ROTARY SWITCHES

- Large Selection of Basic Single and Multi-Decks
- High Quality, Enclosed Switches Including Military Qualified Types
- Low Current, Wiping Contacts
- Adjustable Stop Prototypes
- Keylock Security Types
- Special Features Including: Coded,Spring Return, and Isolated Position
- Standard Options, Including Mixing of Contacts, Shielding, Homing

Page

CATALOG RATINGS

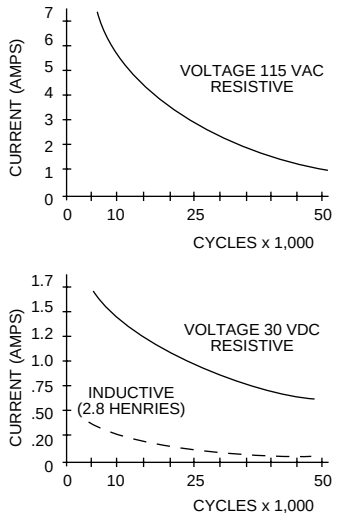
Are catalog ratings misleading? In most cases, yes. Load and life ratings shown in most catalogs are usually invalid for most applications. This results from the complex interplay of such factors as environment, duty cycle, life limiting or failure criteria, actual load, etc. Circuit designers should be aware of these factors, and the effect they have on the useful life of the switch in their applications.

The problem of switch rating arises from the wide variety of requirements placed on the switch. This includes various applications, and the sensitivity of the switch to change in requirements. If we attempted to establish life ratings for all possible applications, we would have an almost infinite variety of ratings.

To simplify the problem, switch manufacturers, switch users, and the military, have established certain references for ratings. These include loads, life requirements, environments, duty cycles, and failure criteria. These references are arbitrarily established. But, they allow you to compare different switch designs. They do not, however, match the actual requirements for most applications.

The curves shown here are an example of some of the life load curves. These curves are life load characteristics of the Grayhill 42M and 44M switches. Note that the curves consider only two voltage sources and two types of loads. These voltages and loads are, however, considered as standards for testing procedures by the industry.

Curve data is based on tests conducted at sea level, 25°C and 68% relative humidity. Cycle = 360° rotation and return. Cycling rate is 10 cycles per minute. Switch rating is for non-shorting contacts.



These curves allow you to predict the expected life of the switch once you know the voltage, current and type of load. Also note that each cycle is approximately a 360° of rotation and a return. For a ten position switch this would be a rotation from position 1 to position 10 and back to 1. This cycle runs approximately ten times a minute. Thus testing causes more electrical and mechanical wear than what the switch incurs in actual use.

Summary

The life and load ratings in this and other catalogs are probably not totally valid for your application. The bright side of the picture is that in most applications the switch will perform better than its ratings. This is because the standard industry test conditions are more stringent than those found in most applications.

This difference can be very dramatic. For example, Grayhill's 42A and 44A Series Rotary Switches, are rated at 1 ampere (115 Vac resistive). However, they will operate at 5 amperes in many applications. To see how some major factors influence switch performance, read on.

USEFUL LIFE CRITERIA

The "useful" life of a switch in your application depends on what you demand of it. This includes parameters such as contact resistance, insulation resistance, torque, detent feel, dielectric strength, and many other factors. For example, a contact resistance of 50 milliohms may be totally unusable in certain applications such as a range switch in a micro-ohm meter. In other applications a contact resistance of 5 ohms may be perfectly satisfactory.

In establishing "useful" life for a switch in your application, you must first determine "failure criteria," or "end of life" parameters. At what level of contact resistance, dielectric strength, etc., is the switch no longer acceptable for your application?

Most switches are acceptable on all parameters when new. There is a gradual deterioration in performance with life. The rate of deterioration varies greatly with basic switch design. Often, circuit designers select a switch on the basis of its performance when new. This is a mistake. The performance of the switch after several years of equipment use is more significant. To estimate this, first determine the life limiting or failure criteria for your application. In most uses, important life-limiting (failure) criteria include the following parameters:

Contact Resistance
Insulation Resistance
Dielectric Strength
Actuating Force

Contact Resistance

This is the resistance of a pair of closed contacts. This resistance effectively appears in series with the load. Typical values are in the range of a few milliohms for new switches. These values usually increase during life. The rate of increase is greatly affected by the voltage, current, power factor, frequency, and environment of the load being switched. Typical industry standard "end of life" criteria for this parameter are:

MIL-S-3786:	20 milliohms (Rotary Switches)
MIL-S-6807:	20 milliohms (Snap Pushbuttons)
MIL-S-8805:	40 milliohms (Pushbuttons)
MIL-S-83504:	100 milliohms (DIP Switches)

Contact resistance can be measured by a number of different methods. All of them are valid depending upon the switch application and the circuit. Grayhill uses the method in applicable military specifications. This method specifies an open circuit test voltage and a test current. The voltage drop across the closed contacts is measured. The contact resistance is determined by Ohm's Law from the test current and the measure voltage drop. MIL-S-3786, MIL-S-6807 and MIL-S-8805 require a maximum open circuit test voltage of 2 Vdc; they require a test current of 100 milliamperes. MIL-S-83504 requires a maximum test voltage of 50 millivolts and a test current of 10 milliamperes.

When a switch is rated to make and break 5 or more amperes, there is a difference. Contact resistance is determined by measuring the voltage drop while the switch is carrying the maximum rated current.

The voltage drop that occurs across the contacts determines, in part, the contact temperature. If the temperature rise of the contacts is sufficient, it affects contact material. A chemical reaction will take place that can cause an insulating film to appear on the contacts. This film is present between the contacts during the next switching operation. This film formation can cause failure due to increasing contact resistance. For switching of very low voltages and currents, this resistance may be the failure criteria.

Insulation Resistance

This is the resistance between two normally insulated metal parts, such as a pair of terminals. It is measured at a specific high DC potential, usually 100 Vdc or 500 Vdc. Typical values for new switches are in the range of thousands of megohms. These values usually decrease during switch life. This is a result of build-up of surface contaminants. Typical industry standard "end of life" criteria for the parameter are:

MIL-S-3786:	1000 megohms (for plastic insulation)
MIL-S-6807:	Not specified
MIL-S-8805:	2000 megohms
MIL-S-83504:	1000 megohms

Another special test condition is commonly specified. It measures insulation resistance for switches in a high humidity atmosphere (90%-98% R.H.). In this condition, condensation of moisture commonly occurs on the surface of the insulating material. Some types of insulation will absorb varying amounts of moisture. This will normally lower the insulation resistance. Typical industry values for this condition are:

MIL-S-3786:	10 megohms (for plastic insulation)
MIL-S-6807:	3 megohms after drying
MIL-S-8805:	10 megohms (for plastic material)
MIL-S-83504:	10 megohms

Dielectric Strength

This is the ability of the insulation to withstand high voltage without breaking down. Typical values for new switches in this test are in excess of 1500 Vac RMS. During switch life, contaminants and wear products deposit on the surface of the insulation. This tends to reduce the dielectric withstanding voltage. In testing for this condition, a voltage considerably above rated voltage is applied. Then, the leakage current is measured at the end of life. Typical industry standard test voltages and maximum allowable leakage currents are as follows:

MIL-S-3786:	1000 Vac and 1 mA maximum leakage
MIL-S-6807:	600 Vac RMS after life 10 microamperes maximum leakage
MIL-S-8805:	1000 or 1000 plus twice working voltage (AC) RMS and 1mA maximum leakage
MIL-S-83504:	500 Vac and 1 mA maximum leakage
UL Standard:	900 Vac without breakdown (UL Standard (dependent on test)

Voltage breakdown is another method for describing the ability of the insulating material to withstand a high voltage. Voltage breakdown describes the point at which an arc is struck and maintained across the insulating surface with the voltage applied between the conducting members.

ADDITIONAL LIFE FACTORS

Effect of Loads

On any switch, an arc is drawn while breaking a circuit. This causes electrical erosion of the contacts. This erosion normally increases contact resistance and generates wear products. These wear products contaminate insulating surfaces. This reduces dielectric strength and insulation resistance.

The amount of this erosion is a function of current, voltage, power factor, frequency and speed of operation. The higher the current is, the hotter the arc and the greater the erosion. The higher the voltage is, the longer the arc duration and the greater the erosion.

Inductance acts as an energy storage device. This returns its energy to the circuit when the circuit is broken. The amount of erosion in an inductive circuit is proportionate to the amount of inductance. Industry standard test inductance as described in MIL-I-81023 is 140 millihenries. Other test loads include 250 millihenries and 2.8 henries.

Frequency can also affect erosion. The arcing ends when the voltage passes through zero. To a certain extent, the following is true. The higher the frequency, the sooner arcing ends, the lower the erosion.

The speed of operation affects the duration of the arc. Fast operation can extinguish the arc sooner. This reduces the erosion, unless the air within the switch is completely ionized.

Actuating Force

Rotational torque is the actuating force required to turn a rotary switch through the various positions. For pushbutton or DIP switches, it is the force required to depress the button, or move the actuator between positions. The actual torque or force required depends on the design of the switch. It varies widely from one design to another. See appropriate MIL Specs or manufacturers literature for typical industry values for specific designs.

When torque or force values are specified, it is customary to give a minimum and maximum value. During life, two offsetting factors may occur to change the initial value. Relaxation of spring members will tend to lower torque or force values. Wear or "galling" of mating surfaces, however, may tend to increase these values. Typical end of life specifications may require the switch to fall within the original range. Or, they may specify a maximum percentage change from original value. For example, "the rotational torque shall not change more than 50% from its initial value.

Effect of Ambient Temperature

Temperature extremes may affect switch performance and life. Very high temperatures may reduce the viscosity of lubricants. This allows them to flow out of bearing areas. This can hasten mechanical wear of shafts, detents, plungers, and cause early mechanical failure. Contact lubricants are sometimes used. Too little lubrication can result in a high rate of mechanical wear. Too much lubrication flowing from other bearing areas can adversely affect dielectric strength and insulation resistance.

Through careful design and selection of lubricants most manufacturers attempt to minimize these affects. Nevertheless, continual operation in high ambient temperatures will shorten the life of a switch regardless of design.

Extremely low ambient temperatures may also create problems. Low temperatures may cause an increase in the viscosity of the contact lubricant. Higher viscosity can delay or prevent the closing of contacts, causing high operating contact resistance. Under certain atmospheric conditions, ice may form on the contact surfaces. This also causes high and erratic contact resistance.

Neither of these conditions may materially reduce the life of the switch. However, it may cause unsatisfactory operation. If the voltage of the circuit is high enough, it can break down the insulating layer. Some current will flow through the high resistance contacts. A local heating action is created, which tends to correct the condition in a short period of time.

Switches with high contact pressures may minimize the low ambient temperature effect. This is particularly true if the application calls for switching signal level voltages and currents.

Effects of Altitude

In high altitudes, barometric pressure is lower. Low pressure reduces the dielectric strength of the air. The arc strikes at a lower voltage and remains longer. This increases contact erosion. Switches for use in high altitudes will therefore require de-rating in terms of loads and/or life.

Effects of Duty Cycle

Mechanical life testers cause accelerated life testing. Testers operate switches at a rate of approximately 10 cycles per minute. This rate is greatly in excess of normal manual operation in equipment. It constitutes a severe test of the switch.

Lubricants do not have an opportunity to redistribute themselves over the bearing surfaces at this duty cycle. The contact heating caused by arcing does not have a chance to dissipate.

Thus, the switch runs "hot", increased mechanical wear and contact erosion result. Your application probably requires manual operation of the switch with an attendant low duty cycle. If so, you can usually expect much longer switch life than is shown by the accelerated life laboratory life tests.

Conclusion

Remember, load and life ratings are based on manufacturers' selected references. They include accelerated life tests and an arbitrary set of application parameters and failure criteria. These parameters and criteria may not always fit your application.

Then how do you know if a switch will give reliable performance in your application?

How do you know if it will last the life of your equipment?

Ask the switch manufacturer. Grayhill, and most other reputable manufacturers have compiled vast quantities of test data. We are in a position to give a good estimate of a switch's performance in many nonstandard applications. You should provide the following data:

Expected Life:	in number of cycles
Load:	voltage, current, power factor, and frequency
Operation:	manual or mechanical, duty cycle
Application:	type of equipment
Environment:	altitude, ambient temperature range relative humidity, corrosive atmosphere, shock, vibration, etc.
Failure Criteria:	end of life contact resistance, dielectric strength, insulation resistance, etc.

With this information, we can usually estimate if a given switch is suitable for your application.

SOLDERING

What causes failure in a new switch after it has been installed? The principle failure is high contact resistance caused by solder flux on the contact surfaces. To avoid this, be sure to follow good soldering practices. Use the proper solder with the proper flux core, maintain the proper soldering temperature, use the proper soldering iron tip for the work, and never use liquid flux when soldering a switch.

Do not use solvent baths or washes with any unsealed electromechanical parts. Switches, unless they have been especially protected suffer badly. Solvents readily dissolve fluxes and carry them into the contact area of switches. A thin, hard flux coats the contact surface after the solvent evaporates. Additionally, solvents may dissolve and wash away lubricants in switches. Lubricant loss may prevent proper mechanical action.

Exercise similar precautions when you mount a switch to a printed circuit board. Maintain proper solder temperatures and follow proper cleaning techniques. Avoid subjecting these switches to lengthy solder baths. The excessive heat can deform the plastics.

RFI/EMI SHIELDING

Some applications require shielding against Radio Frequency Interference and/or Electro-Magnetic Interference. Experts feel that the most effective way to achieve shielding is to provide a conductive bridge across the component mounting hole. They also generally agree that there is no good method for testing shielding. So, the equipment manufacturers themselves must identify and solve specific problems. Component manufacturers can generally assist in the solution of shielding problems.

RFI/EMI testing has recently been incorporated into MIL-S-3786 for rotary switches. Requirements are 1.0 ohm maximum dc resistance between the mounting bushing and operating shaft initially and 10.0 ohm maximum dc resistance following environmental and mechanical tests. Many equipment manufacturers feel they are satisfying their needs with a measurement of .025 to 10 ohms for the expected life of the switch. Under most circumstances, standard non-sealed switches pass the larger value easily. The lower value (.025 ohms) requires special attention and parts for compliance over the life of the switch.

SWITCH SELECTION

Whenever possible, use standard switches and contact configurations. Standards provide the greatest economy and the best delivery. When you need a deviation, it pays to consult with your suppliers as soon as possible. At the early stages of the design, there are many low cost options for achieving the results. At the late stages of design, some of the options may no longer be open. For example, size may be restricted. This might result in a more costly redesign.

Typical standard rotary options are as follows: coded contacts, homing rotor effect, progressively shorting contacts, PC mountable terminals, rotary switch spring return positions, and push-to-turn or pull-to-turn mechanisms.

Limited panel space may be solved by a concentric shaft rotary switch. It is two rotary switches, located one behind the other. There are other concentric shaft possibilities. A rotary switch can be combined with another component. These include a potentiometer, a pushbutton switch, and a mechanical element. The most cost effective design may be one of these concentric options. But, selection must be made at the outset of equipment design.

FEATURES

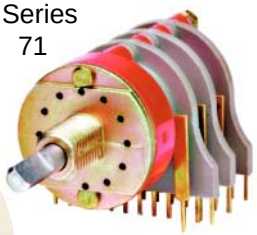
- Quick Route to Rotary Switches
- For Prototypes and Small Production Runs

Series 42/44

Series 50/51

Series 56

Series 71



BEST AVAILABILITY

The Problem

Procurement lead time on rotary switches for prototypes and small production runs can be long. This is often a source of headache for design engineers and production control managers.

Grayhill makes more than 300,000 combinations of rotary switch styles; number of decks, poles per deck, positions per pole, military qualified or commercial grade, etc. This wide variety makes it impractical for either distributors or manufacturers to stock completed switches. Consequently, even small quantities must be built to order.

The Solution

Grayhill Electronic Distributors can supply a wide variety of rotary switches with Adjustable Stops. This feature gives you a switch immediately with exactly the electrical properties you need. These Adjustable Stop switches have the basic mechanical characteristics of their fixed stop counterparts. To get the right number of positions per pole for your application, simply adjust the stop washers or stop pins.

By stocking a few switches, the Distributor provides over 100,000 possible combinations of switches. This includes the popular styles, sizes, angles of throw, number of decks, poles per deck, positions per pole, and types of contacts. Availability of these switches through Distributors speeds prototype development time. There is no time lag in waiting for factory made samples.

The Substitution

Writing an equivalent part number is easy. To obtain an adjustable-stop equivalent to a fixed-stop rotary switch you must substitute style letters and possibly series number. Then replace the positions-per-pole number in the fixed-stop number with the letters AJ. See the examples for the scheme.

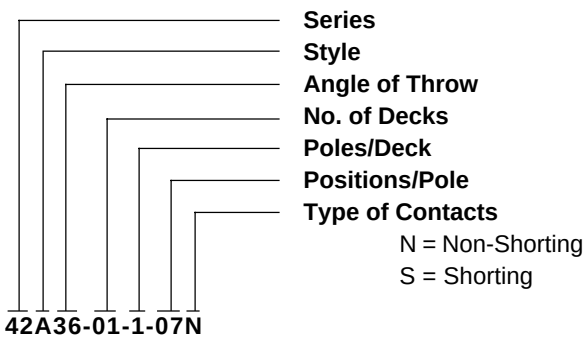
When adjustable equivalents apply, the rotary switch pages will indicate the substitutions. A chart will show the fixed stop rotary switch series, style and angle of throw as well as the adjustable stop rotary switch series, style and angle of throw. Then the letters AJ in the positions-per-pole location, gives you the part number of the equivalent.

Suppliers

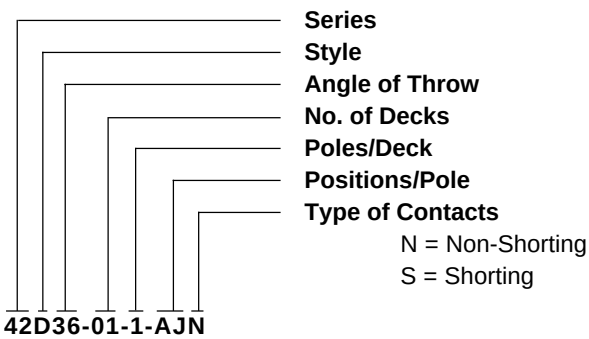
Distributors can supply 1 and 2-deck adjustable-stop switches from stock (one or two poles per deck). They can also quickly secure other variations from factory stock. Reduce prototype development time. Use Grayhill Adjustable Stop Rotary Switches for all of your prototype requirements.

These electronic distributors also maintain a representative stock of Grayhill products. Local availability can often "save the day", and simplify your paperwork. For a list of Grayhill Distributors in your area see Section A.

Fixed Stop Rotary Switch



Adjustable Stop Equivalent



1. SELECT A FEATURE

Since there are fewer switches with certain features, using this chart first will help you narrow your selection more quickly.

FEATURES

	Single Deck Switch Series								Multi-Deck Switch Series				
	03	19	24	50/51	56	58	75	5000	08/09	42/44	43/54	53,57,59	71
Add-A-Pot, Concentric Shafts	—	—	—	—	—	—	—	—	—	—	F-54	—	—
Adjustable Stops (p. F-6)	—	—	—	—	F-22	—	—	—	—	F-53	F-55	—	F-41
Antistatic (Keylocks)	—	—	—	—	—	F-72	—	—	—	—	—	—	F-77
Concentric, 2 Switches	—	—	—	—	—	—	—	—	—	—	F-54	—	F-37
Faston Terminals	—	F-26	—	—	—	—	—	—	—	—	—	—	—
Homing Rotor, Progressive Shorting	—	—	—	—	—	—	—	—	—	F-8	—	—	—
Industrial/Standard Grade	F-67	F-26	F-28	F-15	F-22	—	F-13	F-27	F-45	F-51	F-54	—	F-31
Isolated Positions, Push/Pull to Turn	—	—	—	F-83	—	—		—	F-83	F-83	—	—	—
Key Operated, Keylock	F-67	—	—	—	—	F-72	—	—	—	F-77	—	—	F-75
Military Qualified	—	—	—	F-15	—	—	—	—	F-49	F-56	F-54	F-61	F-31
Metric Mount Shaft & Bushing	—	—	—	F-18	—	—	—	—	—	—	—	—	F-32
Optically Coupled	—	—	—	—	—	—	—	—	—	—	—	—	—
Progressively Shorting	—	—	—	—	—	—	—	—	—	F-8	—	—	—
Screwdriver Slotted Shaft	—	—	—	F-18	F-22	—	F-13	—	—	—	—	—	—
Sealed, Shaft and Panel	—	—	—	F-18	F-22	—	—	—	F-49	F-53	—	F-61	F-31
Sealed, Process	—	—	—	F-18	—	—	—	—	—	—	—	—	F-36
Terminals, PC Mount	—	—	F-28	F-15	F-22	F-72	F-13	—	F-47	—	—	—	F-33
Terminals, Solder Lug	F-67	F-26	F-28	F-15	F-22	F-72	—	F-27	F-45	F-51	F-54	F-61	F-31
Shorting & Non-Shorting	—	N	N&S	N&S	N&S	N&S	N	N&S	N&S	N&S	N&S	N&S	N&S
Spring Return, Momentary	—	—	—	F-81	—	—	—	—	F-83	F-83	—	—	—
UL Recognized	—	F-26	—	—	—	—	—	—	—	F-51	F-51	—	—

2. SELECT A FACTOR

Begin with the table most important to you. If two or more series solve your, rating, size, or circuitry need, use the price chart to decide.

FACTOR: CURRENT LIFE RATING

All switches are rated to make and break at least 100 milliamperes for 10,000 cycles of operation. Rating becomes a matter of interpretation. Carefully review the Engineering Information on the previous pages. Ratings which assure a different life are possible; contact Grayhill.

	Single Deck Switch Series							Multi-Deck Switch Series				
	19	24	26	50/51	56	75	5000	08/09	42/44	43/54	53,57,59	71
25,000 Cycles At Load (Amps)	—	1	LL**	.050	—	—	1	.250	1,3,5*	1,3,5*	—	.250
10,000 Cycles At Load (Amps)	—	—	LL**	.200	.200	.100	—	.500	1,3,5*	1,3,5*	.150, .250*	—
6,000 Cycles At Load (Amps, UL)	15	—	—	—	—	—	—	—	—	—	—	—

* Varies with angle of throw and style.
**Logic Level loads.

