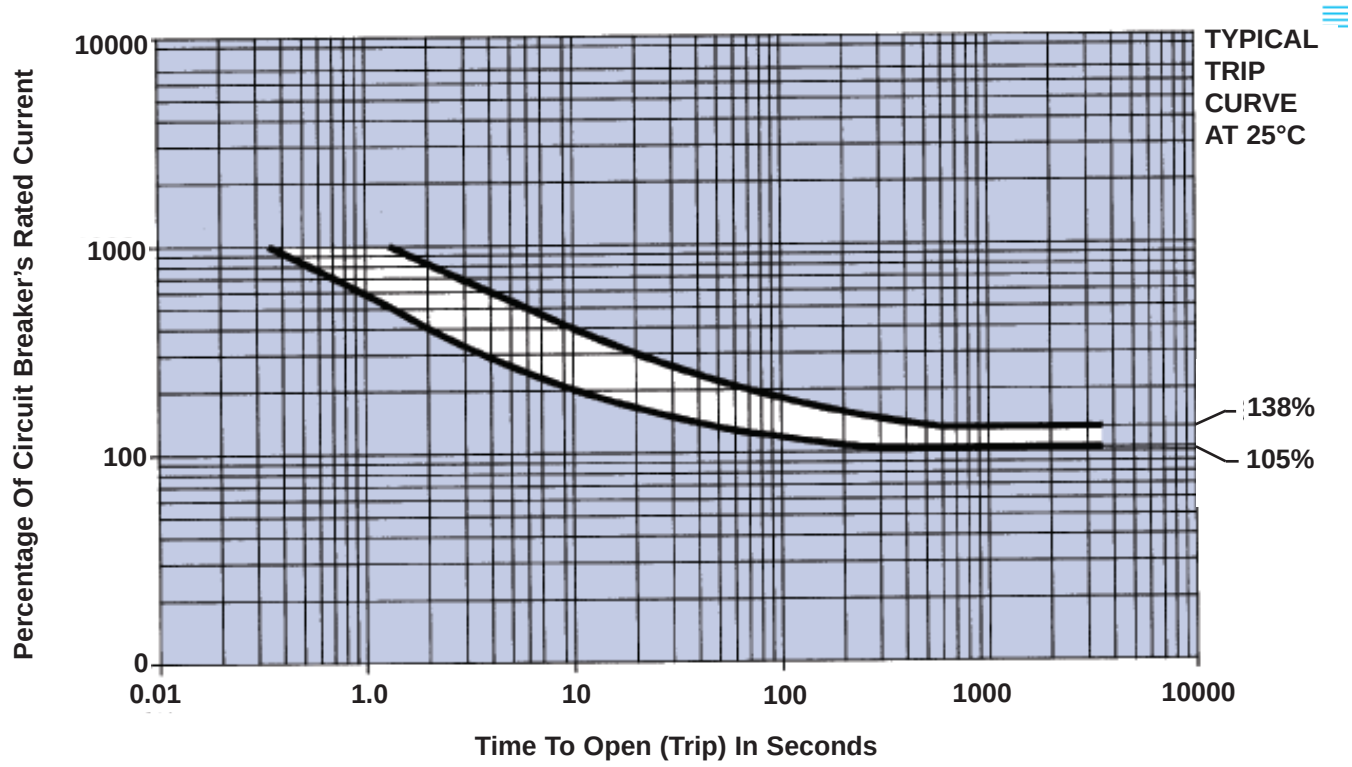
Ampere Rating	Voltage Drop Max.*	Part Number
5	0.350	1536-001-5
7 1/2	0.325	1536-001-705
10	0.300	1536-001-10
15	0.250	1536-001-15
20	0.200	1536-001-20
25	0.180	1536-001-25
30	1.180	1536-001-30
35	0.175	1536-001-35
40	0.175	1536-001-40
50	0.150	1536-001-50

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

DIMENSIONS



TRIP CURVE



Standard

Three-Phase Protection

Qualified

To MS14154 of MIL-C-5809.

Lightweight

Weighs 68 grams maximum (0.15 lbs).

Vibration Resistance

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

Miniature Size — High Performance

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

Temperature-Compensated

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

Performance Rated Circuit Breaker

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

Multiple Options

This series is available in many optional configurations.

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

PERFORMANCE DATA

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

OVERLOAD CALIBRATION DATA

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

ORDERING INFORMATION

			STANDARD		LONG BUTTON		HIGH VIBRATION		LONG BUTTON VIBRATION	
MS APPROVAL STATUS	AMPERE RATING	VOLTAGE DROP MAX.*	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N	MS P/N	SAFRAN MP P/N
MS Approved	1	1.10	MS14154-1	4330-001-1	MS14154-1L	4330-007-1	MS14154-1V	4330-008-1	MS14154-1VL	4330-009-1
MS Approved	2	0.75	MS14154-2	4330-001-2	MS14154-2L	4330-007-2	MS14154-2V	4330-008-2	MS14154-2VL	4330-009-2
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	4330-009-205
MS Approved	3	0.55	MS14154-3	4330-001-3	MS14154-3L	4330-007-3	MS14154-3V	4330-008-3	MS14154-3VL	4330-009-3
MS Approved	4	0.45	MS14154-4	4330-001-4	MS14154-4L	4330-007-4	MS14154-4V	4330-008-4	MS14154-4VL	4330-009-4
MS Approved	5	0.35	MS14154-5	4330-001-5	MS14154-5L	4330-007-5	MS14154-5V	4330-008-5	MS14154-5VL	4330-009-5
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	4330-009-705
MS Approved	10	0.28	MS14154-10	4330-001-10	MS14154-10L	4330-007-10	MS14154-10V	4330-008-10	MS14154-10VL	4330-009-10
MS Approved	15	0.28	MS14154-15	4330-001-15	MS14154-15L	4330-007-15	MS14154-15V	4330-008-15	MS14154-15VL	4330-009-15
MS Approved	20	0.25	MS14154-20	4330-001-20	MS14154-20L	4330-007-20	MS14154-20V	4330-008-20	MS14154-20VL	4330-009-20

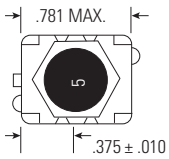
* AT RATED NOMINAL CURRENT

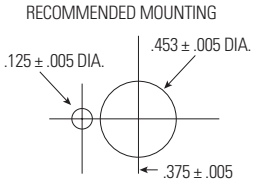
For other amperage ratings and configurations, consult the Business Unit.

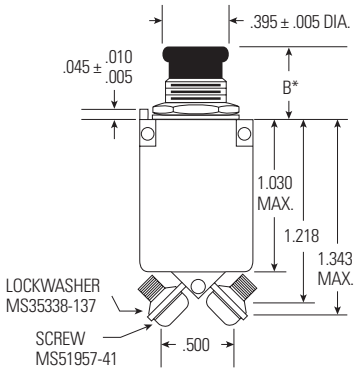
DIMENSIONS

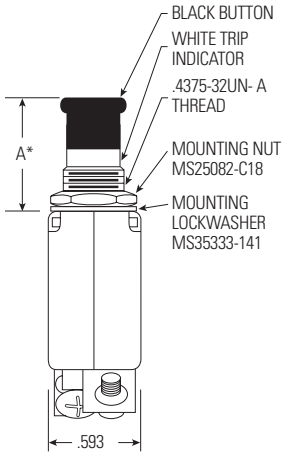
MIL Spec	Part No.	A*Max.	B*Min.
MS14154	4330-001	0.750	0.470
MS14154L	4330-007	1.125	0.845
MS14154V	4330-008	0.750	0.470
MS14154VL	4330-009	1.125	0.845