FACTOR: SIZE

Maximum Dimension In Inches (& Millimeters)	Single Deck Switch Series								Multi-Deck Switch Series							
	19	24	26	50	51	56	75	5000	08	09	42	44	53	57	59	71
Diameter, Behind Panel	2.280	1.015	.500	.500	.561	.500	.298	1.015	.687	.750	1.015	1.170	1.350	1.190	1.190	.750
Length Behind Panel, 1 Deck	.950	.580	.332	.698	.698	.355	.500	.470	.960	.960	1.025	1.025	.916	.916	.916	.760
Behind Panel, Add'l Deck	—	—	—	—	—	—	—	—	.268	.268	.346	.346	.329	.326	.326	.218
Diameter, Behind Panel	(57,9)	(25,8)	(12,7)	(12,7)	(14,2)	(12,7)	(7,6)	(25,8)	(17,4)	(19,0)	(25,8)	(29,7)	(34,3)	(30,2)	(30,2)	(19,0)
Length Behind Panel, 1 Deck	(24,1)	(14,7)	(8,4)	(17,7)	(17,7)	(9,0)	(12,7)	(11,9)	(24,4)	(24,4)	(26,0)	(26,0)	(23,3)	(23,3)	(23,3)	(19,3)
Behind Panel, Add'l Deck	—	—	—	—	—	—	—	—	(6,8)	(6,8)	(8,8)	(8,8)	(8,4)	(8,3)	(8,3)	(5,5)

* If multi-deck switch is needed, contact Grayhill.

FACTOR: CIRCUITRY

For coded switches, see Features chart.

Max. Positions 1 Deck (1Pole)*	Angle Of Throw	Maximum Decks**	Maximum Poles Per Deck***	Shorting Or Non-Shorting	Solder Lug Or PC	Series Number
24	15°	12	12	N or S	Solder	53
20	18°	12	10	N or S	Solder	59
16	22°30'	12	8	N or S	Solder	57
16	22°30'	1	2	N or S	Both	51
12	30°	12	6	N or S	Both	71
12	30°	12	6	N or S	Both	9
12	30°	12	6	N or S	Solder	44
12	30°	1	4	N or S	Both	51
12	30°	1	4	N or S	Both	56
11	30°	1	1	N	****	19
10	36°	12	2	N or S	Both	8
10	36°	12	2	N or S	Both	71
10	36°	12	2	N or S	Both	42
10	36°	1	2	N	PC	75
10	36°	1	2	N or S	Both	50
10	36°	1	2	N or S	Both	56
10	36°	1	1	N or S	Both	24
10	36°	1	1	N or S	Solder	5000
8	45°	12	4	N or S	Both	9
8	45°	12	4	N or S	Solder	44
8	45°	1	2	N	Both	50
6	60°	6	3	N	Both	9
6	60°	12	3	N	Solder	44
6	60°	1	2	N	Both	50
4	90°	12	2	N	Solder	44
4	90°	6	2	N	Both	9
4	90°	1	2	N	Both	50

* Maximum positions per pole depends on number of poles per deck.

** Based on 1 pole per deck. Number of decks is also limited by the total number of poles.

*** Limited by total number of poles per switch.
****Choice of Faston or Solder Lug terminals.

FACTOR: RELATIVE PRICE

This listing is provided to help you decide between several switches which might otherwise meet your needs. Coded switches are not included. Relative price multiplier is based on rotary switches with 1 pole per deck and 6 positions per pole in lots of 100. While actual prices vary, relative price remains more constant.

Switches are listed from least expensive to most expensive, with item number 1 being the least expensive. Other listings show a multiple of that price. For example, a series 50 military qualified switch is about twice the expense of a series 56 switch, although they switch about the same current in a .5 inch diameter package.

For actual prices and discounts, contact a local sales office, an authorized local distributor, or Grayhill.

Price Rank	Relative Price	Series Number	Switch Grade
1	1.0x	56	Standard
2	1.1x	24	Standard
3	1.3x	5000	Standard
4	1.5x	50	Standard
5	1.6x	51	Standard
6	1.6x	71	Standard
7	1.7x	71	Military
8	1.7x	75	Standard
9	2.0x	50	Military
10	2.1x	51	Military
11	2.2x	19	UL/Standard
12	2.5x	08 & 09	Standard
13	2.7x	42 & 44	UL/Standard
14	3.1x	42 & 44	Military
15	3.2x	08 & 09	Military
16	3.9x	53,57,59	Military

THEN

PROCEED TO THE SPECIFIC CHOICES & LIMITATIONS CHART

For special feature switches such as coded, spring return, isolated positions, and keylocks, see the pages referenced in the Features chart on the facing page.

OPTIONS

- Custom Switches With No Tooling Required
- Easily Ordered Specials

See also Features selection on page F-7.

ORDERING INFORMATION

For prices and ordering information, contact Grayhill or your local Sales Office.

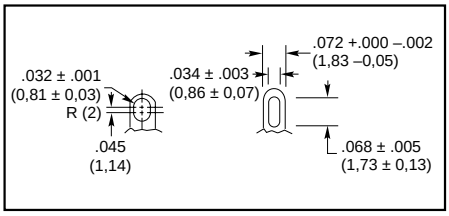
Switch Series#	Options For Styles A and S								Options For All Styles							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
08	x	x					x	x			x	x				
09	x	x					x	x			x	x				
24	x		x	x	x	x		x								
42	x	x*	x	x	x	x	x	x	x	x	x	x				
43	x		x	x	x	x		x*			x			x	x	
44	x	x*	x	x	x		x	x	x	x	x		x			
50/51								x			x					
56								x			x					
53/57/59								x								
54	x		x	x	x			x*			x		x	x	x	x
71								x*	x		x					
5000	x		x	x	x	x		x								

* See description below for limitations.

1. Dummy Terminal

Used as tie point, it is not an active switch position. Can be located at any specified position outside of active switch terminals. Priced as active position. Example, a three position switch with 2 dummy terminals would be priced as a five position switch.

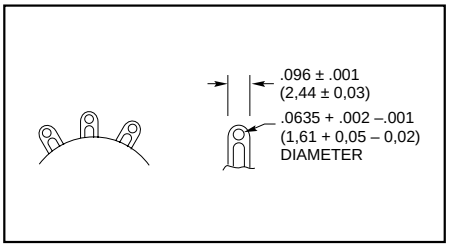
2. Enlarged Wire Holes



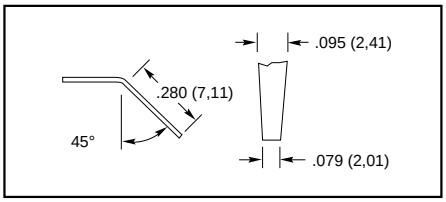
Series 08A, 09A, 42H, 42M, 44H, and 44M: Lug terminals for several wires; standard in Series 08M, 09M, 53, 57, and 59 switches.

3. High Density Wiring Terminal

The gold-plated terminal features a slot to accept wires in addition to the conventional wire hole.

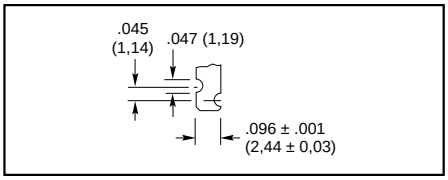


4. Taper Tab Terminals



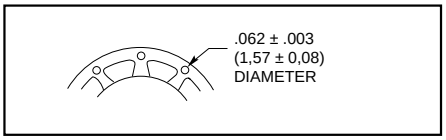
Used in place of conventional solder lug terminals. Taper tab terminals are gold plated.

5. Notched Terminals



Used in place of the conventional solder lug terminals.

6. External Shorting Links



External shorting links, as shown in the drawing, can be used in place of conventional solder lug terminals in the Series 5000, 24, 42 or 43 rotary switches. Shorted terminals can also be accomplished internally in the Series 71 rotary switches. Solder lug terminals can be intermixed on the same deck.

7. Non-Standard, Non-Turn Devices

Switches without tabs

Series 08, 09, 42 and 44: There is no additional charge for a front support plate without a non-turn tab.

Non-turn tab of non-standard projection

Series 08:
All tabs located at .260 inch radius from centerline of switch. The following projections (inches) are available: .121; .094; .045; .032

Series 44:

From Centerline	Projection
.375" (9,53 mm)	.062" (1,57 mm)
.531" (13,49 mm) (3,07 or 1,24 mm)	.121" or .049"

8. RFI Grounding

A silver-plated shaft and wave washer improve DC grounding of shaft to mounting bushing, thus minimizing possible radio frequency interference. Example: static and dynamic DC resistance after 25,000 cycle life test is maximum 100 milliohms. For concentric shaft switches, discuss grounding with factory. Special handling charges apply to small lots.

9. Electrostatic, Electromagnetic Shielding

A metallic shield can be added between decks. Grounding of the shield provides additional RFV /EMI protection, Size and shape of the shield depends on the equipment configuration and the amount of protection required Price is dependant onthe number and type of shields required.

10. Unidirectional Rotation

The detenting system permits rotation in only one direction. Usable only with continuous rotation switches. Specify direction of rotation. Applicable to 30° and 36° throw switches only.

11. Intermixing of Shorting and Non-Shorting Contacts

In some switches, non-shorting and shorting contacts can be intermixed between decks. A 2-deck switch, for example could have shorting contacts on deck 1 and non-shorting contacts on deck 2. In a few switches, non-shorting and shorting contacts can also be intermixed between poles. A 2-pole per deck switch, for example, could have non-shorting on pole #1, and shorting on pole #2.

Series 08 and 09:
An 09M30 or 08M36 rotary switch can have shorting and non-shorting contacts intermixed between decks. Shorting and non-shorting contacts can be intermixed between poles as well as decks in styles A, S, P, and SP.

Series 42, 43, 44, and 54, in 30° or 36°:
Non-shorting and shorting contacts can be intermixed between poles or decks.

Series 50, 51, and 56:
Non-shorting and shorting contacts can be intermixed between poles.

Series 71:
Non-shorting and shorting contacts can be intermixed between poles in fixed stop switches only.

Priced the same as standard switches. The type of contacts on each pole must be precisely indicated.

12. PC Mount Switches With Terminals From One Side of Switch

Series 71 PC mount switch has all terminals on one side.

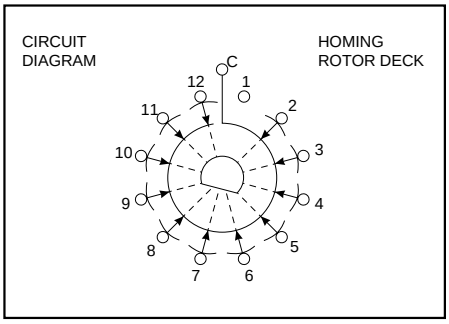
Series 08P, 09P, and 42P with non-shorting contacts are also available with terminals limited to one side. Contact Grayhill for a special part number. This is accomplished by using 2 decks per pole and placing the rotating contacts 180° out of phase on each deck. The first deck picks up the first half of the positions; the second deck picks up the last half of the positions. Common terminals are tied together by the PC board circuitry.

A total of 12 decks (6 usable poles) is the maximum per switch. Switches with the maximum number of positions (12 for 30°, or 10 for 36°) will have continuous rotation. Rotation can be limited to less than the maximum positions. For example, an 8 position Series 8P36 switch with terminals on one side, would pick up 5 positions on the first deck and 3 positions on the second deck.

Price is the same as standard switches with comparable number of decks and positions. Example: an 08P36, 1-pole, 10 position switch with terminals on one side of the switch would be priced as a 2 deck, five position, one pole per deck switch.

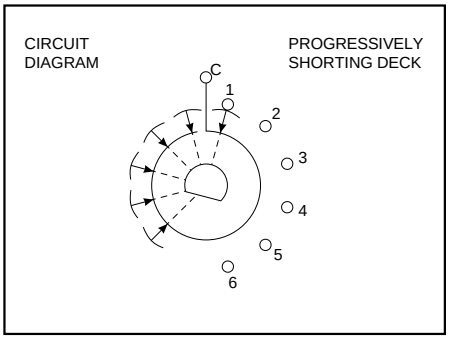
13. Homing Rotor (Bridging and Shorting Deck) and Progressively Shorting Deck

A homing rotor (bridging and shorting) switch deck connects all terminals to the common except the terminal in the selected switch position. For example, in position 1, terminals 2 thru 12 are connected to the common, and terminal 1 is



open. In position 2, terminal 3 thru 12 and 1 are connected to the common, and terminal 2 is open. A homing rotor deck will function for 25,000 mechanical cycles of operation.

The progressively shorting switch deck connects consecutive switch positions to the common. For example, in position 1, terminal 1 is connected to the common; in position 2, terminals 1 and 2 are connected to the common; in position 3, terminals 1,2, and 3 are connected to the

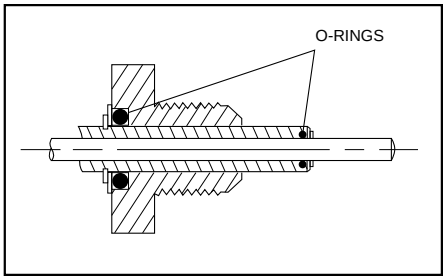


common. A progressively shorting deck is limited to a maximum of 6 positions. A progressively shorting deck will function for 25,000 mechanical cycles of operation.

Homing Rotor or Progressively Shorting decks can be ordered as a deck of a 44A or 44M style switch, or their sealed equivalents. Order up to 11 conventional decks and 1 special circuitry deck. For a good detent feel, the switch is limited to a total of 12 poles plus the homing rotor or progressively shorting deck. Example: 6 2-pole decks and a homing rotor. When these special decks are used in combination with conventional decks, it is important to remember that the stop system limits the rotation of both types of decks. For example, when a homing rotor deck Is used in combination with a 6-position conventional deck, the homing rotor is likewise limited to six positions.

14. Shaft and Panel Seal on Concentric Shaft Switches

The following diagram shows the location of the O-rings required to seal the shafts to the bushings. When the concentric shaft switches are sealed in this manner, the .125 inch diameter shaft is supplied full round. Bushing-to-panel sealing is accomplished by the panel seal kit.

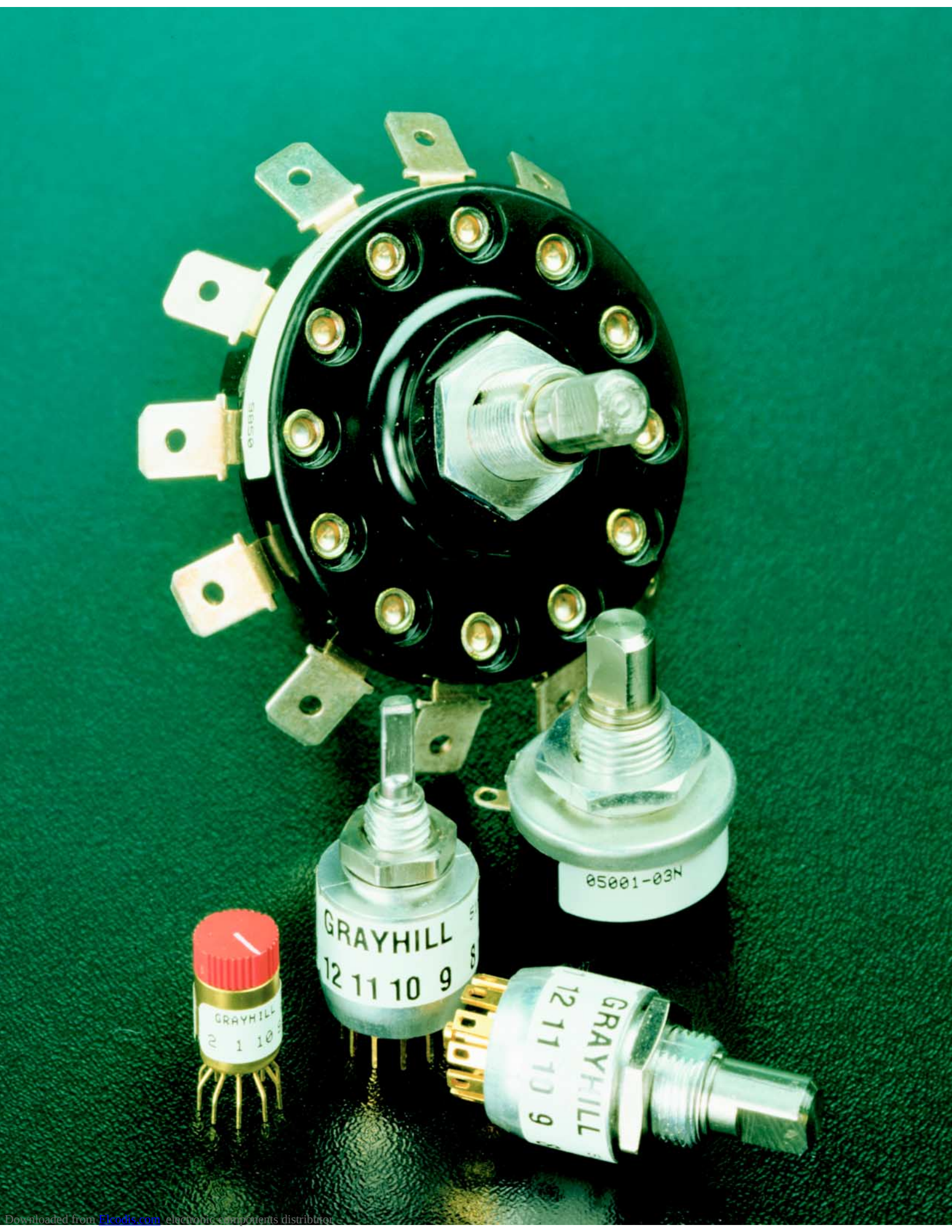


15. Fixed Stop, Add-A-Pot Switches

The rotary switch section of the Add-A-Pot rotary switches can be built with a fixed mechanism rather than the standard adjustable stop mechanism. The front end of a switch of this type is similar to the Series 43A or Series 54A style concentric rotary switches. The total number of decks is limited to three. The Series 43 is limited to 1 pole per deck. Series 54 to 2 poles per deck.

16. Series 54 Concentric Shaft Switch in 45°, 60°, and 90° Throws

The Series 54A switch is available with these angles of throw in Section A of the concentric rotary switch. Section B is available in 30° angle of throw only. Section A is limited to 1 to 3 decks, non-shorting contacts, and 1 or 2 poles per deck.



SINGLE DECK ROTARY SWITCHES

- Minimal Space Behind Panel .3" up to 1"+ In Diameter
- More Economical Choice Than Multi Deck Rotary Switches
- High Quality, Enclosed Switches Including Military Types
- Low Current, Wiping Contacts

SERIES 75

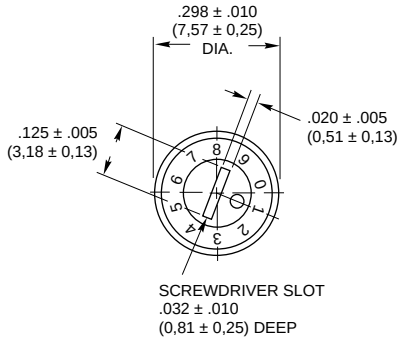
0.3" Diameter, 200 mA

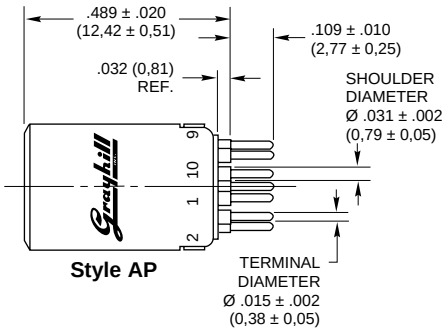
FEATURES

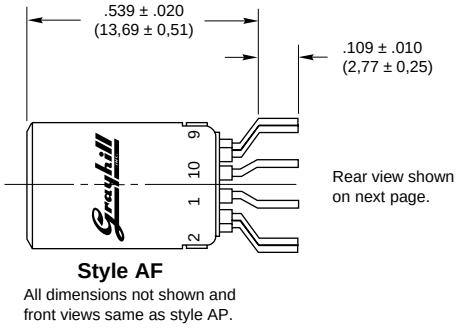
- Small Size
- Flush, Shafted, or Knobbed Shaft

DIMENSIONS In inches (and millimeters)

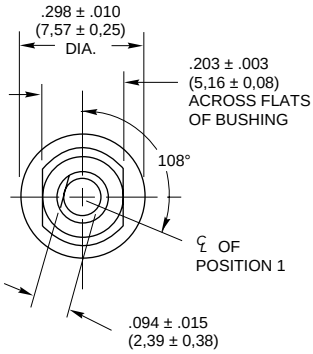
Screwdriver Actuated

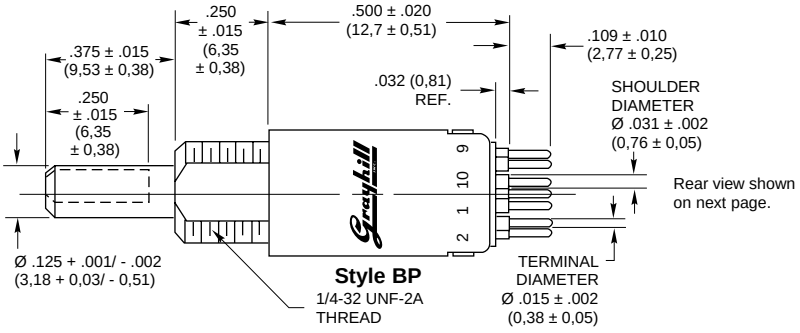


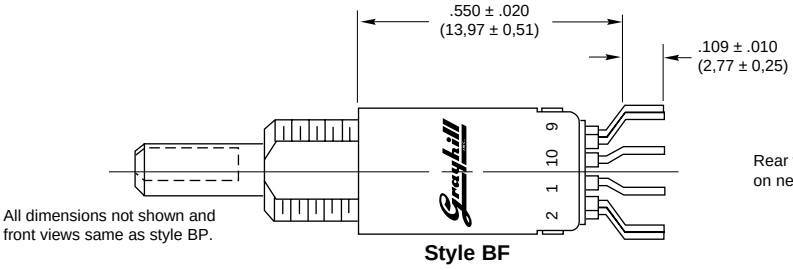




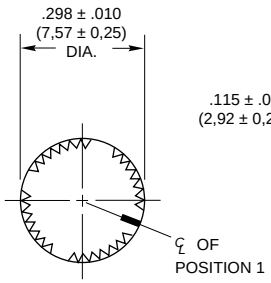
Shaft Actuated

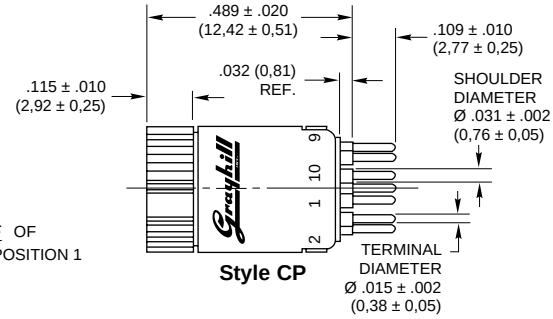


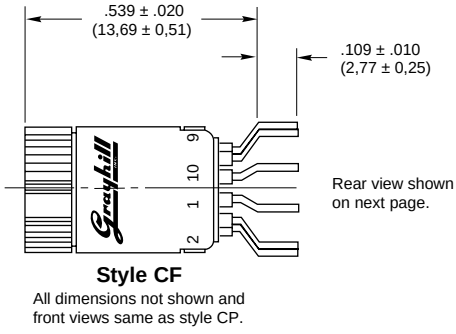




Integral Knob Actuated

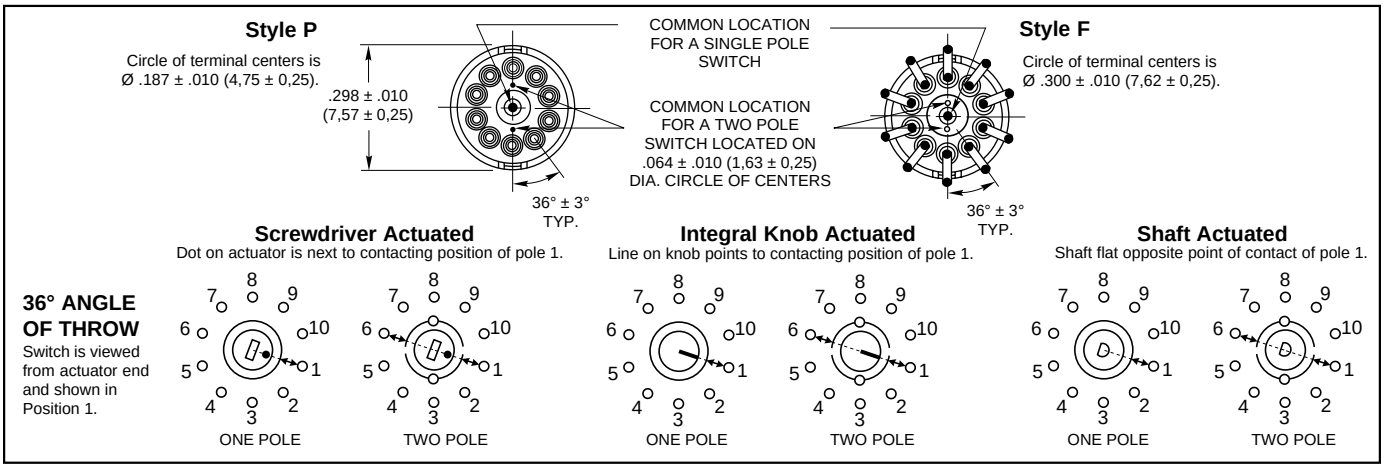






Grayhill part number and date code marked on label.
Customer part number marked on request.

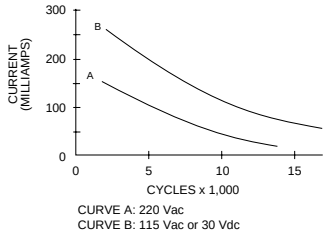
CIRCUIT DIAGRAMS AND REAR VIEWS



SPECIFICATIONS

Electrical Ratings

Chart shown for non-shorting (break before make) contacts, resistive load.



CURVE A: 220 Vac
CURVE B: 115 Vac or 30 Vdc

One cycle is 360° rotation and a return through all switch positions to the starting position. The data for the curve was measured at sea level, 25°C and 68% relative humidity with the following limiting criteria:

Contact Resistance: 50 milliohms maximum (15 milliohms initially).

Insulation Resistance: 10,000 Mohms minimum between mutually insulated parts.

Voltage Breakdown: 500 Vac between mutually insulated parts.

Life Expectancy: 10,000 cycles at 200 milliamps. One cycle is 360° rotation and a return through all switch positions to the starting position.

Low Level Rating: Make and break a 50 mV, 1 milliamp, resistive load for 10,000 cycles with a maximum contact resistance of 50 milliohms.

Contact Grayhill for information if the life limiting criteria is more critical than those listed, if the required cycles of operation are greater than those listed, if a larger make and break current is required than the one listed for the desired number of cycles, or if elevated temperatures or reduced pressures are part of the operating environment.

Materials and Finishes

Switch Base: Diallyl per MIL-M-14

Detent Cover and Detent Rotor in Styles AP, AF, BP, and BF: Phenolic per MIL-M-14

Bushing: Brass, cadmium-plated, with yellow chromate

Stop Pin: Stainless steel, passivated

Detent Balls: Steel, nickel-plated

Detent and Contact Springs: Tinned music wire

Rotor Contact: Silver cad-oxide, gold-plated

Terminals and Common: Brass, gold plate .00002" minimum thickness over silver plate .0003" minimum.

Shaft in Style BF or BP: Zinc

Integral Knob and Detent Rotor in Style CF or CP: Red Thermoplastic

Mounting Hardware for Style BF or BP: One mounting nut .062" thick by .312" across flats and one external tooth lockwasher supplied with each switch. Mounting nut is brass, cadmium-plated and lockwasher is spring steel, cadmium-plated.

Additional Characteristics

Contact Type: Non-shorting, wiping contacts

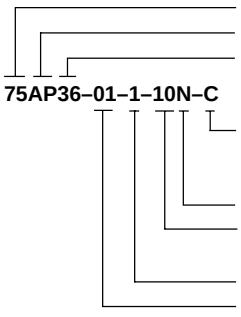
Terminals: Switches are provided with the full circle of terminals regardless of the number of active positions.

Stop Strength: 8 ounce-inches minimum

CHOICES AND LIMITATIONS

Style and Designation		Angle Of Throw	Stops	Terminal	Poles Per Deck	Number of Decks		Number of Positions/Pole
Ø 0.187 (4,75) Circle of Term.	Ø 0.300 (7,62) Circle of Term.					Shorting	Non-Shorting	
AP = Screwdriver Actuated BP = Shaft Operated CP = Integral Knob	AF = Screwdriver Actuated BF = Shaft Operated CF = Integral Knob	36°	Fixed	Printed	1 2	Not Available	1 1	2 thru 10 2 thru 5

ORDERING INFORMATION



Series

Style: Letters from Choices and Limitations Chart

Angle of Throw: 36° only

Stop Arrangement: The suffix C or F must be added to a one pole per deck switch to indicate continuous rotation (C) or fixed stop (F) between position 1 and position 10

Type of Contacts: N=Non-shorting only

Positions per Pole: requires 02 positions as a minimum to maximum allowable dependent on the poles per deck

Poles per Deck: 1 or 2 poles available

Number of Decks: 1 deck only

ACCESSORIES

Control knobs available, see page E-39.

Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

SERIES 50
SERIES 51

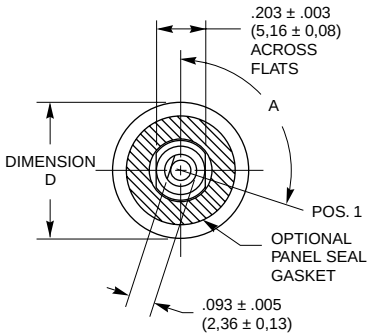
0.5" Diameter, 200mA,
.698" Behind Panel

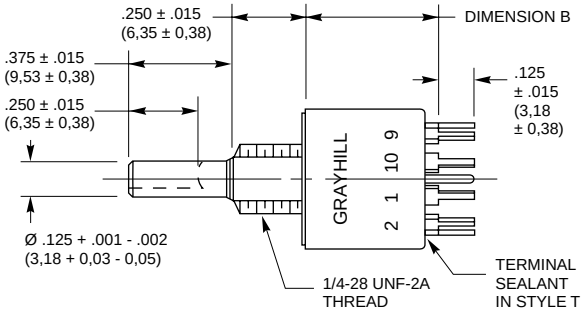
FEATURES

- Optional Complete Seal for PC Board Assembly and Cleaning
- Small 1/2" Diameter
- Choice of 22.5°, 30°, 36°, 45°, 60° and 90° Angles of Throw
- Up to 4 Poles on 1 Deck
- Up to 16 Positions Per Switch
- PC or Solder Lug Termination
- Positive Shaft Grounding for EMI/RFI Shielding

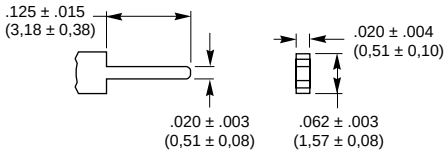
DIMENSIONS In inches (and millimeters)

PC Mount Style

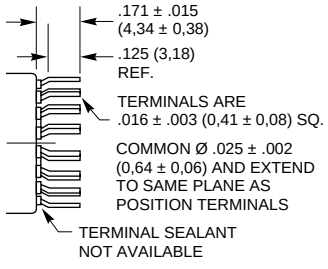




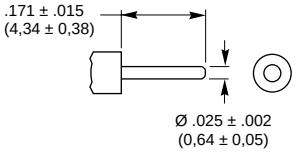
PC TERMINAL DETAIL
All angles of throw, except 22.5°



Side View
All others as shown at left



PC COMMON DETAIL
All angles of throw, except 22.5°



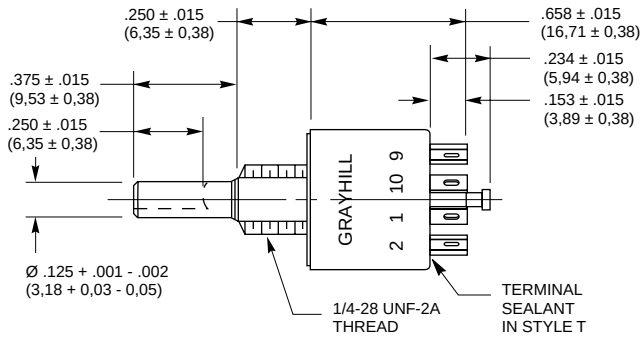
Grayhill part number and date code marked on label. Customer part number marked on request. Military part number marked when required.

Angle of Throw	Angle A	Angle of Throw	Angle A
22.5°	101.25°	**45°**	112.5°
30°	105°	**60°**	120°
36°	108°	**90°**	135°

Dimension	Series 50	Series 51
D	.500 ± .015 (12,70 ± 0,38)	.562 ± .015 (14,27 ± 0,38)

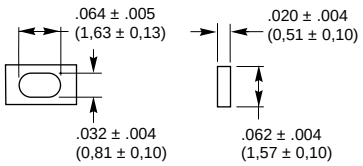
Dimension	Style T	All Others
B	.576 ± .015 (14,63 ± 0,38)	.537 ± .015 (13,64 ± 0,38)

Solder Lug Style

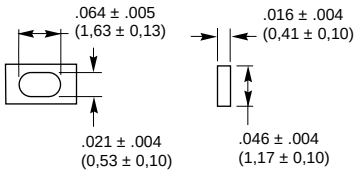


Front view same as PC Mount style.

SOLDER LUG TERMINAL DETAIL
All angles of throw, except 22.5°



SOLDER LUG TERMINAL DETAIL 22.5°

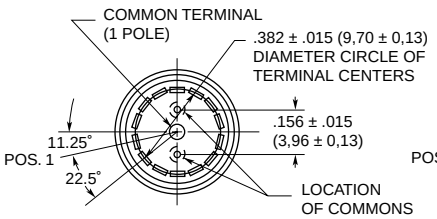


Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

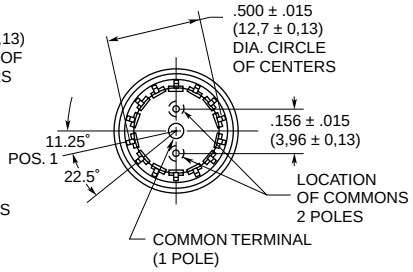
CIRCUIT DIAGRAMS AND REAR VIEWS: Solder Lug and PC Mount

Rear View

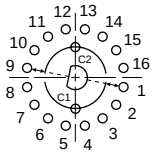
SOLDER LUG

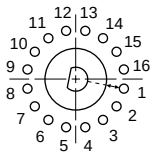


PC MOUNT

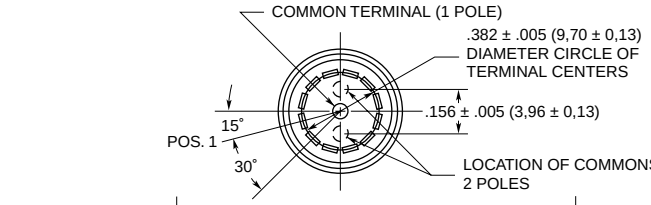


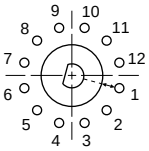
Circuit as Viewed From Shaft End

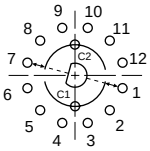


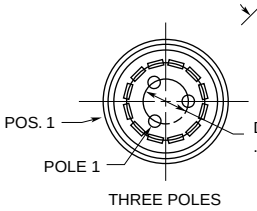


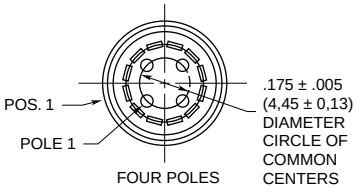
22.5° Angle of Throw



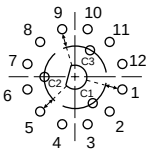


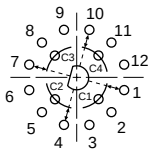




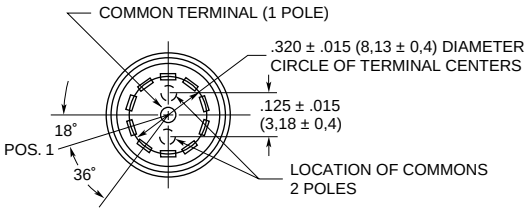


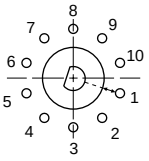
Dimension A, diameter circle of common centers, is .175 (4,45) for Solder Lug and .232 (5,89) for PC.

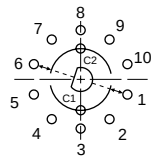




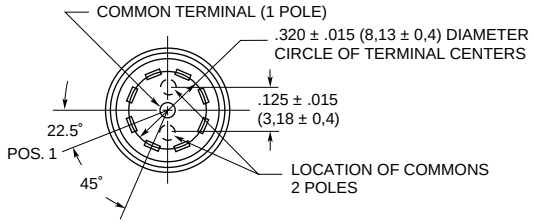
30° Angle of Throw

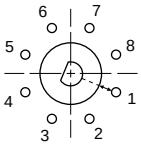


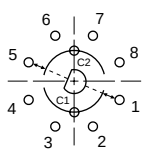




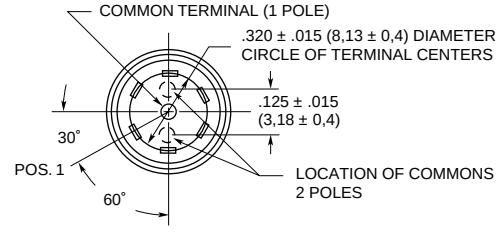
36° Angle of Throw

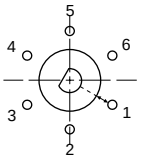


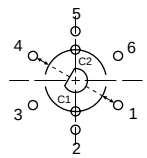




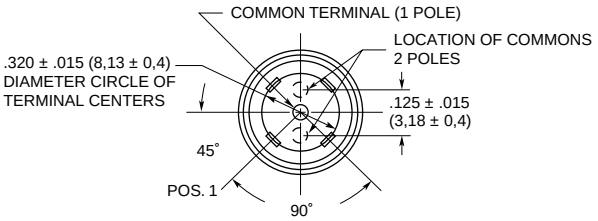
45° Angle of Throw

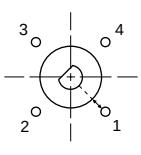


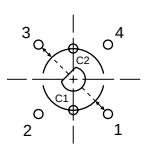




60° Angle of Throw







90° Angle of Throw

SPECIFICATIONS

Military Qualification

The dimensions for qualified switches are the same as those indicated in the drawings of standard switches. Switches with standard variations, such as shaft and bushing length, which do not affect switch performance, can be marked as qualified product. Contact Grayhill for complete information on variations.

36°, 45°, 60°, 90° (Series 50): The C and M style switches are qualified to MIL-S-3786/20. They include the following:

Solder lug or PC terminals
With or without panel seal

Series 50 qualified switches may be ordered by the 'M' number or by the Grayhill part number.

30° (Series 51): The C and M style switches are qualified to MIL-S-3786/35. They include the following:

Solder lug or PC terminals
With or without panel seal

Series 51 qualified switches may be ordered by the 'M' number or by the Grayhill part number.

Electrical Ratings

Life Expectancy: With the limiting criteria stated here, the Series 50 and 51 with non-shorting contacts will switch the following loads at atmospheric and reduced pressures for 25,000 cycles of operations. One cycle is 360° rotation clockwise and 360° return.

At 85°C, atmospheric pressure

200 mA,	28	Vdc resistive
150 mA,	115	Vac resistive
30 mA,	28	Vdc inductive
100 mA,	28	Vdc lamp load
75 mA,	220	Vac lamp load

At 25°C, reduced pressure (70,000 feet)

200 mA,	28	Vdc resistive
150 mA,	115	Vac resistive
75 mA,	220	Vac resistive

Contact Resistance: 20 milliohms maximum, (10 milliohms initially).
Insulation Resistance: 1,000 Mohms minimum between mutually insulated parts.
Voltage Breakdown: 600 Vac minimum between mutually insulated parts at standard atmospheric pressure.
Life Expectancy: Listed for the voltage source and make and break current levels. Contact Grayhill for more information if any of the following is true: the life limiting criteria are more critical than those listed; longer operation is required; a larger make and break current is required; the operating environment includes elevated temperatures or reduced pressures.
Contact Carry Rating: Switch will carry 6 amperes continuously with a maximum contact temperature rise of 20°C.

SPECIFICATIONS: Other

Additional Characteristics

Contact Type and Forces: Shorting or non-shorting wiping contacts with over 80 grams of contact force.
Shaft Flat Orientation: Flat opposite contacting position of pole number one (see circuit diagrams).
Terminals: Switches have the full circle of terminals, regardless of number of active position.
Stop Strength: 7.5 pound-inches minimum
Rotational Torque: 8–24 ounce-inches, depending on the number of poles.

Materials and Finishes

Switch Base: Thermoset
Detent Rotor: Nylon
Shaft, Stop Blades, Stop Arm, Thrust washer, and Retaining Ring: Stainless steel
Detent Balls: Steel, nickel-plated
Bushing: Zinc, cadmium-plated*
Detent and Contact Springs: Stainless steel
Common Ring: Brass, gold-plated over silver plate.
Terminals: Brass, gold-plated over silver plate and nickel plate
Rotor Contact: Precious metal alloy, gold-plated

Panel Seal: Silicone rubber
Shaft Seal: Fluorosilicone
Mounting Nuts: Brass, zinc-plated
Mounting Hardware: One mounting nut .089" thick by .375" across flats and one internal tooth lockwasher are supplied with the switch.

*Contact Grayhill for cadmium free part requirements.

PROCESS SEALED–Style T

Switch can be mounted on PC board with other components and subjected to wave soldering and conventional board cleaning techniques. No secondary wiring or soldering is necessary.

Bushing is o-ring sealed; epoxy potting seals the terminals and the rear of the switch. Designed for PC assembly, this sealing technique can also be applied to solder lug terminal switches. A bushing to panel seal can also be added to the process sealed versions. Military qualified versions are available, see ordering information.

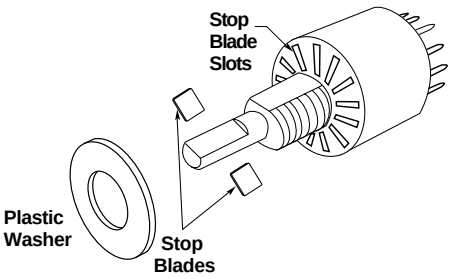
SUGGESTED ADJUSTABLE STOP SUBSTITUTION GUIDE

Fixed Stop Style	Adj. Stop Style Equivalent	Fixed Stop Style	Adj. Stop Style Equivalent
50A	50D	51A	50D
50C	50CD	51C	51CD
50CP	50CDP	51CP	51CDP
50M	50CD*	51M	51CD*
50MP	50CDP*	51MP	51CDP*
50P	50DP	51P	51DP
50S	50D*	51S	51D*
50SP	50DP*	51SP	51DP*

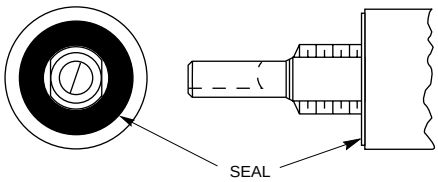
*Form fit and function equivalents, but not watertight sealed to the panel.

ADJUSTABLE STOPS: Style D

Adjustable stops permit the user to set and reset the number of positions per poles. Shown in the diagram, a plastic washer can be removed to reveal slots at the base of the bushing. Stop blades can be inserted into the appropriate slots to limit switch rotation. Positions per pole configuration can thus be changed to meet the needs of the application. Dimensions are the same as the fixed stop version, when plastic washer is in place. Most desirable for prototype work. Readily available from local distributor.