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

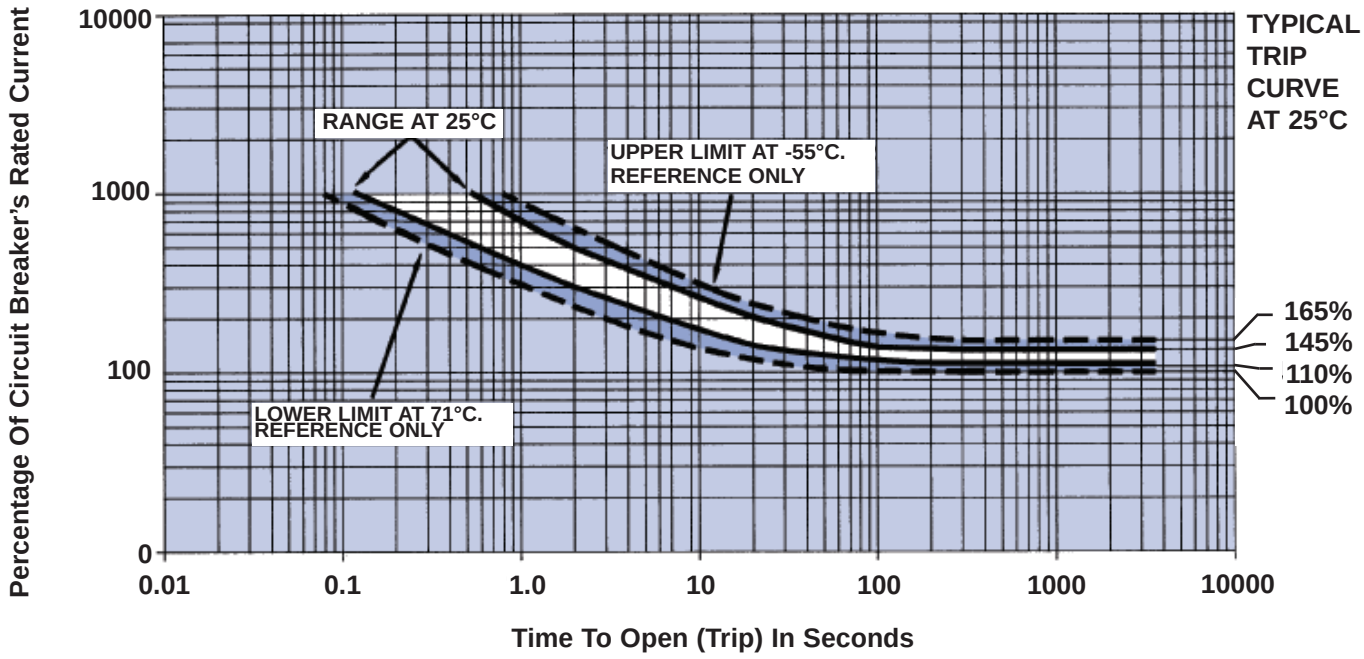








TRIP CURVE



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 1Pole 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
Note: 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

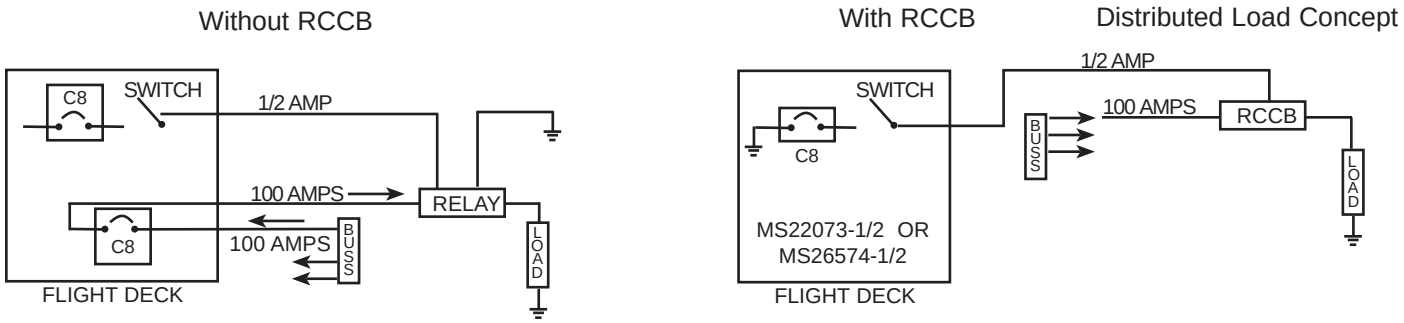
AMPERE RATING	200% Trip Times -54°C to +71°C		400% Trip Times -54°C to +71°C		1000% Trip Times -54°C to +71°C	
	MIN	MAX	MIN	MAX	MIN	MAX
AMPERES	SECONDS	SECONDS	SECONDS	SECONDS	SECONDS	SECONDS
10	12	80	2.8	11	0.42	1.3
15	13	80	1.7	10	0.35	1.2
20	14	80	2.9	9.6	0.4	1.15
25	15	80	2.6	10	0.4	1.3
35	16	80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