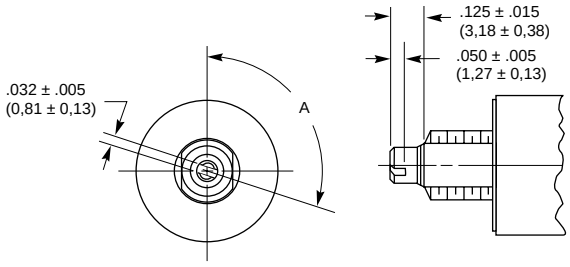


SHAFT AND PANEL SEAL: Styles S and M



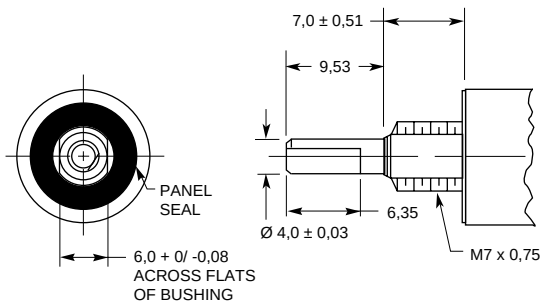
Shaft and panel seal switches are watertight to the panel. They are not totally process sealed like the Style "T". Panel is sealed by a gasket at the base of the bushing. Shaft is sealed by an O-ring inside the bushing. After mounting, seals do not alter switch dimensions. See Style "S" (standard switches) and Style "M" (military switches) in the Choices and Limitations chart.

SCREWDRIVER SLOTTED SHAFT: Style B



Form, fit and function equivalent to standard shaft switches. The dimensions shown have evolved as the most popular for this type of switch. See Style "B" in the Choices and Limitations chart. Previous users may have ordered these switches by a non-descriptive part number containing a "Y". Contact Grayhill, if in doubt about a cross-reference.

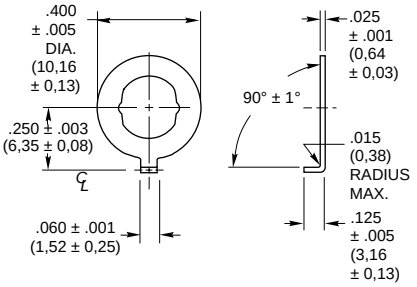
METRIC SHAFT AND BUSHING: Style E



Metric standard dimensions for the shaft and bushing are shown in the drawing. Other dimensions approximately the same as shown in dimensional drawing. Contact Grayhill for exact dimensions. All metric shaft and bushing switches have shaft and panel seals and are constructed of military grade materials. See Style "E" in the Choices and Limitations chart.

ACCESSORY: Non-Turn Washers

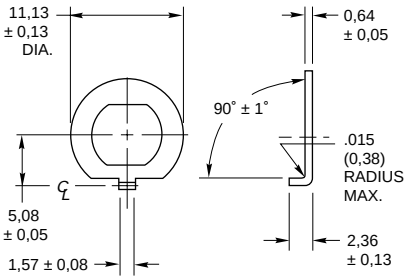
In Inches (and millimeters)



Part No. 50J1066

Cut round hole for the bushing and for the non-turn tab. Washer fits the double D bushing flats. Washer is sold only when accompanied by an order for a like number of switches. Washer is 302 stainless steel.

Dimensions are in millimeters



Part No. 71J1103

Designed to fit the double flatted bushing of the metric dimensioned bushing, this non-turn washer permits a round hole for the bushing and the tab while still preventing switch rotation. Washer is only sold when accompanied by a like number of switches. Washer is 302 stainless steel.

CHOICES AND LIMITATIONS: Series 50

A = Standard, 1/8" Shaft
B = Screwdriver Slot Shaft
C = Military, Without Panel Seal
D = Adjustable Stop (Adj. Stop)
E = Metric, 4mm Shaft
K = 1/4" Shaft
M = Military
P = PC Mount Terminals
S = Shaft/Panel Seal (S/P Seal)
T = Process Sealed

Standard Style

Series	Style Choices[1] Std., 1/8" Shaft	1/4" Shaft	Metric, 4mm Shaft	Terminals	Angle of Throw	Number of Poles	Number of Positions Per Pole	Shorting or Non-Shorting Contacts
50	A AT B BS BST BT D S ST	K KS KST KT	E ES EST ET	Solder Lug	36°	1 2	02 thru 10 02 thru 05	N or S N or S
					45°	1 2	02 thru 08 02 thru 04	N N
					60°	1 2	02 thru 06 02 or 03	N N
					90°	1 2	02 thru 04 02	N N
	BP BPT BSP BSPT DP P PT SP SPT	KP KPT KSP KSPT	EP EPT ESP ESPT	PC Mount	36°	1 2	02 thru 10 02 thru 05	N or S N or S
					45°	1 2	02 thru 08 02 thru 04	N N
					60°	1 2	02 thru 06 02 or 03	N N
					90°	1 2	02 thru 04 02	N N

Military Style[2]

Series	Style Choices Std., 1/8" Shaft	1/4" Shaft	Metric, 4mm Shaft	Terminals	Angle of Throw	Number of Poles	Number of Positions Per Pole	Shorting or Non-Shorting Contacts
50	C CB CBT CD CT M MB MBT MT	KM KMB KMBT KMT	EM EMB EMBT EMT	Solder Lug	36°	1 2	02 thru 10 02 thru 05	N or S N or S
					45°	1 2	02 thru 08 02 thru 04	N N
					60°	1 2	02 thru 06 02 or 03	N N
					90°	1 2	02 thru 04 02	N N
	CBP CBPT CDP CP CPT MBP MBPT MP MPT	KMBP KMBPT KMP KMPT	EMBP EMBPT EMP EMPT	PC Mount	36°	1 2	02 thru 10 02 thru 05	N or S N or S
					45°	1 2	02 thru 08 02 thru 04	N N
					60°	1 2	02 thru 06 02 or 03	N N
					90°	1 2	02 thru 04 02	N N

[1] Adjustable stop styles are available in 36°, 45°, 60° and 90° angles of throw only. The number of positions per pole are designated by substituting AJ when formulating the part number.
[2] Because MIL-S-3786/20 does not include PC terminals, military style, 36°, 45°, 60° and 90° angles of throw with PC terminals are not qualified, but have been tested to meet all required criteria. If a 30° angle of throw cannot be substituted in the design, contact Grayhill, Inc. Also contact Grayhill for the correct military marking of the process sealed switches.

Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

CHOICES AND LIMITATIONS: Series 51

A = Standard, 1/8" Shaft
B = Screwdriver Slot Shaft
C = Military, Without Panel Seal
D = Adjustable Stop (Adj. Stop)
E = Metric, 4mm Shaft
K = 1/4" Shaft
M = Military
P = PC Mount Terminals
S = Shaft/Panel Seal (S/P Seal)
T = Process Sealed

Standard Style

Series	Std., 1/8" Shaft	Style Choices[1,2] 1/4" Shaft	Metric, 4mm Shaft	Terminals	Angle of Throw	Number of Poles	Number of Positions Per Pole	Shorting or Non-Shorting Contacts
51	A B S	SEE BELOW	SEE BELOW	Solder Lug	22.5°	1 2	02 thru 16 02 thru 08	N or S N or S
	A AT B BS BST BT D S ST	K KS KST KT	E ES EST ET	Solder Lug	30°	1 2 3 4	02 thru 12 02 thru 06 02 thru 04 02 or 03	N or S N or S N or S N or S
	AP BP SP	KP KPT KSP KSPT	EP EPT ESP ESPT	PC Mount	22.5°	1 2	02 thru 16 02 thru 08	N or S N or S
	BP BPT BSP BSPT DP P PT SP SPT	KP KPT KSP KSPT	EP EPT ESP ESPT	PC Mount	30°	1 2 3 4	02 thru 12 02 thru 06 02 thru 04 02 or 03	N or S N or S N or S N or S

Military Style

Series	Std., 1/8" Shaft	Style Choices 1/4" Shaft	Metric, 4mm Shaft	Terminals	Angle of Throw	Number of Poles	Number of Positions Per Pole	Shorting or Non-Shorting Contacts
51	C CB CBT CD CT M MB MBT MT	KM KMB KMBT KMT	EM EMB EMBT EMT	Solder Lug	30°	1 2 3 4	02 thru 12 02 thru 06 02 thru 04 02 or 03	N or S N or S N or S N or S
	CBP CBPT CDP CP CPT MBP MBPT MP MPT	KMBP KMBPT KMP KMPT	EMBP EMBPT EMP EMPT	PC Mount	30°	1 2 3 4	02 thru 12 02 thru 06 02 thru 04 02 or 03	N or S N or S N or S N or S

[1] Contact Grayhill if the process sealed style (designation T) is required in a 22.5° angle of throw.
[2] Adjustable stop styles are available in 30° angles of throw only. The number of positions per pole are designated by substituting AJ when formulating the part number.

STANDARD OPTIONS

Not available thru Distributors.
Intermixing of shorting and non-shorting contacts, metric styles, and 1/4" diameter shafts. Contact Grayhill.

Shaft grounding to meet the specifications of MIL-S-3786.

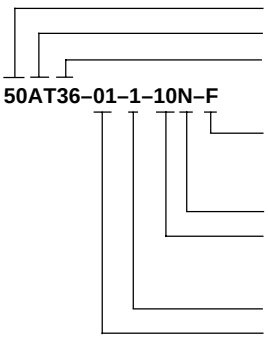
ACCESSORIES

Control knobs available, see page E-39.

ADDITIONAL FEATURES

Economy keylock switch, isolated position, spring return, and coded switches are available in similar series. See Keylock and Special Function Rotary Switch sections.

ORDERING INFORMATION: Series 50

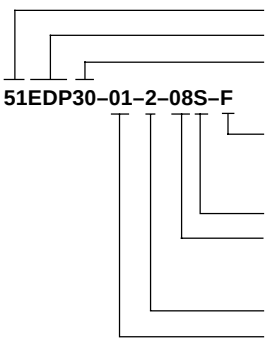


Series: Series 50 (36°, 45°, 60°, or 90°)
Style*: Letters from Choices Chart
Angle of Throw: 36, 45, 60, or 90

Stop Arrangement: *Needed only with 1 pole switches with maximum positions.* Leave blank for continuous rotation; add F for fixed stop.
Type of Contacts: N = Non-shorting, S = Shorting
Positions Per Pole: 02 as a minimum to the maximum allowable for the angle of throw and the number of poles per the Choices Chart. Use Letters AJ in this location if adjustable stop switch is ordered.
Poles per Deck: See chart
Number of Decks: 01 only

* All rotary switches that are required to have military designated markings and testing adhering to MIL-3786 are to be ordered by specifying the military part number identified on the appropriate slash sheet.

ORDERING INFORMATION: Series 51



Series: Series 51 (30°; 22.5°)
Style*: Letters from Choices Chart
Angle of Throw: Use 22 (for 22.5°), 30

Stop Arrangement: *Needed only with 1 pole switches with maximum positions.* Leave blank for continuous rotation; add F for fixed stop.
Type of Contacts: N = Non-shorting, S = Shorting
Positions Per Pole: 02 as a minimum to the maximum allowable for the angle of throw and the number of poles per the Choices Chart. Use Letters AJ in this location if adjustable stop switch is ordered.
Poles per Deck: See chart
Number of Decks: 01 only

* All rotary switches that are required to have military designated markings and testing adhering to MIL-3786 are to be ordered by specifying the military part number identified on the appropriate slash sheet.

Available from your local Grayhill Distributor.
For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

SERIES 56

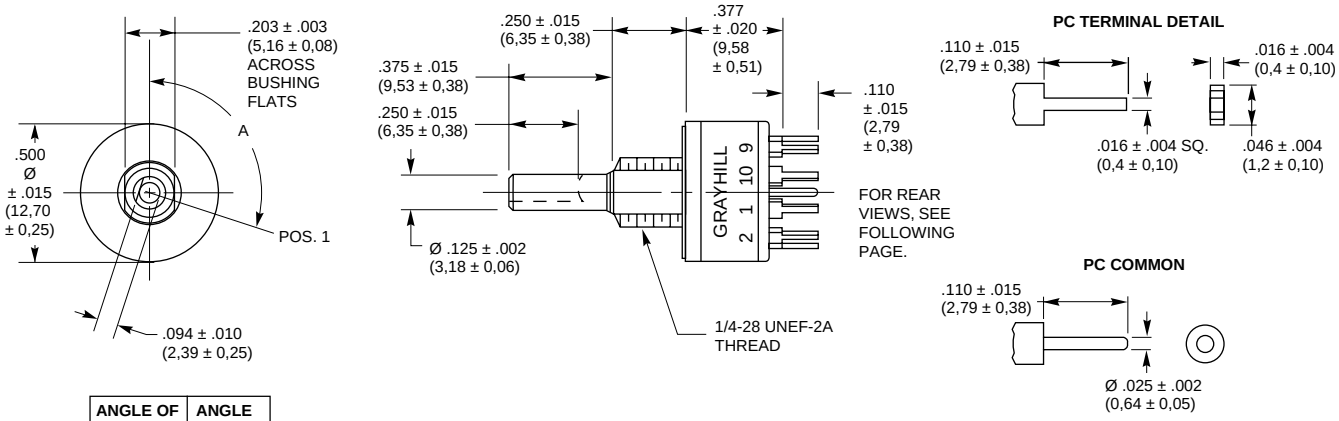
0.5" Diameter, 200mA,
.355" Behind Panel

FEATURES

- Requires Minimum Distance Behind the Panel
- Adjustable Stop Types Provide Prototypes Immediately
- Industrial Quality, Economically Priced

DIMENSIONS In inches (and millimeters)

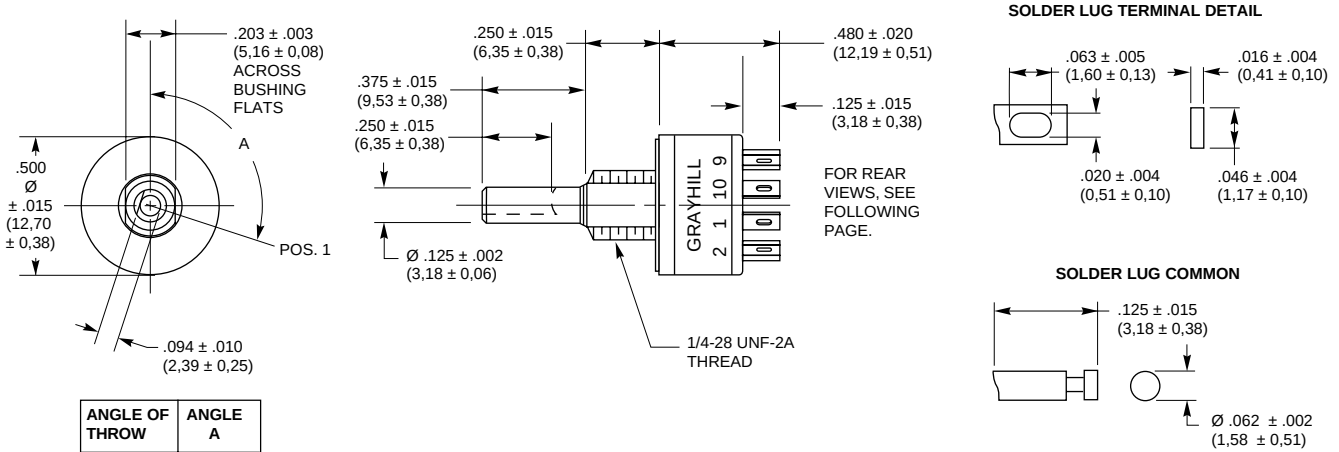
PC Mount Style



ANGLE OF THROW	ANGLE A
30°	105°
36°	108°

Grayhill part number and date code marked on label.
Customer part number marked on request.

Solder Lug Style

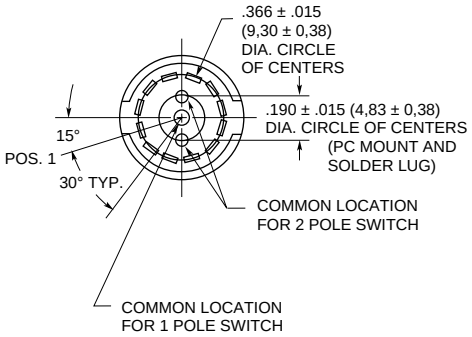


ANGLE OF THROW	ANGLE A
30°	105°
36°	108°

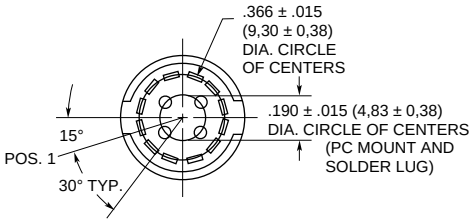
Grayhill part number and date code marked on label.
Customer part number marked on request.

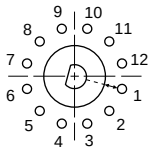
CIRCUIT DIAGRAMS AND REAR VIEWS: PC Mountable AND Solder Lug Terminals

Rear View

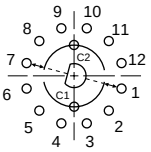


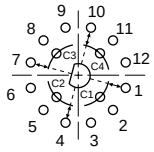
Circuit as Viewed From Shaft End

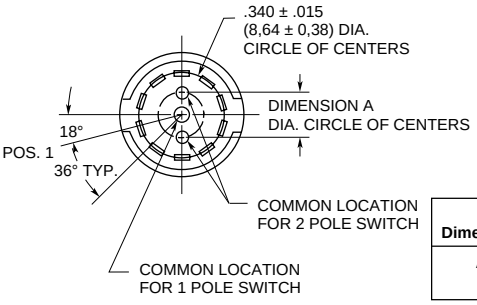




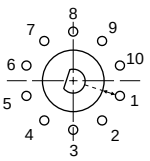
30° Angle of Throw

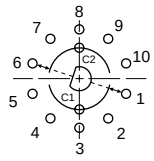






Dimension	PC Mount Terminals	Solder Lug Terminals
A	.184 ± .015 (4,67 ± 0,38)	.126 ± .015 (3,20 ± 0,38)



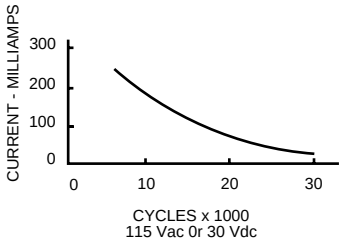


36° Angle of Throw

SPECIFICATIONS

Electrical Ratings

Chart shown for non-shorting (break before make) contacts, resistive load.



One cycle is 360° rotation clockwise and 360° return. The data for the curve was measured at sea level, 25°C and 68% relative humidity with the life limiting criteria which follows.

Contact Resistance: 100 milliohms maximum, (15 milliohms initially).

Insulation Resistance: 10,000 Mohms minimum between mutually insulated parts (50,000 Mohms initially).

Voltage Breakdown: 600 Vac minimum between mutually insulated parts at standard atmospheric pressure.

Life Expectancy: As determined from the load-life curve for the current to be switched. Contact GRAYHILL for more information if any of the following is true: the life limiting criteria are more critical than those listed; longer operation is required; a larger make and break current is required; the operating environment includes elevated temperatures or reduced pressures.

Contact Carry Rating: Switch will carry 6 amperes continuously with a maximum contact temperature rise of 20°C.

Additional Characteristics

Contact Type and Forces: Shorting or non-shorting wiping contacts with over 25 grams of contact force.

Shaft Flat Orientation: Flat opposite contacting position of pole number one (see circuit diagrams).

Terminals: Switches have the full circle of terminals, regardless of number of active positions.

Stop Strength: 7.5 lb-in. minimum

Rotational Torque: 3.5 to 9 oz-in. (21-53 mN-m), depending on the number of poles.

Bushing Mounting: Required for switches with stops, and recommended for switches without stops.

Meets MIL-S-3786 for:

High and medium shock; Vibration (10 to 2,000 Hz); Thermal shock (-65° to 85 ° C); Salt spray; Explosion; Stop strength (7.5 in-lbs. minimum (.85 N-m); Terminal strength; Sealed styles withstand water pressure of 15 PSI minimum (103 KPa) without leakage.

Materials and Finishes

Housing: Zinc die cast, zinc-plated with chromate treatment.

Mounting Nut: Brass, zinc-plated with chromate treatment.

Lockwasher: Spring steel, zinc-plated with chromate treatment.

Panel Seal: Silicone rubber

Shaft and Stop Arm: Zinc die cast, zinc-plated with chromate treatment.

Retaining Ring: 302 Stainless steel, passivated

Shaft Seal: Silicone rubber

Stop Pins: 303 Stainless steel, passivated

Detent Rotor: Molded thermoplastic

Detent Spring: Tinned music wire

Detent Balls: Steel, nickel-plated

Contact Spring: Stainless steel, passivated

Rotor Contact: Brass, silver over nickel plate

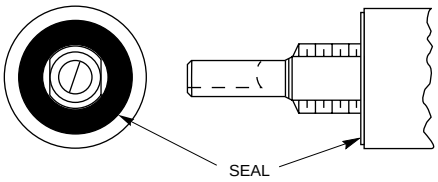
Common Ring: Brass, gold over silver over nickel plate

Terminals: Brass, gold over silver over nickel plate

Switch Base: Molded thermoset plastic

Mounting Hardware: One mounting nut .089" thick by .375" across flats and one internal tooth lockwasher are supplied with the switch.

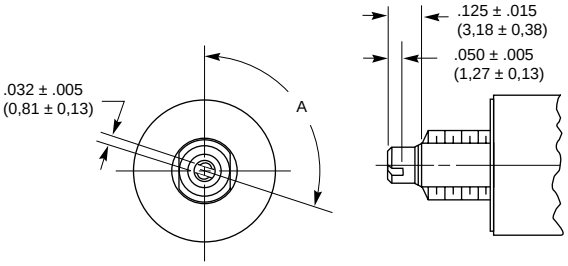
SHAFT AND PANEL SEAL: Style S



Panel is sealed by an O-ring at the base of bushing. Shaft is sealed by an O-ring inside the bushing. After the switch is mounted, seals do not alter the dimensions of the unsealed style.

Shaft and Panel Seal

SCREWDRIVER SLOTTED SHAFT: Option

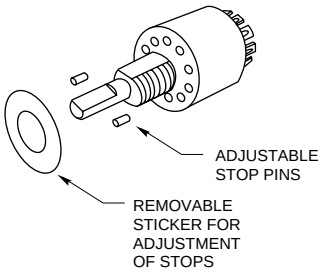


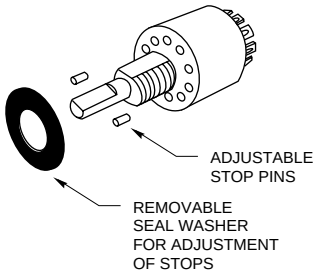
Series 56 rotary switches are available with a screwdriver slotted shaft with dimensions as shown. Available in the styles, angles of throw and pole/positions combinations shown in the choice and limitations chart.