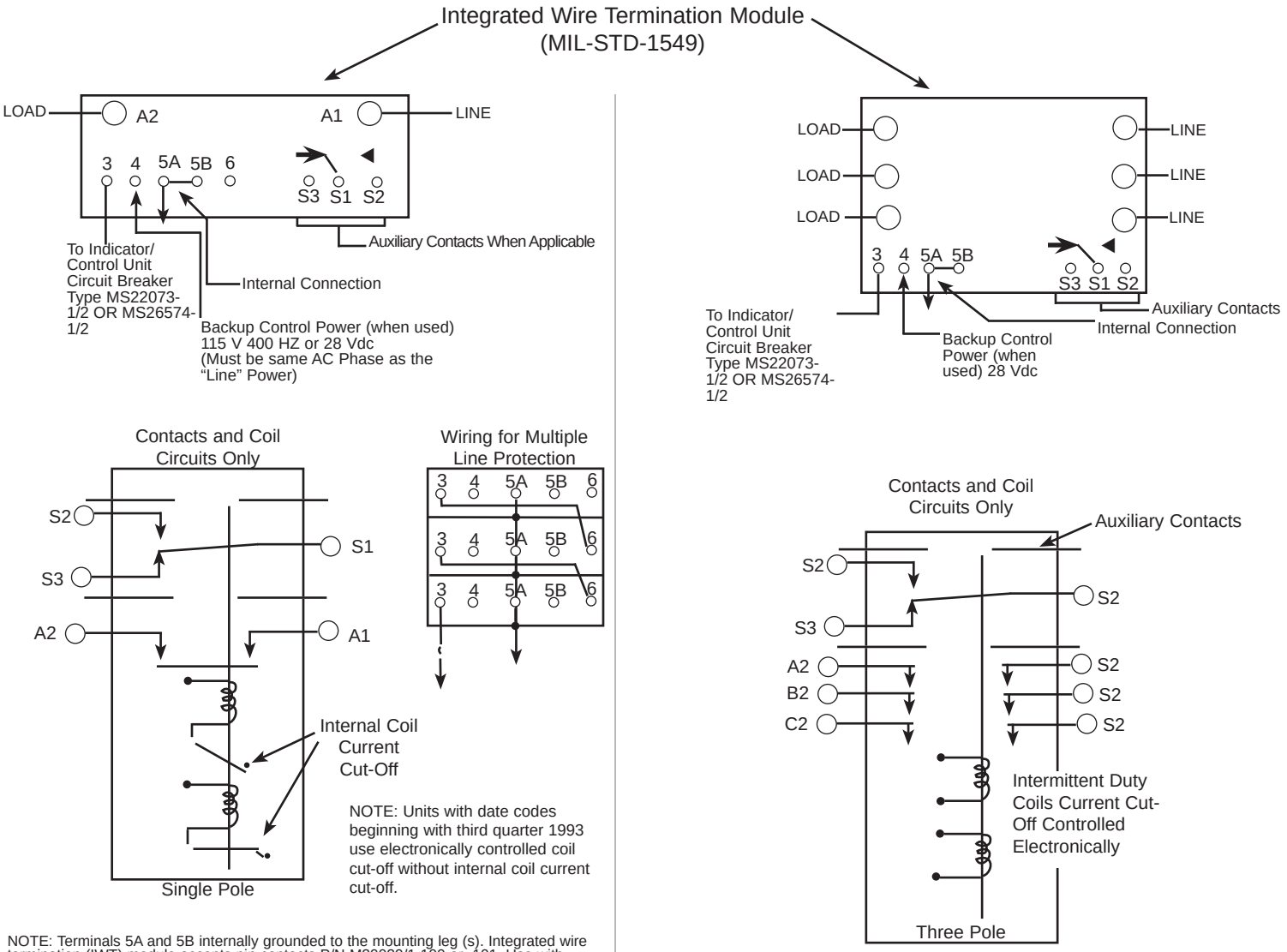
Contact business unit for trip curve.

REMOTE CONTROLLED CIRCUIT BREAKER (RCCB)
1 POLE AND 3 POLE

Engineering Data
Application Note



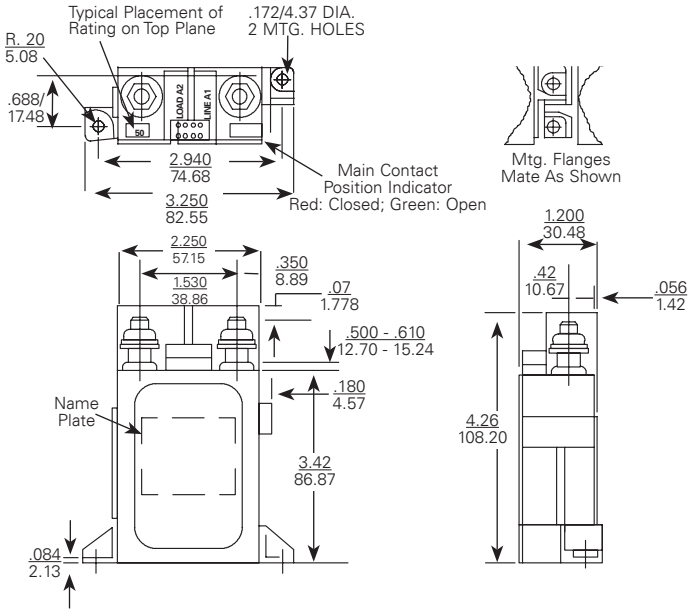
Typical Wiring Diagram



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

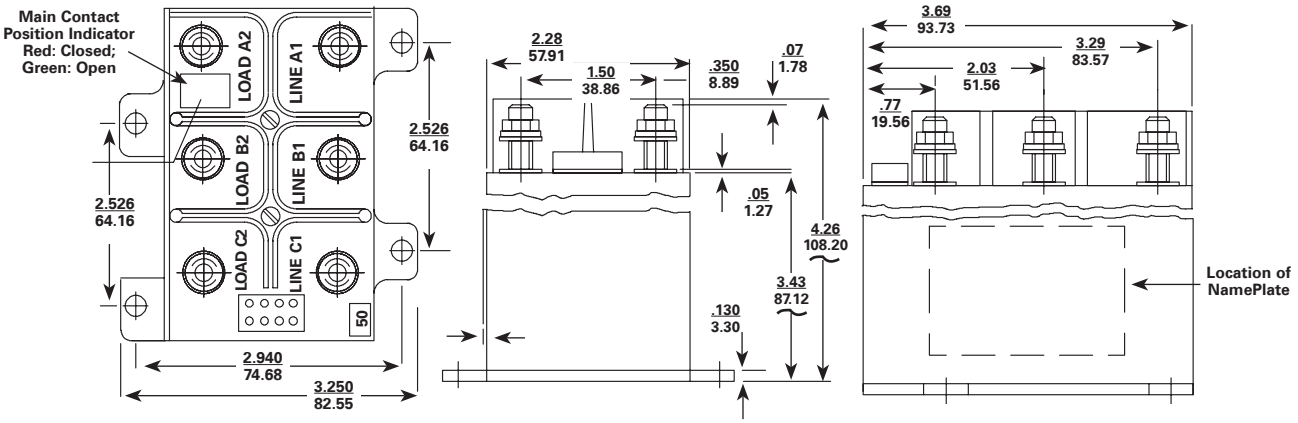
Approximate Dimensions - 1 Pole



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

3Pole



Coil Operate Current/Set And Trip Time RCCB

Circuits	Nominal System Voltage	I/CU Set Current @ Nom Voltage (Mulliamp)	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.) 115 Vac 400 Hz (104 V. 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
		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.) 115 Vac 400 Hz (104 V. 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
		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 7.5
** 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

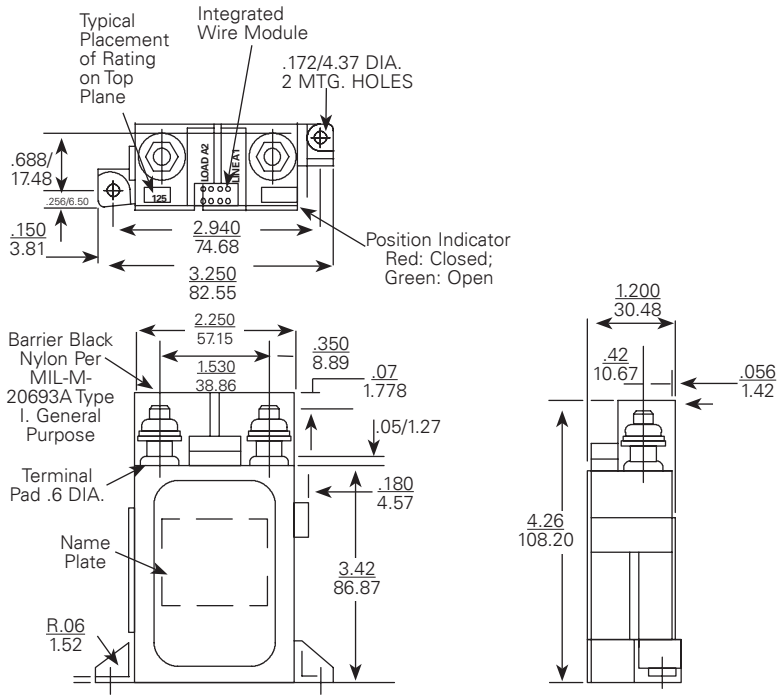
Single Pole Single Throw (Double Break Contacts)

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.