Screwdriver Slotted Shaft

ADJUSTABLE STOP SWITCHES

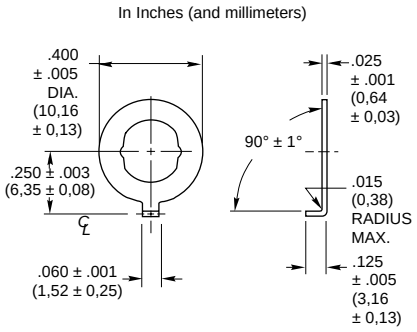
Two stop pins and an adhesive backed sticker or seal washer are provided. Sticker is temporarily removed to locate stop pins as desired to limit the shaft rotation. All dimensions are identical to the fixed stop switch counterpart.





Adjustable Stop

ACCESSORY: Non-Turn Washer



Part No. 50J1066

Cut round hole for the bushing and for the non-turn tab. Washer fits the double D bushing flats. Washer is sold only when accompanied by an order for a like number of switches. Washer is 302 stainless steel.

SUGGESTED ADJUSTABLE STOP SUBSTITUTION GUIDE

Fixed Stop Style	Adjustable Stop Style Equivalent	Fixed Stop Style	Adjustable Stop Style Equivalent
56A	56D	56B	56BD
56S	56SD	56BS	56BSD
56P	56DP	56BP	56BDP
56SP	56SDP	56BSP	56BSDP

CHOICES AND LIMITATIONS: Series 56

A = Standard, 1/8" Shaft
B = Screwdriver Slot Shaft
D = Adjustable Stop (Adj. Stop)
P = PC Mount Terminals
S = Shaft/Panel Seal (S/P Seal)

Style Designation	FEATURES: Solder Lug Terminals	PC Mount Terminals	Shaft/Panel Seal	Adjustable Stops[1]	Screwdriver Slotted Shaft Equivalent	Angle Of Throw	Number Of Poles	Number Of Positions Per Pole	Shorting Or Non-Shorting Contacts
A	X				B	30°	1 2 4	02 thru 12 02 thru 06 02 or 03	N or S N or S N or S
S	X		X		BS				
P		X			BP				
SP		X	X		BSP				
D	X			X	BD	36°	1 2	02 thru 10 02 thru 05	N or S N or S
SD	X		X	X	BSD				
DP		X		X	BDP				
SDP		X	X	X	BSDP				

[1] Adjustable stop versions allow selection of 2 positions to the maximum number of positions per pole.

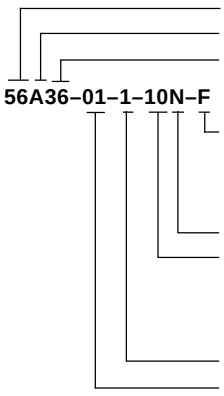
ACCESSORIES

Control knobs available, see page E-39.

STANDARD OPTIONS

Available from your local Grayhill Distributor
For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill. Not available thru Distributors when Intermixing of shorting and non-shorting contacts. Contact Grayhill.

ORDERING INFORMATION



Series
Style: Letters from Choices Chart
Angle of Throw: 30 or 36°

Stop Arrangement: The suffix C or F must be added to a one pole per deck switch with the maximum number of positions to indicate continuous rotation (C) or fixed stops (F) between position 1 and the last position. Leave blank if not applicable.
Type of Contacts: N = Non-shorting, S = Shorting
Positions Per Pole: 02 as a minimum to the maximum allowable for the angle of throw and number of poles per the Choices Chart. Use the letters AJ in this location if adjustable stop switch is to be ordered.
Poles per Deck: Limited by angle of throw. See chart
Number of Decks: 01 only

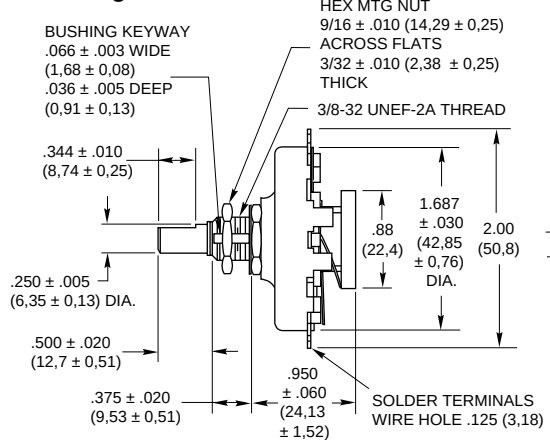
Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

SERIES 19
2" Diameter, 15 Amp

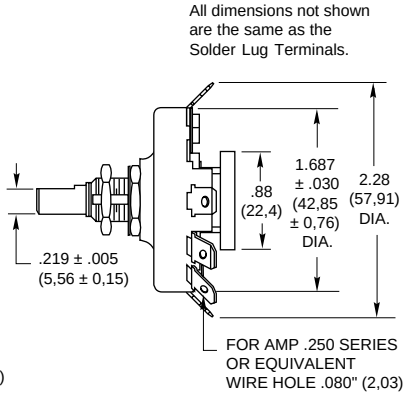
FEATURES
- UL Recognized
- Rugged Construction
- Choice of Termination

DIMENSIONS In inches (and millimeters)

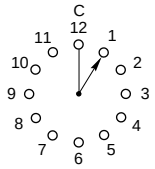
Solder Lug Terminals



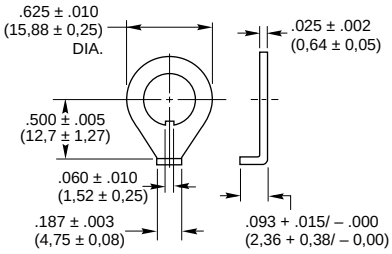
'Faston' Terminals



Circuit Diagram



Non-Turn Washer Detail



Grayhill part number and date code marked on label. Customer part number marked on request.

SPECIFICATIONS

Electrical Rating

Rated: UL Recognition: File Number E35289
15 Amps, 120 Vac, non-inductive load.
One Amp, 120 Vdc, non-inductive load.
Additional Grayhill Rating: 7.5 Amps, 220 Vac, non-inductive load.
This rating is based on the following criteria:
Overload—50 operations at 125% rated ac load and 150% rated DC load.
Endurance—6000 operations at rated load with 900 Vac dielectric strength before and after test.
Temperature Rise—Not to exceed 30°C when carrying rated ac load after endurance test.
Contacts will carry 20 Amps at 115 volts AC with 30°C maximum temperature rise.
Contact Resistance: (Measured at 2 Vdc and approximately 100 mA) for new switch approximately 10 milliohms.
Insulation Resistance: Approximately 100,000 Mohms. Between mutually insulated parts.
Voltage Breakdown: Approximately 2500 Vac between mutually insulated parts.

Materials and Finishes

Rotor Contact: Silver alloy
Stator Contact: Silver alloy
Shaft: 303 Stainless steel
Stop Rivet: Steel, cadmium-plated
Mounting Bushing: Brass, cadmium-plated
Base and Drive Hub: Heat resistant, electrical grade phenolic.
Detent Mechanism: Brass, silver-plated
"Faston" Terminal: Brass, silver-plated
Solder Terminal: Brass, silver-plated
Mounting Hardware: One mounting nut $^{9}/_{16}$" across flats, $^{3}/_{32}$" thick and one non-turn washer (see detail) are supplied with each switch.

Additional Characteristics

Single Pole, Single Deck: 2 to 11 positions plus common 30° Indexing.
Contacts: Non-shorting type
Stops: A rivet provides the fixed stop on all switches. Minimum number of positions is 2, and maximum is 11. Terminal 12, the common, is isolated from rotation.
Rotational Torque: 30 to 75 ounce-inches on a new switch. Approximately 22 ounce-inches after 25,000 cycles of operation.
Contact Force: Approximately 12 ounces

ACCESSORIES

Screw Terminal Adapter

Spring loaded, plug-in adapters for 'Faston' Terminals provide excellent mechanical fit and electrical contact. Adapter material is brass tin-plated. The terminal adapters are available with a 6-32 thread (-1) or 8-32 thread (-2). A 1/4" panhead screw is provided as part of the adapter.

Part No. SC906-1 .....6-32 Thread
Part No. SC906-2 .....8-32 Thread

Non-Turn Washer

Brass, cadmium-plated washer, detailed above may be purchased as a separate item.
Part No. 19C1014.

Control Knobs

See page E-39.

ORDERING INFORMATION

Part Numbers: Designate as follows, using the 2 digits after the dash to indicate the number of positions.
For Faston Terminal:
Use 19101-02UL through 19101-11UL
For Solder Terminal:
Use 19001-02UL through 19001-11UL
Specials: Not available through Distributors. For special shafts, bushings, etc. contact Grayhill.

Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

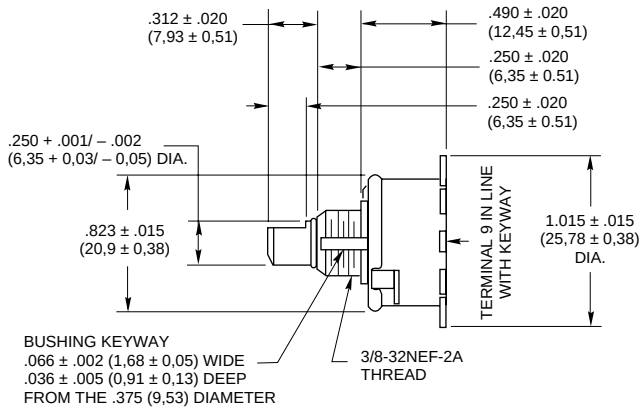
SERIES 5000

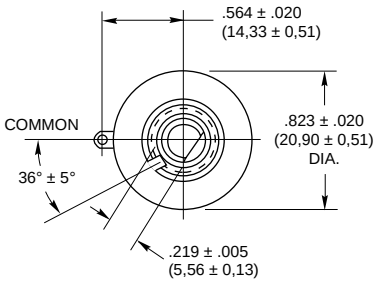
1" Diameter, 1 Amp, .
470" Behind Panel

FEATURES

- High Quality at a Low Price
- High Contact Force Provides Stable Electrical and Mechanical Operation
- Proven Reliability in Thousands of Applications

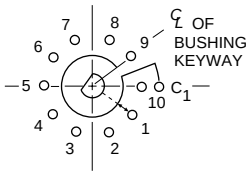
DIMENSIONS In inches (and millimeters)





Circuit Diagram

(Switch is viewed from shaft end.)
Note: Common Terminal is located above Base Terminal 10.



ONE POLE

Grayhill part number and date code marked on label. Customer part number marked on request.

SPECIFICATIONS

Electrical Rating

Rated: To make and break the following loads: 1 amp at 115 Vac resistive; 0.5 amp at 220 Vac resistive; 1/4 amp, 115 Vac inductive; 1/50 amp, 115 Vdc inductive, 1/10 amp, 6 to 28 Vdc inductive; 1/10 amp, 115 Vdc resistive; 1 amp, 6 to 28 Vdc resistive; to carry 10 amps continuously.
Contact Resistance: 10 milliohms initial. After 25,000 cycles of operation 20 milliohms maximum.
Insulation Resistance: 50,000 Mohms minimum initially
Voltage Breakdown: 1,000 Vac (500 Vac, or better after most environmental tests).
Life Expectancy: 100,000 mechanical cycles of operation normally.
NOTE: Actual life is determined by a number of factors, including electrical loading, rate of rotation, and environment, as well as maximum contact resistance, minimum insulation resistance, and minimum voltage breakdown required at the end of life.

Materials and Finishes

Switch Base: Melamine per MIL-M-14 (ASTM-D-5948)
Cover, Stop Washers, Bushing and Nut: Brass, cadmium-plated
Retaining Rings, Stop Arms, and Thrust Washers: Stainless steel, passivated
Shaft: Stainless steel, passivated
Terminals (except common): Brass, lead-tin plated, and fused
Rotor Contact: Phosphor bronze, silver-plated .0003" minimum
Stator (Base) Contact: Brass, silver-plated .0003" minimum
Common Plate: Brass, silver-plated .0003" minimum
Rotor Mounting Plate: Nylon fabric-based laminated Phenolic per MIL-T-1 5047.

Additional Characteristics

Stop Strength: 12 in-lbs
Rotational Torque: 12 in-ozs.
Contacts: Shorting or non-shorting wiping contacts with over 500 grams contact force.
Shaft Flat Orientation: Opposite point of contact (See circuit diagram.)
Environmental: These switches have passed the following environmental testing: Altitude and temperature; 100 hour salt spray; Vibration 10 to 500 cps; Shock 30-G; Humidity; Fungus.
Detent: A formed spring operating against a formed wave washer.

STANDARD OPTIONS

Special Terminals
Not available through distributors.
See page F-9.

ACCESSORIES

Control knobs available, see page E-39.

ORDERING INFORMATION

The Series 5000 switches are single deck, one pole switches of two to 10 positions. Ten position switches have continuous rotation. Ten position fixed stop switches are available by special order.

The part number is 05001-XX with the number of positions required (02,03, etc.) listed in place of the XX. Complete part number by adding N for non-shorting contacts or S for shorting contacts.

Available from your local Grayhill Distributor.
For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

SERIES 24

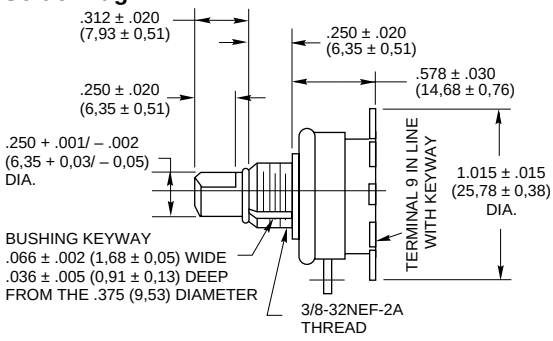
1" Diameter, 1 Amp, .580" Behind Panel

FEATURES

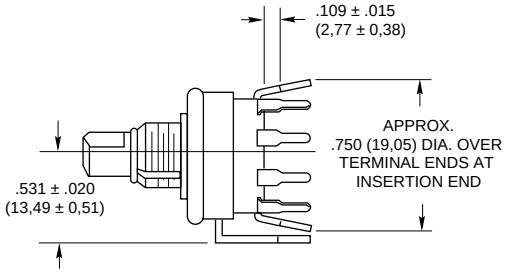
- Positive Detent Provides Operator Feedback
- Stainless Steel or Plastic Shaft Option
- Unsurpassed Performance in Numerous Applications

DIMENSIONS In inches (and millimeters)

Solder Lug

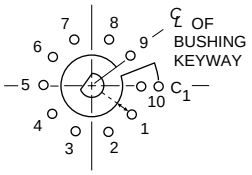


PC Mountable

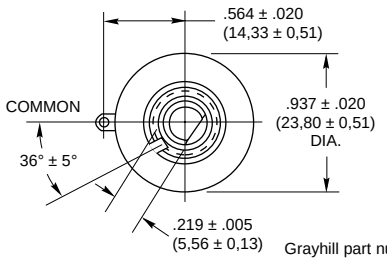


Circuit Diagram

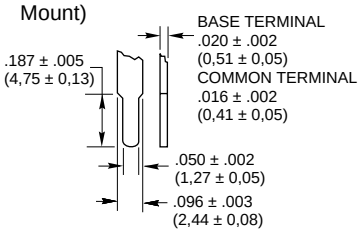
Solder Lug and PC Mount
(Switch is viewed from shaft end.)
Note: Common Terminal is
located above Base Terminal 10.



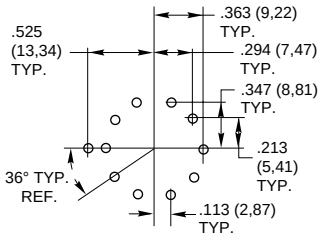
ONE POLE



Typical Terminal Detail (PC Mount)



Terminal Location (PC Mount)



Grayhill part number and date code marked on label. Customer part number marked on request.

SPECIFICATIONS

Electrical Rating

Rated: To make and break the following loads: 1 amp at 115 Vac, resistive; 0.5 amp at 220 Vac resistive; 1/4 amp, 115 Vac inductive; 1/50 amp, 115 Vdc inductive; 1/10 amp, 6 to 28 Vdc inductive; 1/10 amp, 115 Vdc resistive; 1 amp, 6 to 28 Vdc resistive; to carry 10 amps continuously.
Contact Resistance: 10 milliohms initial. After 25,000 cycles of operation 20 milliohms maximum.
Insulation Resistance: 50,000 Mohms minimum initially
Voltage Breakdown: 1,000 Vac, (500 Vac, or better after most environmental tests).
Life Expectancy: 100,000 mechanical cycles of operation normally. NOTE: Actual life is determined by a number of factors, including electrical loading, rate of rotation, and environment, as well as maximum contact resistance, minimum insulation resistance, and minimum voltage breakdown required at the end of life.

Materials and Finishes

Switch Base: Melamine per (MIL-M-14) ASTM-D-5948
Cover, Stop Washers, Bushing and Nut: Brass, cadmium-plated
Contacts: Both shorting and non-shorting wiping contacts have over 300 grams contact force.
Retaining Rings, Stop Arms, and Thrust Washers: Stainless steel, passivated
Detent Balls: Steel, nickel-plated
Shafts: Stainless steel, passivated or plastic
Detent: Opposing spring and ball in a hill and valley raceway.
Detent Springs: Tinned music wire
Terminals (except common): Brass, lead-tin plated, and fused.
Rotor Contact: Steel shaft version—phosphor bronze, silver-plated .0003" minimum. Plastic shaft version—silver alloy.
Stator (Base) Contact: Brass, silver-plated .0003" minimum
Common Plate, including Solder Lug or PC Tab: Brass, silver-plated .0003" minimum
Rotor Mounting Plate: Nylon fabric-based laminated phenolic per MIL-T-15047

Additional Characteristics

Stop Strength: 12 in-lbs
Rotational Torque: 12 in-ozs
Shaft Flat Orientation: Opposite point of contact (See circuit diagram.)
Environmental: These switches have passed the following environmental testing: Altitude and temperature, 100 hour salt spray; Vibration 10 to 500 cps; Shock 30-G; Humidity; Fungus.
PC Mount: PC Switches are furnished with 10 base terminals for mounting purposes.

STANDARD OPTIONS

Special Terminals
RFI Grounding
Not available through distributors.
See page F-9.

ACCESSORIES

Control knobs available, see page E-39.

ORDERING INFORMATION

Switches are single deck, one pole switches of 2 to 10 positions. They have plastic or steel shaft, with solder lug or PC terminals, with either shorting or non-shorting contacts (plastic shaft PC mount in non-shorting only). Ten position switches have continuous rotation; fixed stop switch with a metal shaft is available by special order. Base part numbers are as follows:
Lug style, steel shaft: 24001-X*
Lug style, plastic shaft: 24B36-01-1-X*
PC style, steel shaft: 24878-X*
PC style, plastic shaft: 24P36-01-1-X*

The X is replaced with the number of positions required (02, 03, etc.) Complete the part number by adding N for non-shorting contacts or S for shorting contacts.

Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

MULTI-DECK ROTARY SWITCHES

- Maximal Circuitry Possibilities
- Wide Range of Sizes and Ratings
- High Quality, Enclosed Switches Including Military Types
- Low Current, Wiping Contacts
- High Current UL Types

SERIES 71

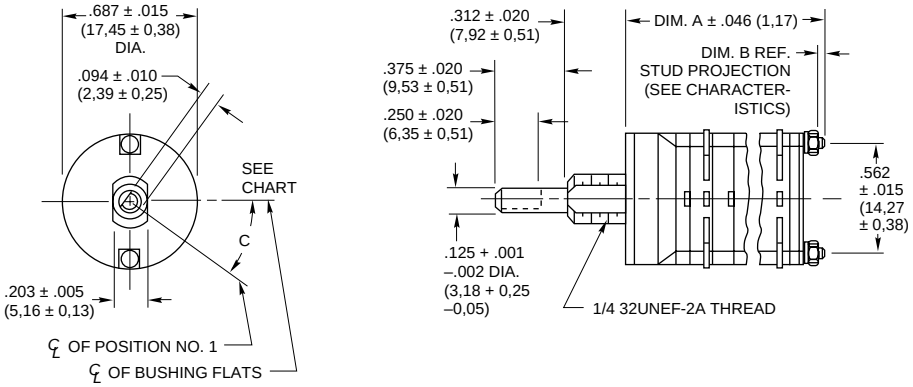
.5-.75" Diameter, 1/4 Amp,
12 Max. Positions/Pole

FEATURES

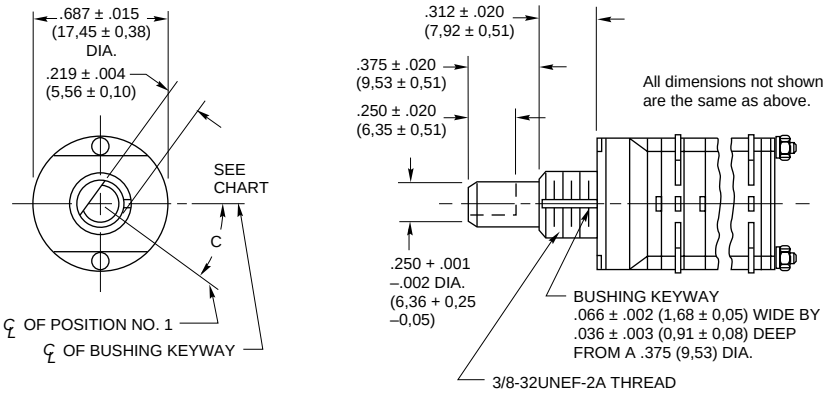
- Performance and Value Leader
- Molded-In Position Terminals
- Choice of Shaft/Bushing Diameters
- 30° and 36° Angles of Throw

DIMENSIONS: Standard and Military In inches (and millimeters)

0.125" Diameter Shaft–Styles A and MA (and sealed versions)



0.250" Diameter Shaft–Styles B and MB (and sealed versions)



No. of Decks	Dimension A	Dimension B	Approx. Weight Grams	No. of Decks	Dimension A	Dimension B	Approx. Weight Grams
1	.761 (19,33)	.031 (0,79)	14	7	2.349 (59,66)	.312 (7,92)	26
2	.979 (24,87)	.031 (0,79)	16	8	2.567 (65,20)	.312 (7,92)	28
3	1.197 (30,40)	.031 (0,79)	18	9	2.785 (70,74)	.312 (7,92)	30
4	1.415 (35,94)	.031 (0,79)	20	10	3.003 (76,28)	.312 (7,92)	32
5	1.633 (41,48)	.031 (0,79)	22	11	3.221 (81,81)	.312 (7,92)	34
6	2.131 (54,13)	.312 (7,92)	24	12	3.439 (87,35)	.312 (7,92)	36

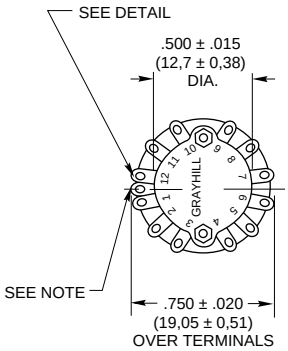
Angle C is 15° in 12 position switches and 36 ° in 10 position switches.