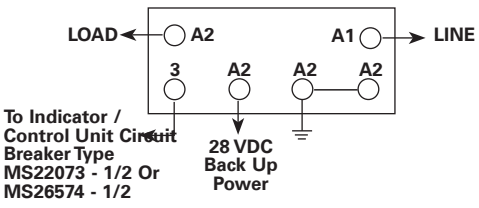
Engineering Data

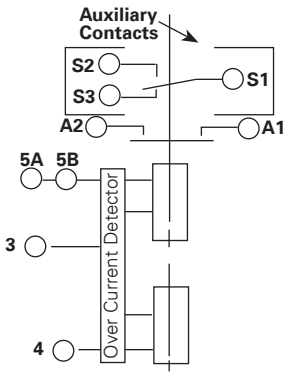
Approximate Dimensions - 1 Pole

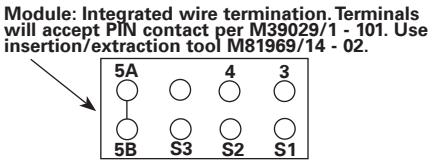


Typical Wiring Diagram

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 $I^2t >= 2$

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 mate-rial 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 (F.P.) - 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 serv-ing 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 pushbut-ton is at "normal" position for one circuit and latched down posi-tion 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 reach-ing 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 (P.T.) - 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 capabili-ties) caused by extreme ambi-ent temperatures.

AUTOMATIC RESET - Device that will automatically open an overload circuit. It will also automatically close or com-plete the circuit after a period of time. If the overload is still pres-ent, 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 cur-rent.

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

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

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 break-er 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 over-loads. 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 physi-cally 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 surg-es, 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 inter-rupt and remain in operable con-dition, capable of clearing addi-tional 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 break-ers that provides independence between the protection mecha-nism and the operating button or handle, such that a fault can-not 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 over-load.

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
MS3320-2	4310-001-2	24	MS14154-7 1/2	4330-001-705	32	MS25244-P15	700-089-15	16	MS26574-20	4200-001-20	22
MS3320-2L	4310-005-2	24	MS14154-7 1/2L	4330-007-705	32	MS25244-P20	700-089-20	16	MS26574-20A	4200-004-20	22
MS3320-2V	4310-019-2	24	MS14154-7 1/2V	4330-008-705	32	MS25244-P25	700-089-25	16	MS26574-20L	4200-003-20	22
MS3320-2VL	4310-024-2	24	MS14154-7 1/2VL	4330-009-705	32	MS25244-P30	700-089-30	16	MS26574-D3/4	4200-006-075	22
MS3320-2 1/2	4310-001-205	24	MS14154-10	4330-001-10	32	MS25244-P35	700-089-35	16	MS26574-D3/4L	4200-007-075	22
MS3320-2 1/2L	4310--005-205	24	MS14154-10L	4330-007-10	32	MS25244-PT5	700-092-5	16	MS26574-D1	4200-006-1	22
MS3320-2 1/2V	4310-019-205	24	MS14154-10V	4330-008-10	32	MS25244-PT7 1/2	700-092-705	16	MS26574-D1L	4200-007-1	22
MS3320-2 1/2VL	4310-024-205	24	MS14154-10VL	4330-009-10	32	MS25244-PT10	700--092-10	16	MS26574-D1 I/2	4200-006-105	22
MS3320-3	4310-001-3	24	MS14154-15	4330-001-15	32	MS25244-PT15	700-092-15	16	MS26574-D1 1/2L	4200-007-105	22
MS3320-3L	4310-005-3	24	MS14154-15L	4330-007-15	32	MS25244-PT20	700-092-20	16	MS26574-D2	4200-006-2	22
MS3320-3V	4310-019-3	24	MS14154-15V	4330-008-15	32	MS25244-PT25	700-092-25	16	MS26574-D2L	4200-007-2	22
MS3320-3VL	4310-024-3	24	MS14154-15VL	4330-009-15	32	MS25244-PT30	700-092-30	16	MS26574-D2 1/2	4200-006-205	22
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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
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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 suit-ability 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 and76374.

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