Grayhill part number and date code marked on detent cover label. Customer part number marked on request. Military part number marked when required.

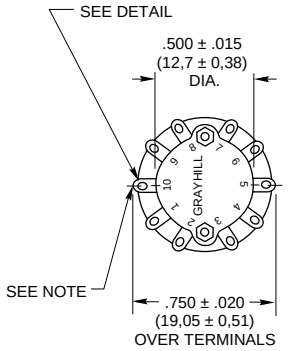
Rear Views–Style A, B, MA, MB (and sealed versions)

30° and 36° Angle of Throw may be interposed on either shaft diameter.

30° Angle of Throw

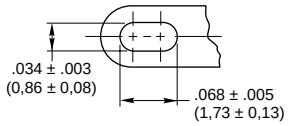


36° Angle of Throw



Note: Common location for a single pole per deck switch. For common location on multipole switches see circuit diagrams.

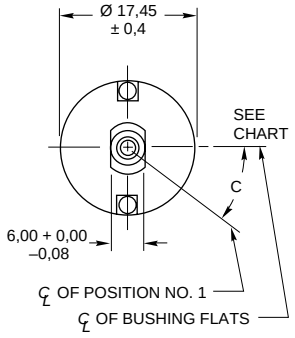
Terminal Detail

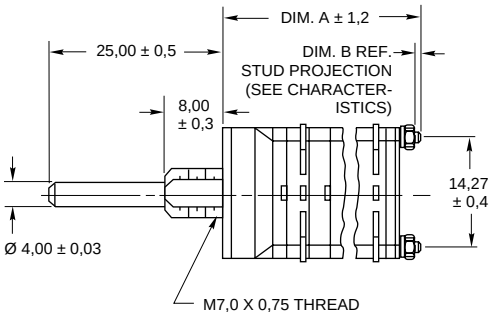


See pages F-39 through F-44 for specifications, accessories and ordering information.

DIMENSIONS: Metric All dimensions are in millimeters

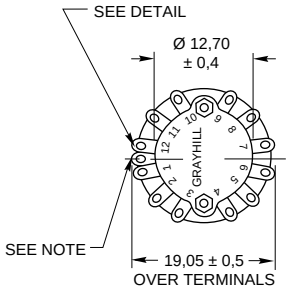
4mm Diameter Shaft–Style E and ES





Rear Views

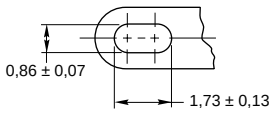
30° Angle of Throw



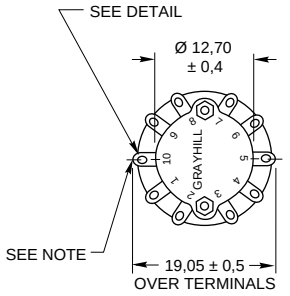
No. of Decks	Dim. A	Dim. B	Approx. Weight Grams
1	19,33	0,79	12
2	24,87	0,79	14
3	30,40	0,79	16
4	35,94	0,79	18
5	41,48	0,79	20
6	54,13	7,92	22
7	59,66	7,92	24
8	65,20	7,92	26
9	70,74	7,92	28
10	76,28	7,92	30
11	81,81	7,92	32
12	87,35	7,92	34

Angle C is 15° in 12 position switches and 36° in 10 position switches.

Terminal Detail



36° Angle of Throw



Note: Common location for a single pole per deck switch. For common location on multipole switches see circuit diagrams.

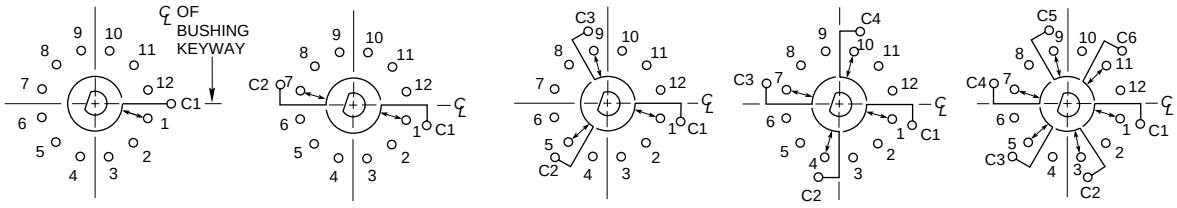
Grayhill part number and date code marked on detent cover label. Customer part number marked on request.

CIRCUIT DIAGRAMS: Standard, Military and Metric

Switch is Viewed From Shaft End and Shown in Position No. 1.

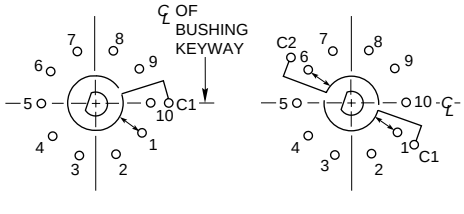
Note: All common terminals are located above base terminals as shown.

30° Angle of Throw



ONE POLE | TWO POLE | THREE POLE | FOUR POLE | FIVE OR SIX POLE

36° Angle of Throw



ONE POLE | TWO POLE

See pages F-39 through F-44, and F-63 for specifications, accessories and ordering information.

SERIES 71

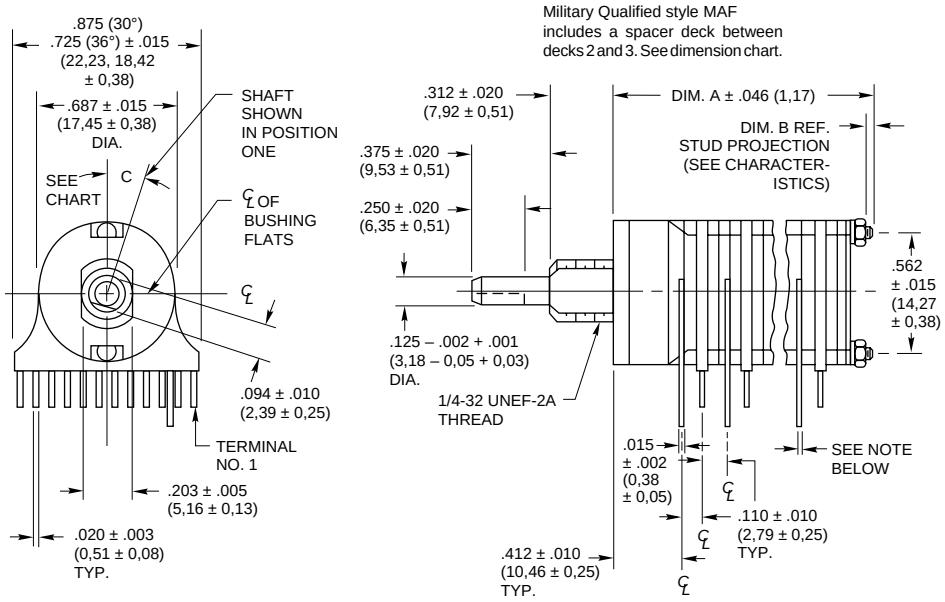
.5-.75" Diameter, 1/4 Amp, 12 Max. Positions/Pole, PC Mount

FEATURES

- Terminals From One Side
- Minimum Board Footprint
- Choice of Shaft/Bushing Diameters
- 30° and 36° Angles of Throw

DIMENSIONS: Standard and Military In inches (and millimeters)

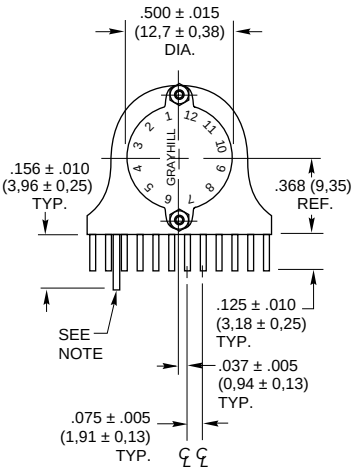
0.125" Diameter Shaft: Styles AF and MAF (and sealed versions)



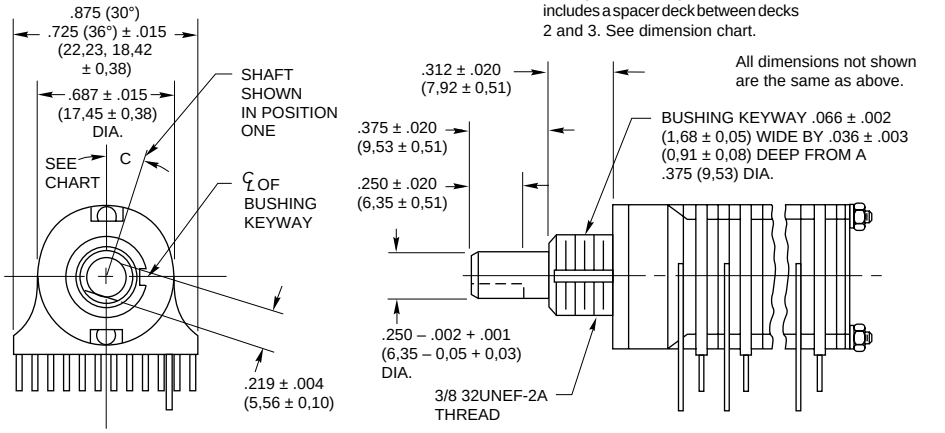
Rear Views: Styles AF, BF, MAF, MBF (and sealed versions)

30° and 36° Angle of Throw may be interposed on either shaft diameter.

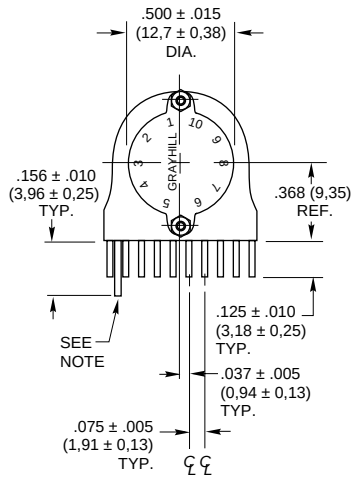
30° Angle of Throw



0.250" Diameter Shaft: Styles BF and MBF (and sealed versions)



36° Angle of Throw



No. of Decks	Dimension A Standard Style	Dimension A Military Style	Dimension B All Styles	Approx. Weight Grams	No. of Decks	Dimension A Standard Style	Dimension B Standard Style	Approx. Weight Grams
1	.761 (19,33)	.761 (19,33)	.031 (0,79)	12	7	2.349 (59,66)	.312 (7,92)	24
2	.979 (24,87)	.979 (24,87)	.031 (0,79)	14	8	2.567 (65,20)	.312 (7,92)	26
3	1.197 (30,40)	1.415 (35,94)	.031 (0,79)	16*	9	2.785 (70,74)	.312 (7,92)	28
4	1.415 (35,94)	1.633 (41,49)	.031 (0,79)	18*	10	3.003 (76,28)	.312 (7,92)	30
5	1.633 (41,48)	N.A.	.031 (0,79)	20	11	3.221 (81,81)	.312 (7,92)	32
6	2.131 (54,13)	N.A.	.312 (7,92)	22	12	3.439 (87,35)	.312 (7,92)	34

Note: Common location for a single pole per deck switch. For common location on two pole switches see circuit diagrams.

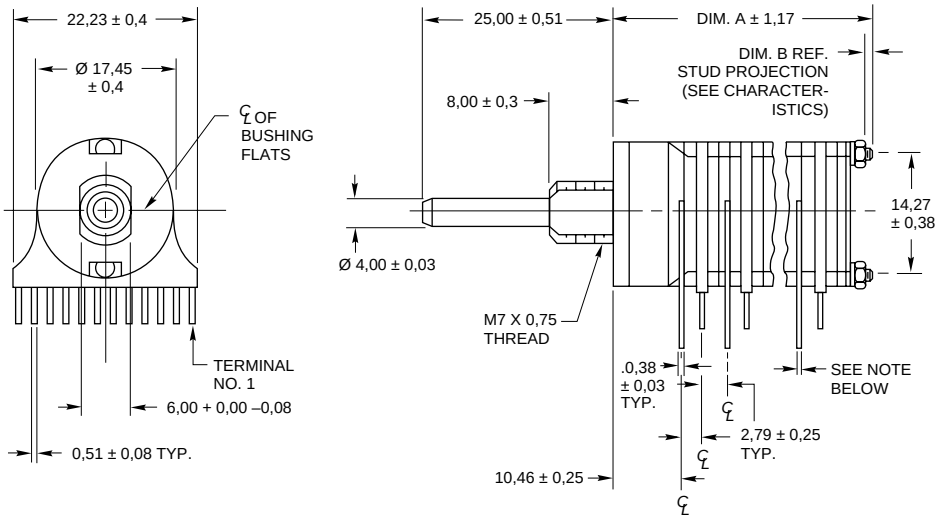
Angle C is 15° in 12 position switches and 18° in 10 position switches.
*Military style switch is 18 grams for 3 decks and 20 grams for 4 decks.

Grayhill part number and date code marked on detent cover label. Customer part number marked on request. Military part number marked when required.

Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

DIMENSIONS: Metric All dimensions are in millimeters

4mm Diameter Shaft: Style EF and ESF



No. of Decks	Dim. A	Dim. B	Approx. Weight Grams	No. of Decks	Dim. A	Dim. B	Approx. Weight Grams
1	19,33	0,79	12	7	59,66	7,92	24
2	24,87	0,79	14	8	65,20	7,92	26
3	30,40	0,79	16	9	70,74	7,92	28
4	35,94	0,79	18	10	76,28	7,92	30
5	41,48	0,79	20	11	81,81	7,92	32
6	54,13	7,92	22	12	87,35	7,92	34

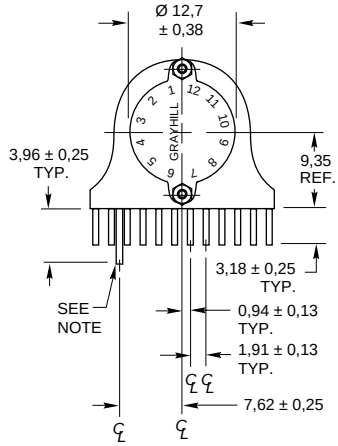
Note: Common location for a single pole per deck switch. For common location on two pole switches see circuit diagrams.

Grayhill part number and date code marked on detent cover label. Customer part number marked on request.

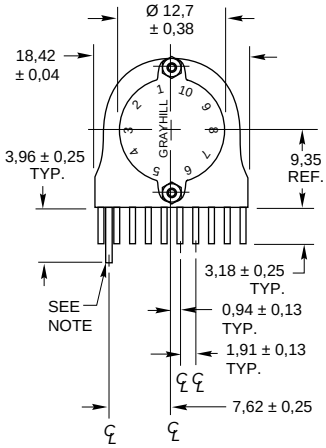
Rear Views

30° and 36° Angle of Throw may be interposed on either shaft diameter.

30° Angle of Throw



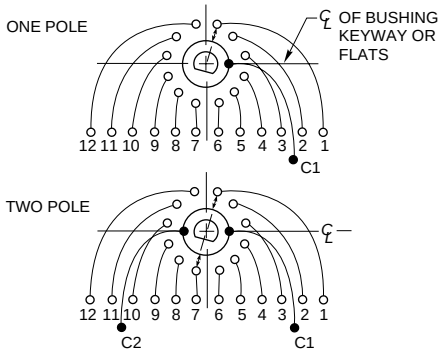
36° Angle of Throw



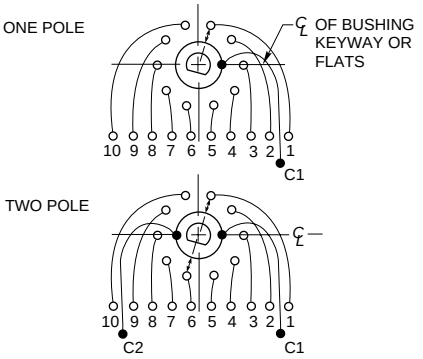
CIRCUIT DIAGRAMS: Standard, Military and Metric PC Mount

Circuit is Viewed From Shaft End and Shown in Position No. 1

30° Angle of Throw



36° Angle of Throw

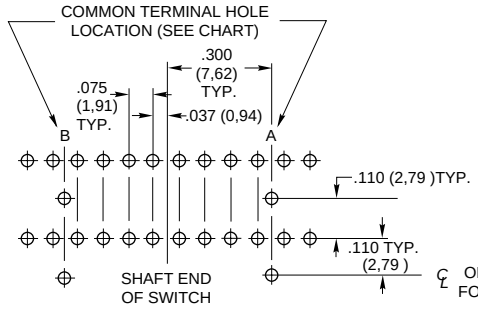


See pages F-39 through F-44 for specifications, accessories and ordering information.

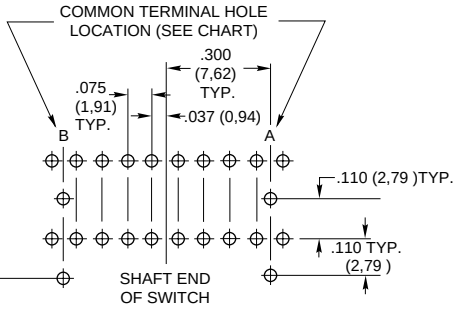
SERIES 71: PC Board Pattern In inches (and millimeters)

All Styles Except 71BT

30° Angle of Throw



36° Angle of Throw



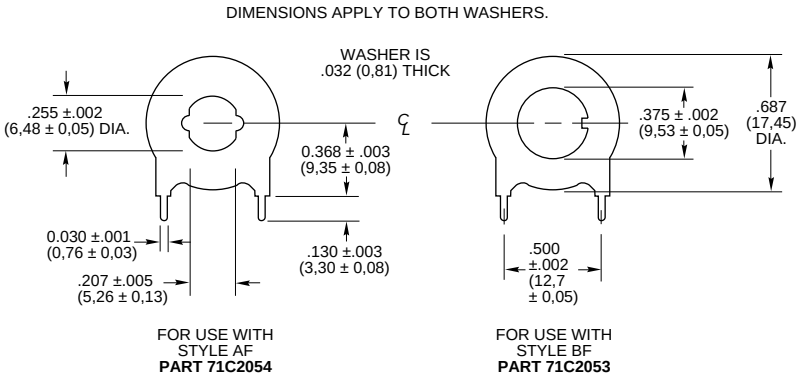
Spacer decks can be supplied to facilitate PC board layouts of three or more decks. A spacer deck does not have any terminals and provides no switching function. Dimensionally, it requires the same space as one normal switch deck. Spacer deck can be placed at any location in the switch, per your instructions. Switches which include spacer decks are procured under a special part number.

Shown for a two deck switch.
Bushing mount is recommended.

Number of Poles Per Deck	Common Terminal Hole Location
1	A
2	A and B

SERIES 71: PC MOUNT ACCESSORY

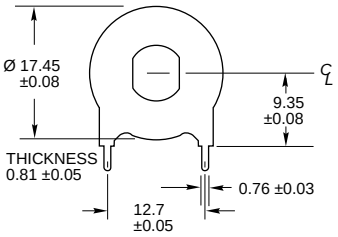
1/8" and 1/4" Diameter Shaft Styles
In inches (and millimeters)



FOR USE WITH STYLE AF
PART 71C2054

FOR USE WITH STYLE BF
PART 71C2053

Metric Mount Styles
In millimeters



FOR USE WITH STYLE EF
PART 71C2111

For printed circuit styles. Mounting bushing provides additional support for the front end of the switch. Order separately by appropriate part number. Rotary switch discount applies.

See pages F-39 through F-44 for specifications, accessories and ordering information.

SERIES 71

.5-.75" Diameter, 1/4 Amp, 12 Max. Positions/Pole, Process Sealed

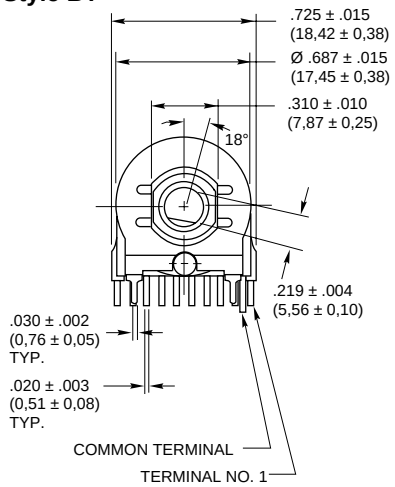
FEATURES

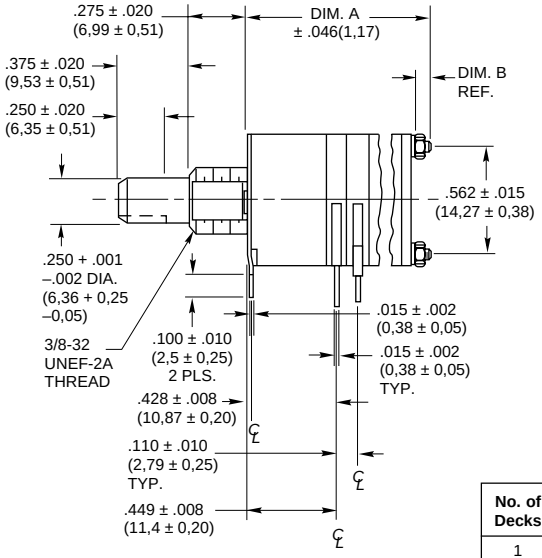
- No Hand Soldering Required
- Sealed to Resist Intrusion by Flux, Solder and Cleaning Solutions
- .75" Diameter
- 250 mA for 20,000 Cycles
- 36°, 1 or 2 Poles, Up to 5 Decks
- 10 Positions, Continuous Rotation, or 2-9 Positions With Fixed Stops

DIMENSIONS: Standard and Military

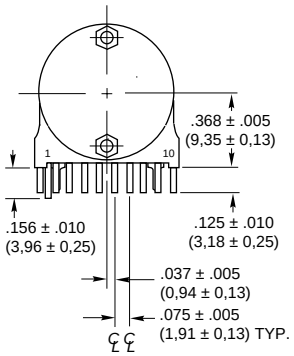
In inches (and millimeters)

Style BT





Rear View



Shaft flat is opposite point of contact for pole number one. Shaft is shown here in position 1.

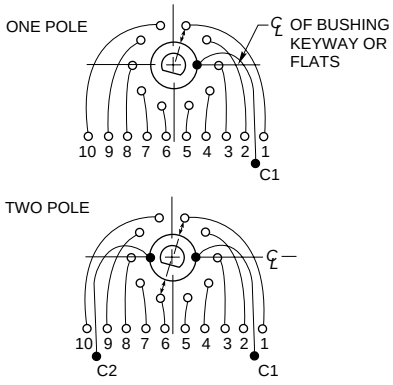
No. of Decks	Dimension A	Dimension B
1	0.795 (20,19)	0.031 (0,79)
2	1.040 (26,42)	0.053 (1,35)
3	1.285 (32,64)	0.076 (1,93)
4	1.530 (38,86)	0.098 (2,49)
5	1.775 (45,09)	0.120 (3,05)

Grayhill part number and date code marked on detent cover label. Customer part number marked on request.

CIRCUIT DIAGRAMS

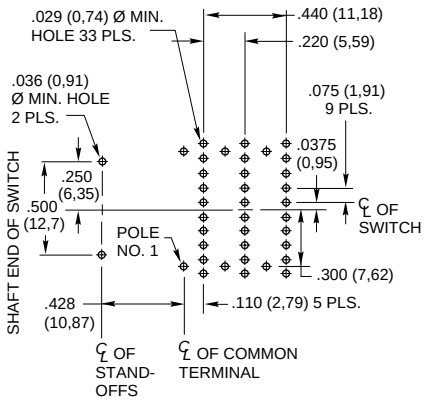
Circuit is Viewed From Shaft End and Shown in Position No. 1

36° Angle of Throw



STYLE 71BT: PC Board Pattern

Including Integral Front Plate Standoffs



See pages F-39 through F-44 for specifications, accessories and ordering information.

SERIES 71

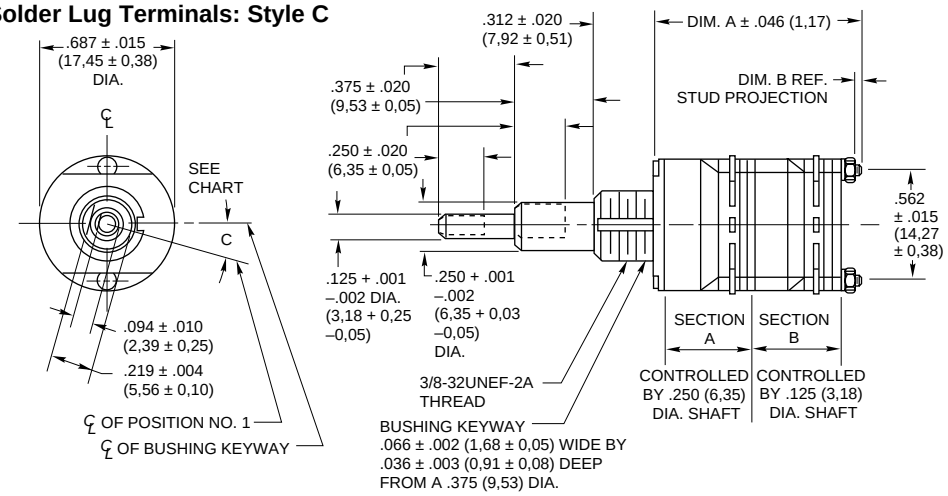
0.5 to 0.75" Diameter, 1/4 Amp, 12 Max. Positions/Pole, Concentric Shaft

FEATURES

- Two Switches in the Panel Space of a Single Shaft Rotary

DIMENSIONS In inches (and millimeters)

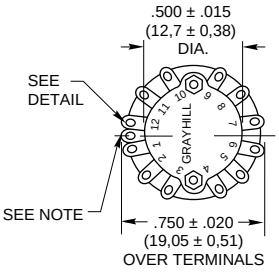
Solder Lug Terminals: Style C



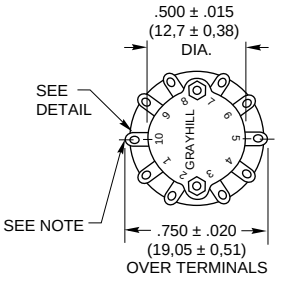
Rear Views

30° and 36° Angle of Throw may be interposed on either shaft diameter.

30° Angle of Throw



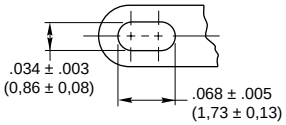
36° Angle of Throw



No. of Decks				
Sec. A	Sec. B	Dimension A	Dimension B	Approx. Weight Grams
1	1	1.415 (35,94)	.032 (0,81)	24
2	1	1.633 (41,49)	.032 (0,81)	26
3	1	2.131 (54,13)	.312 (7,92)	28
1	2	1.633 (41,49)	.032 (0,81)	26
2	2	2.131 (54,13)	.312 (7,92)	28
3	2	2.349 (59,66)	.312 (7,92)	30
1	3	2.131 (54,13)	.312 (7,92)	28
2	3	2.349 (59,66)	.312 (7,92)	30
3	3	2.567 (65,20)	.312 (7,92)	32

Angle C is 15° in 12 position switches and 36 ° in 10 position switches.

Terminal Detail



Note: Common location for a single pole per deck switch. For common location on multipole switches see circuit diagrams.

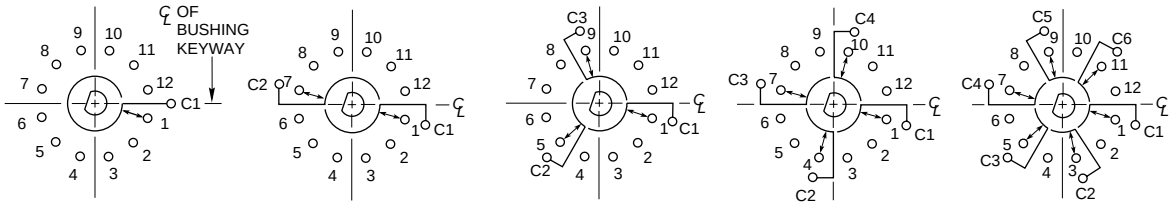
Grayhill part number and date code marked on detent cover label. Customer part number marked on request.

CIRCUIT DIAGRAMS: Solder Lug Terminals

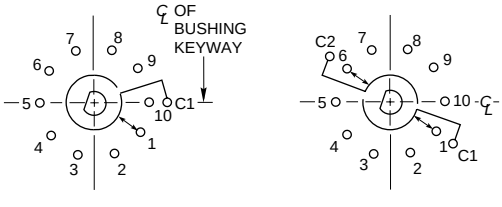
Switch is Viewed From Shaft End and Shown in Position No. 1.

Note: All common terminals are located above base terminals as shown.

30° Angle of Throw



36° Angle of Throw



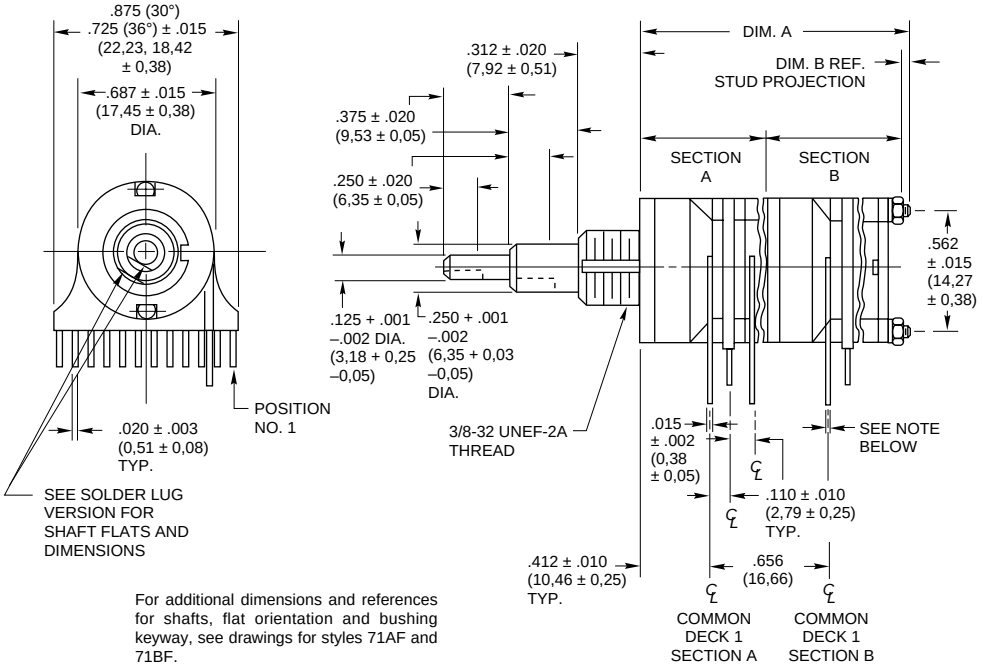
ADD-A-POT SWITCHES

Contact Grayhill for Series 71 Concentric Add-A-Pot or Add-A-Switch type switches.

See pages F-39 through F-44 for specifications, accessories and ordering information.

DIMENSIONS In inches (and millimeters)

PC Mount: Style CF



For additional dimensions and references for shafts, flat orientation and bushing keyway, see drawings for styles 71AF and 71BF.

No. of Decks				
Sec. A	Sec. B	Dimension A	Dimension B	Approx. Weight Grams
1	1	1.415 (35,94)	.032 (0,81)	24
2	1	1.633 (41,49)	.032 (0,81)	26
3	1	2.131 (54,13)	.312 (7,92)	28
1	2	1.633 (41,49)	.032 (0,81)	26
2	2	2.131 (54,13)	.312 (7,92)	28
3	2	2.349 (59,66)	.312 (7,92)	30
1	3	2.131 (54,13)	.312 (7,92)	28
2	3	2.349 (59,66)	.312 (7,92)	30
3	3	2.567 (65,20)	.312 (7,92)	32

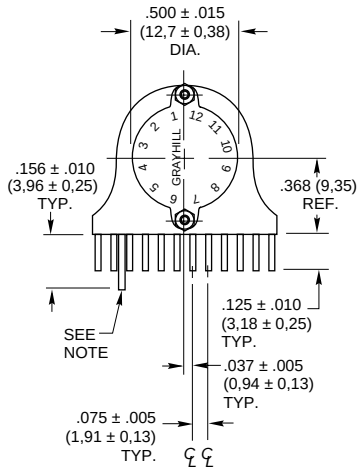
For layout of printed circuit board, see diagrams illustrated on page F-36.

Grayhill part number and date code marked on detent cover label. Customer part number marked on request.

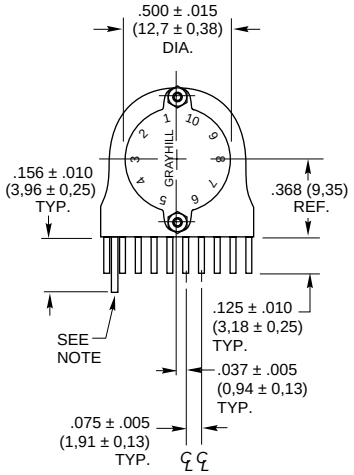
Rear Views

30° and 36° Angle of Throw may be interposed on either shaft diameter.

30° Angle of Throw



36° Angle of Throw



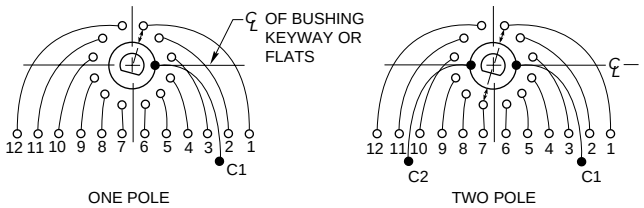
Note: Common location for a Single Pole Per Deck Switch. For common location on multipole switches see circuit diagrams.

CIRCUIT DIAGRAMS: PC Mount Terminals

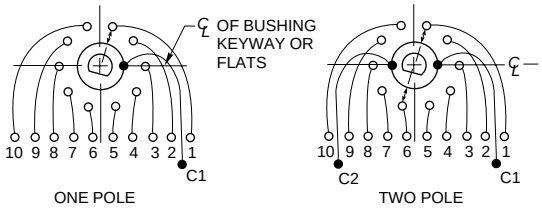
Switch is Viewed From Shaft End and Shown in Position No. 1.

Note: All common terminals are located above base terminals as shown.

30° Angle of Throw



36° Angle of Throw



See pages F-39 through F-44 for specifications, accessories and ordering information.

SPECIFICATIONS

Military Qualification MIL-S-3786/39

The military style of the Series 71 rotary switch is qualified to MIL-S-3786/39. Complete electrical rating information is listed on the following page. The Series 71 rotary switch qualification includes the 30° and the 36° angles of throw, in .125" (3,18) and .250" (6,35) diameter shafts, with solder lug terminals and printed circuit terminals, in sealed and unsealed style switches. Standard variations such as shaft and/or bushing length, etc. that do not affect the switch performance can also be marked as qualified product. Contact Grayhill for complete details.

Dimensionally the military style is the same as the standard style with the exception of the PC version of 3 or 4 decks; a spacer deck between decks 2 and 3 adds another deck length to the switch without increasing the number of operative decks.

Another difference in the standard and military styles is the mounting hardware. Ordered as options with a standard style switch these items are included with the military style switch: non-turn washer with solder lug style, and a non-turn washer plus a mounting bushing washer with the PC terminal style.

Complete specification drawings are available from Grayhill, Inc. for the standard military qualified products. Military qualified Series 71 rotary switches may be ordered by the "M" number listed in Military Specification Sheet/39 or by Grayhill part number. All qualified switches will be marked to the specification.

Military Shaft and Panel Seal

A shaft and panel seal is available to provide watertight mounting of the Series 71 standard military style rotary switches. Sealing is accomplished by an O-ring shaft seal and a panel seal washer. Panel seal dimension differences are shown in the dimensional drawings. When the panel seal is compressed, dimensions are approximately the same as an unsealed switch. If the non-turn washer supplied with the switch is used, it should not be allowed to extend entirely through the panel when mounting a sealed switch. However, the bushing may be used as a non-turn device instead. Switches are provided with a double flat bushing in styles which include the letter A, and with a bushing which has a keyway in the styles which include the letter B.

SPECIFICATIONS: Materials and Finishes

Materials and Finishes

Standard Style

Cover: Diallyl per (MIL-M-14) ASTM-D-5948 except for 71 BT (see bushing).
Base and Deck Separator: Diallyl per (MIL-M-14) ASTM-D-5948
Rotor Mounting Plate: Thermoplastic
Bushing: Zinc casting, cadmium-plated per ZZ-P-416, Class 2, Type II.
Through Bolts and Nuts, Shaft, and Rear Support Plate, Stop Pins, and Stop Arm (All Others): Stainless steel
Shaft, Stop Plates, Stop Arm (71BT): Reinforced thermoplastic
Detent Rotor: Reinforced thermoplastic for 71BT; phenolic per (MIL-M-14) ASTM-D-5948 for all others
Detent Balls: Steel, nickel-plated
Detent Springs: Tinned music wire
Rotor Contact: Silver alloy and beryllium copper
Base Contacts, Common Plate, and Terminals: Brass, Gold plate .000005" minimum over Silver plate .00005" over nickel .00002".
Front Support Plate (71 BT only): Tempered steel, tin/lead-plated.
Interdeck Seal (71 BT Only): Silicone
Extension: Brass, unplated
Mounting Hardware: One mounting nut and one internal tooth lockwasher are supplied with each switch. For switches with A in the style description, the nut is .062" (1,57) thick by .312" (7,92) across flats. For switches with B or C in the style description, the nut is .094" (2,39) thick by .562" (14,27) across flats. Nuts are brass, cadmium-plated per QQ-P-416, Class 2, Type II.

Materials and Finishes

Military Qualified

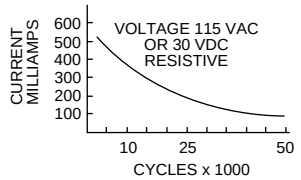
Cover, Base, and Deck Separator: Diallyl per (MIL-M-14) ASTM-D-5948
Rotor Mounting Plate: Thermoplastic
Bushing: Zinc, cadmium-plated per QQ-P-416, Class 2, Type II
Through Bolts and Nuts, Shaft Extension, Lockwashers, Shaft, and Rear Support Plate, Stop Pins, and Stop Arm (All Others): Stainless steel
Detent Balls: Steel, nickel-plated
Detent Springs: Tinned music wire
Rotor Contact: Silver alloy and beryllium copper
Base Contacts, Common Plate, and Terminals: Brass, gold plate .000005" minimum over silver plate .00005" over Nickel .00002".
Detent Rotor: Phenolic per (MIL-M-14) ASTM-D-5948
Mounting Hardware: One mounting nut and one internal tooth lockwasher are supplied with each Series 71 switch. For switches with Style A in the description, the nut is .062" (1,57) thick by .312" (7,92) across flats. For switches with Style B or C in the description, the nut is .094" (2,39) thick by .562" (14,27) across flats. Nuts are brass, cadmium-plated per QQ-P-416 Class 2, Type II.
Additional Hardware: Each switch is supplied with a non-turn washer to use if desired. Additionally, each PC mount switch is supplied with a mounting bushing washer (see PC Mount Accessory). For switches with Style A in the description, non-turn washer is stainless steel; for switches with Style B in the description, non-turn washer is stainless steel. Mounting bushing washer (PC Mount Accessory) is brass, cadmium-plated. For dimensions of non-turn washers see page F-42. For custom control knobs accessories see page E-39 and E-40.

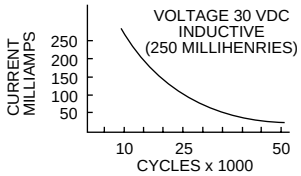
SPECIFICATIONS: Electrical Ratings, Others

Electrical Ratings
General

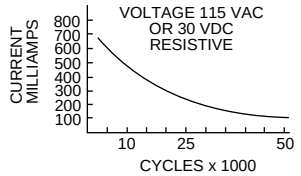
Charts: Charts shown are for non-shorting (break before make) contacts. Measurements were made at 25°C and 68% relative humidity. The load life curves show the number of rotational cycles which can be expected for the voltage, current and type of load. Thus, for a standard style switch with a 300 milliampere 115 Vac resistive load, the expected life is 15,000 cycles. Reducing the load to 200 milliamperes increases the life to 25,000 cycles. Life limiting or failure criteria are listed in the rating sections which follow.
Cycles: A cycle is a 360° rotation and a return through all switch positions to the starting position.
Voltage: As listed in charts.

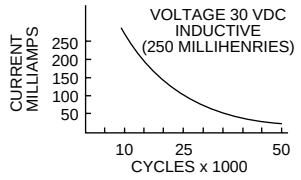
Standard





Military





Electrical Ratings
Standard Style

Curves are based on the following failure criteria:
Contact Resistance: 50 milliohms maximum (20 milliohms initially).
Insulation Resistance: 1,000 megohms minimum between terminals and shaft. (50,000 megohms initially).
Voltage Breakdown: 500 Vac minimum between mutually insulated parts.
Current Rating: These switches will carry 4 amperes with a maximum contact temperature rise of 20°C. If the life limiting characteristics are less critical than those shown above, if elevated temperatures or reduced pressures are involved, Grayhill can predict the switch life for the application.
Meet the Following Requirements of MIL-S-3786: Moisture Resistance: Medium and High Shock; Vibration (10 to 2,000 cps); Thermal Shock (-65°C to 85°C); Salt Spray, Explosion; and Stop Strength (10 in-lb).

Electrical Ratings
Military Style

Curves are based on the following failure criteria:
Qualified to the following MIL-S-3786/39 circuit values: (also see standard style description.) The Series 71 has been tested to meet the requirements of MIL-S-3786, Style SR39, the majority of which are listed here. At 85°C approximately 68% relative humidity and sea level pressure, the switches have been tested to make and break the following loads, as stated in MIL-S-3786/39: 125 milliamperes at 28 Vdc resistive; 75 milliamperes at 115 Vac resistive.

The switches have also been tested at reduced barometric pressure (70,000 feet), 25°C at approximately 68% relative humidity to make and break the following loads as stated in MIL-S-3786/39: 50 milliamperes, 28 Vdc resistive; 20 milliamperes, 115 Vac resistive. When tested to the above loads at stated conditions, the Series 71 switches meet the following life-limiting criteria after 25,000 cycles of operation in accordance with MIL-S-3786/39.

Contact Resistance: 50 milliohms maximum after life.
Insulation Resistance: 1,000 megohms minimum between terminals and shaft.
Dielectric Strength: 500 Vac (atmospheric pressure) and 350 Vac (reduced pressure) between mutually insulated parts.

The Series 71 also meets the requirements of MIL-S-3786/39 for moisture resistance, stop strength, rotational torque, vibration (10 through 2,000 cps), medium and high shock, salt spray, explosion, thermal shock (-65°C to 85°C), and terminal pull. When tested at sea level, 25°C and 68% relative humidity with failure criteria of 50 milliohms maximum contact resistance and 500 Vac breakdown voltage, these switches will make and break 250 milliamps at 28 Vdc inductive (250 millihenries) 500 milliamps at 28 Vdc resistive: 500 milliamps at 115 volts Vac, 60 hertz resistive, for 10,000 cycles of operation.

Additional Characteristics
Standard and Military Styles

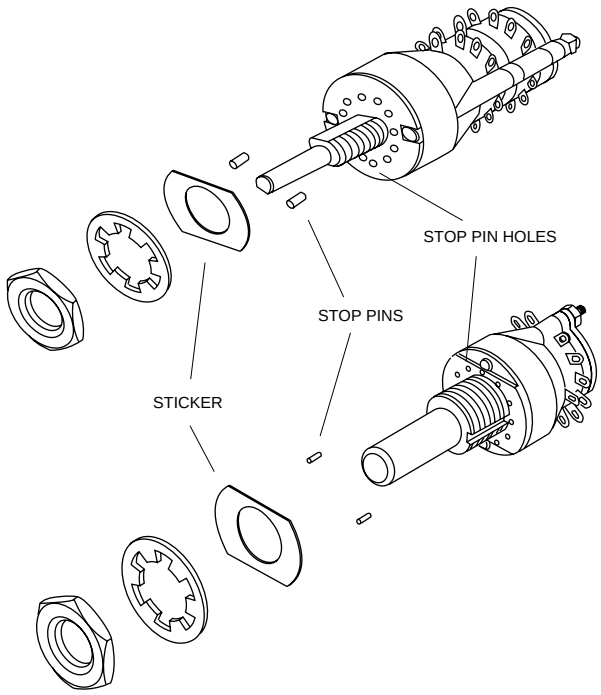
Rotational Torque: 4-32 ounce-inches, (28-230 N•mm) depending on the number of poles per deck and the number of decks.
Contacts: Shorting or non-shorting wiping contacts with over 100 grams of contact force.
Shaft Flat Orientation: Opposite first position pole no. 1 (See Circuit Diagrams).
Terminals: Switches are provided with full circle of terminals regardless of the number of active positions.
Extended Studs: Switches of 6 or more decks (or concentric switches of 4 or more) have longer studs and extra stud nuts for recommended double end mounting. Stud hole size is 1/16" diameter for #0-80 NF-2A thread.
Stop Strength: 10 pound-inches.
Mounting Bushing Strength: 10 pound-inches.

STANDARD OPTIONS

Intermixing of shorting/non-shorting, RFI grounding, and shielding, see pages F-9 and F-10.

ADJUSTABLE STOPS

Set and Reset Stops to Limit Rotation
Form, Fit, Function Equivalent to Fixed Stop Styles



The adjustable stop Series 71 rotary switches allow you to change the number of positions per pole. Simply remove and relocate stop pins in the holes in the front of the switch. The pins are held in place by a self adhesive sticker which fits over the front plate.

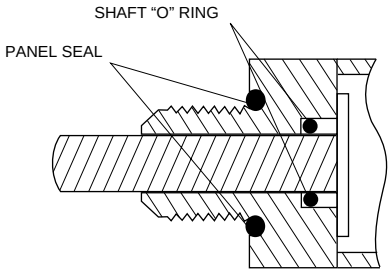
This feature is available in the Series 71 single shaft standard switches with either 1/8" or 1/4" diameter shafts with either PC or solder lug terminals. It is not available in military qualified or concentric shaft styles.

All dimensions, ratings and characteristics are the same as the fixed stop equivalent. The chart shown here describes the adjustable stop style substitutions for the fixed stop styles. Although Series 71 is not an exact dimensional equivalent of the fixed stop styles of Series 8 and 9, it most nearly represents a functional substitution.

Fixed Stop Style	Adjustable Stop Substitution
08A	71AD
09A	71AD
71A	71AD
71AF	71ADF
71B	71BD
71BF	71BDF
71E	71ED
71EF	71EDF

For more adjustable stop information, see page F-6. For ordering information, see page F-44.

SHAFT AND PANEL SEAL



The shaft is sealed by an O-ring inside the bushing. The panel is sealed by an O-ring at the base of the bushing.

The seals do not alter the dimensions as shown in the drawings when the switch is mounted.

The panel seal is silicone rubber. The shaft seal is an O-ring per MIL-P-5516B.

ACCESSORIES: Non-Turn Washers In inches (and millimeters)

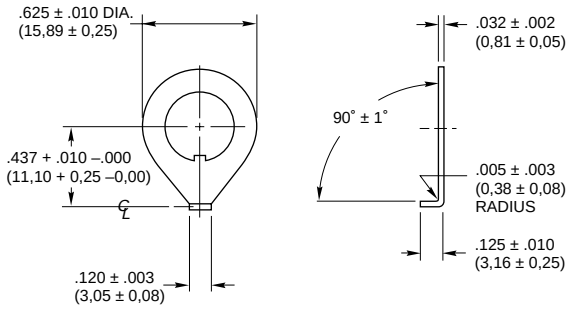
1/8" and 1/4" Diameter Shaft Switches

The bushing of the Series 71 switch is designed so the switch will not turn if the panel has been cut to fit the exact bushing shape. The bushing for the 1/8" diameter shaft switch has a double flat; the 1/4" diameter shaft switch has a keyway in the bushing. An alternate means of keeping the switches from turning is to mount them with optional, non-turn washers.

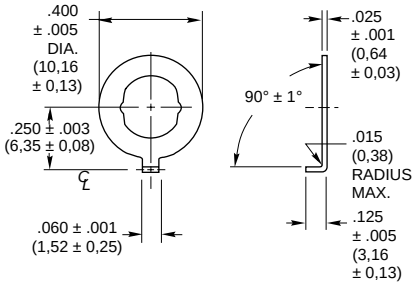
Part number 50J1066 is made of Stainless Steel. It is supplied with military switches with Style A in the description. When ordered for standard product, a like number of switches must be ordered.

Part number 12C1087-1 is Brass, Cadmium-plated and may be ordered for standard product.

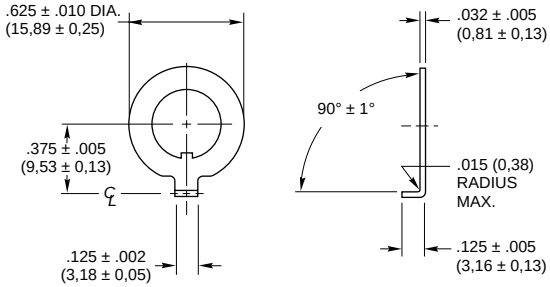
Part number SHH694-5 is Stainless Steel washer supplied with all military style switches with Style B in the description.



PART NO. 12C1087-1
STANDARD



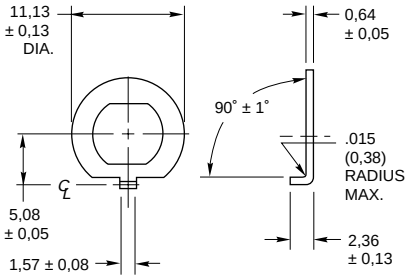
PART NO. 50J1066
MILITARY AND STANDARD
FOR 1/8" DIAMETER SHAFT



PART NO. SHH694-5
MILITARY
FOR 1/4" DIAMETER SHAFT

4mm Diameter Shaft Switches

Non-Turn Washer
For styles E, ED, EF and EDF.
Mounting bushing washer provides non-turn feature.
302 Stainless Steel.
Part No. 71 J1103. Contact Grayhill for price.



Control Knobs Available.
See page E-39.

CHOICES AND LIMITATIONS: Series 71

A = 1/8" Diameter Shaft
B = 1/4" Diameter Shaft
E = Metric Mount Shaft & Bushing
D = Adjustable Stops (Adj. Stop)
S = Shaft and Panel Seal (S/P Seal)

F = PC Mount Terminals
T = PC Mount Terminals and Process Sealed Switching Decks & Bushing; no panel seal
M = Military

All switches without F or T have solder lugs

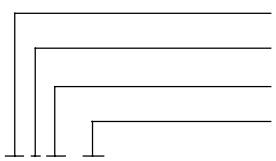
C = Concentric Shaft
2 Switches with same Style and Angle of Throw, one behind the other.
Limits below apply to either switch section (A or B).

Style Choices			Angle of Throw	No. Of Decks	Poles Per Deck	Positions Per Pole[1]	Shorting Or Non-Shorting
Basic Style	With S/P Seal	Adj. Stop					
A B E	AS BS ES	AD BD ED	30°	01 thru 12 01 thru 08 01 thru 05 01 thru 04 01 thru 03 01 or 02	1 2 3 4 5[5] 6[5]	02 thru 12[3] 02 thru 06 02 thru 04 02 or 03 02 02	N or S N or S N or S N or S N or S N or S
			36°	01 thru 12 01 thru 08	1 2	02 thru 10[3] 02 thru 05	N or S N or S
AF BF EF	ASF BSF ESF	ADF BDF EDF	30°	01 thru 12 01 thru 08	1 2	02 thru 12[3] 02 thru 06	N or S N or S
			36°	01 thru 12 01 thru 08	1 2	02 thru 10[3] 02 thru 05	N or S N or S
BT	——	——	36°	01 thru 05 01 thru 05	1 2	02 thru 10[3] 02 thru 05	N or S N or S
MA MB	MAS MBS	—— ——	30°	01 thru 05[4] 01 thru 05[4] 01 thru 05[4] 01 thru 04[4] 01 thru 02[4]	1 2 3 4 6	02 thru 12[3] 02 thru 06 02 thru 04 02 or 03 02	N or S N or S N or S N or S N or S
			36°	01 thru 05[4] 01 thru 05[4]	1 2	02 thru 10[3] 02 thru 05	N or S N or S
MAF MBF	MASF MBSF	—— ——	30°	01 thru 04[2,4] 01 thru 04[2,4]	1 2	02 thru 12[3] 02 thru 06	N or S N or S
			36°	01 thru 04[2,4] 01 thru 04[2,4]	1 2	02 thru 10[3] 02 thru 05	N or S N or S
C	——	——	30°	01 thru 03 01 thru 03 01 or 02 01 01 01	1 2 3 4 5 6	02 thru 12[3] 02 thru 06 02 thru 04 02 or 03 02 02	N or S N or S N or S N or S N or S N or S
			36°	01 thru 03 01 thru 03	1 2	02 thru 10[3] 02 thru 05	N or S N or S
CF	——	——	30°	01 thru 03 01 thru 03	1 2	02 thru 12[3] 02 thru 06	N or S N or S
			36°	01 thru 03 01 thru 03	1 2	02 thru 10[3] 02 thru 05	N or S N or S

[1] For Adjustable Stop styles (with the letter D), use AJ instead of number of positions when ordering.
[2] Military Qualified PC mount switches of 3 or 4 operative decks have an additional spacer deck after deck 2. Use total decks to calculate length; but use only the number of *operative* decks when creating the part number.
[3] For 1-pole switches with maximum positions, specify **F**ixed stop after last position or **C**ontinuous rotation when ordering. (Note: 1 p, 71BT, 10 positions, is available only as **C**ontinuous).
[4] In addition to qualified types (Solder lug–5 decks; PC mount–4 decks), Grayhill can provide switches with additional decks in the materials of the 'M' style. Contact Grayhill.
[5] Switches in 30° throw with 5 or 6 poles per deck are not available with adjustable stops.

Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

ORDERING INFORMATION: Single Shaft Switches



Series

Style*: Letter(s) from the Choices and Limitations chart

Angle of Throw: 30° or 36°

Number of Decks: As limited by Choices and Limitations chart

Stop Arrangement: Use suffix only when ordering 1 pole with maximum positions.
C = Continuous rotation; F = Stop between last and first positions

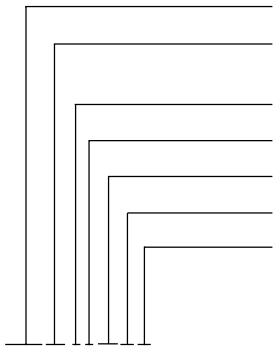
Type of Contacts: N = Non-shorting; S = Shorting

Positions Per Pole: 02 to 12 per Choices chart.
For adjustable stop switches (D) use AJ here.

Poles Per Deck: As limited by the Choices chart

** All rotary switches that are required to have military designated markings and testing adhering to MIL-3786 are to be ordered by specifying the military part number identified on the appropriate slash sheet.*

ORDERING INFORMATION: Concentric Shaft Switches



Entire Switch

Series and Style: 71C or 71CF

Angle of Throw: 30° or 36°. Both switch sections will be the same.

Switch Section A (Front Switch)

Number of Decks: 1 to 3, per Choices and Limitations chart

Poles Per Deck: As limited by the Choices and Limitations chart

Positions Per Pole: 02 to 12 per Choices and Limitations chart

Type of Contacts: N = Non-shorting; S = Shorting

Stop Arrangement: Use suffix only when ordering 1 pole with maximum positions.
C = Continuous rotation; F = Stop between last and first positions

Switch Section B (Rear Switch)

Stop Arrangement: Use suffix only when ordering 1 pole with maximum positions.
C = Continuous rotation; F = Stop between last and first positions

Type of Contacts: N = Non-shorting; S = Shorting

Positions Per Pole: 02 to 12 per Choices and Limitations chart.

Poles Per Deck: As limited by the Choices and Limitations chart

Number of Decks: 1 to 3, per Choices and Limitations chart

ACCESSORIES

Control knobs available, see page E-39.

Available from your local Grayhill Distributor.
For prices and discounts, contact a Local Sales Office, an authorized local Distributor, or Grayhill.

SERIES 08
SERIES 09

0.5" Diameter, 1/4 Amp,
10 Max. Positions/Pole,

Standard, Military SR13

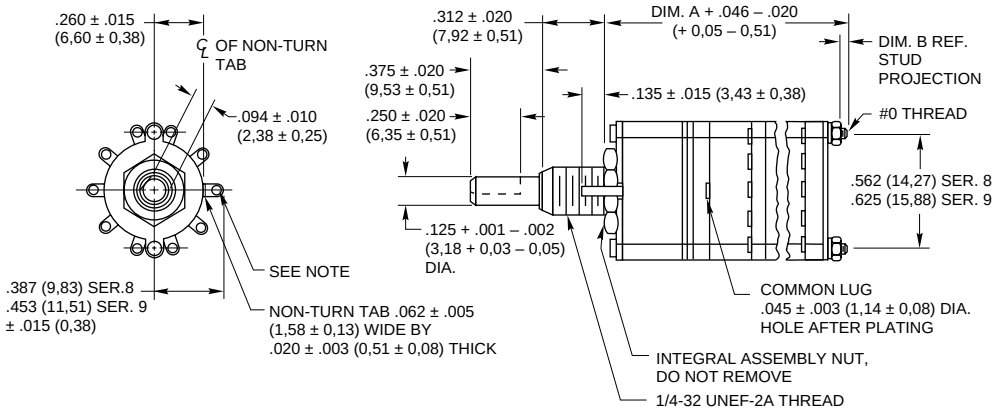
FEATURES

- Proven Quality in Thousands of Applications
- Gold-plated Contact System
- 30°, 36°, 45°, 60° and 90° Angle of Throw Options
- MIL Qualified Versions MIL-S-3786/13

DIMENSIONS In inches (and millimeters)

Standard Style

Front view shows terminal location of Series 8, 36° angle of throw. Transpose rear view for terminal location of other angles of throw.



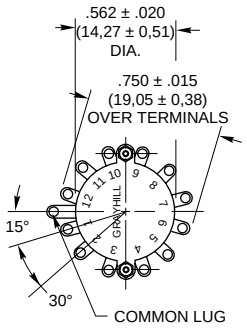
Note: Common location for a single pole per deck switch. For common location on multi-pole switches, see circuit diagrams.

No. of Decks	Dimension A	Dimension B	Approx. Weight Grams Srs. 08	Srs. 09	No. of Decks	Dimension A	Dimension B	Approx. Weight Grams Srs. 08	Srs. 09
1	.960 (24,38)	.062 (1,57)	12	16.0	7	2.818 (71,58)	.312 (7,92)	24	31.0
2	1.228 (31,19)	.062 (1,57)	14	18.5	8	3.086 (78,38)	.312 (7,92)	26	33.5
3	1.496 (38,00)	.062 (1,57)	16	21.0	9	3.354 (85,19)	.312 (7,92)	28	36.0
4	1.764 (44,81)	.062 (1,57)	18	23.5	10	3.622 (91,00)	.312 (7,92)	30	38.5
5	2.032 (51,61)	.062 (1,57)	20	26.0	11	3.890 (98,81)	.312 (7,92)	32	41.0
6	2.550 (64,77)	.312 (7,92)	22	28.5	12	4.158 (105,61)	.312 (7,92)	34	43.5

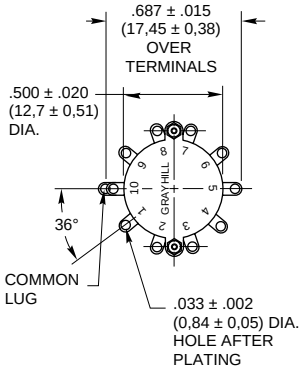
Grayhill part number and date code marked on standard style detent cover label. Customer part number marked on request. Grayhill part number and date code printed on military style cover. Military number printed when required.

Rear Views

Series 09
30° Angle of Throw



Series 08
36° Angle of Throw



For rear view of 45°, 60° and 90°, see circuit diagrams.

See pages F-49 and F-50 for specifications and ordering information.

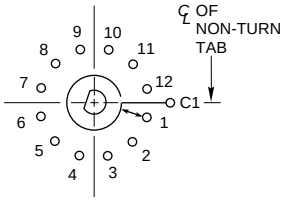
Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

CIRCUIT DIAGRAMS: Solder Lug Terminals

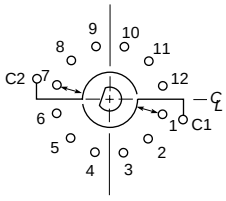
Switch is Viewed From Shaft End and Shown in Position No. 1

Note: All common terminals are located above base terminals as shown.

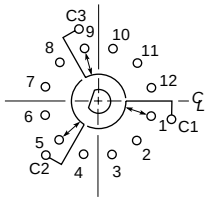
Series 09 30° Angle of Throw



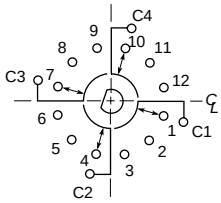
ONE POLE



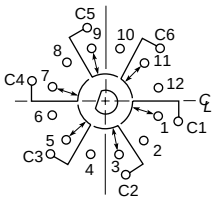
TWO POLE



THREE POLE

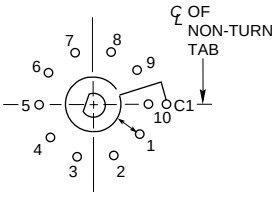


FOUR POLE

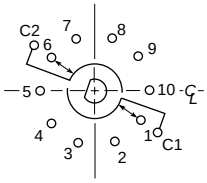


FIVE OR SIX POLE

Series 08 36° Angle of Throw

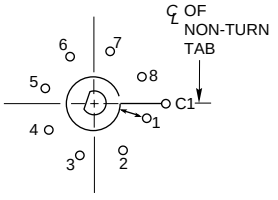


ONE POLE

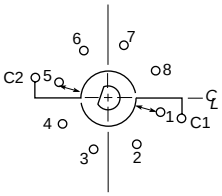


TWO POLE

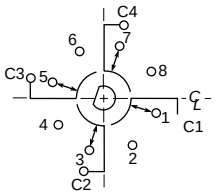
Series 09 45° Angle of Throw



ONE POLE

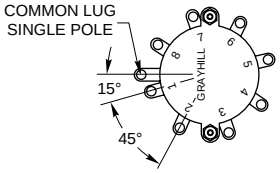


TWO POLE

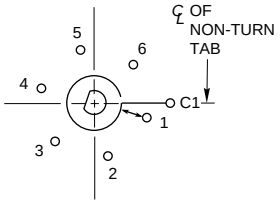


THREE OR FOUR POLE

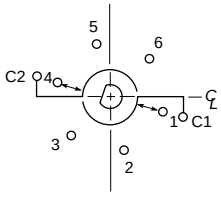
Rear Views



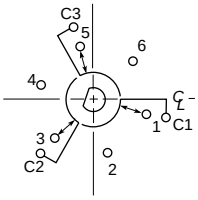
Series 09 60° Angle of Throw



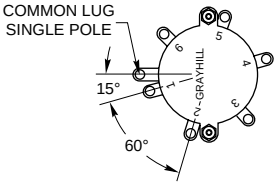
ONE POLE



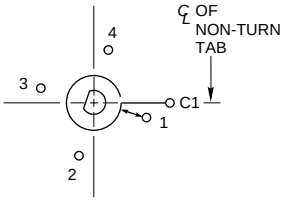
TWO POLE



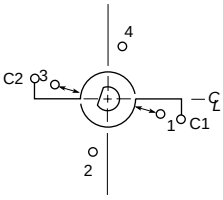
THREE POLE



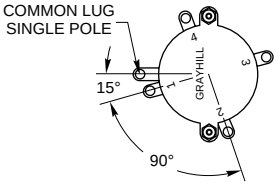
Series 09 90° Angle of Throw



ONE POLE



TWO POLE



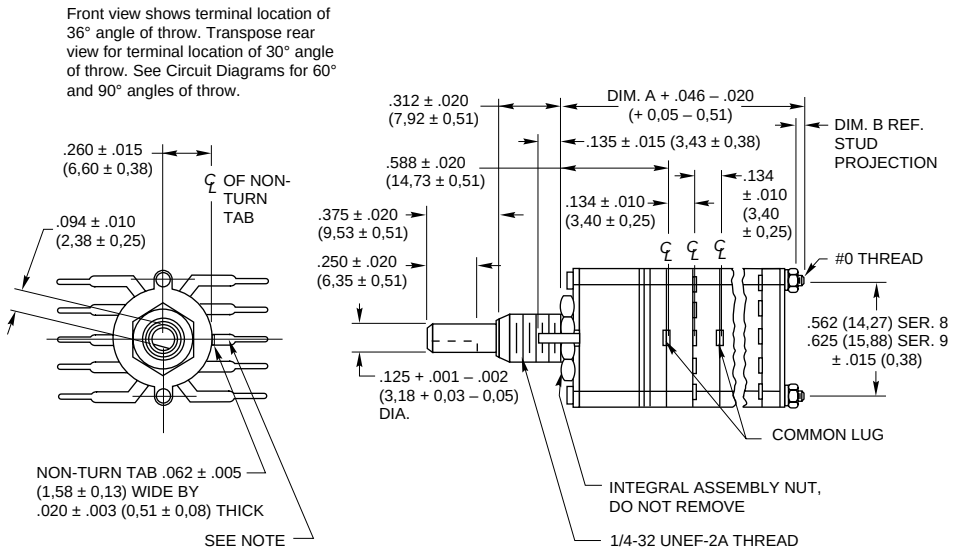
See pages F-49 and F-50 for specifications and ordering information.

SERIES 08
SERIES 09
.5" Diameter, 1/4 Amp, 10 Max. Positions/Poles, PC Mount

FEATURES
- Gold-plated Contact System
- 30°, 36°, 60° or 90° Angle of Throw Options
- Compatible with Logic Level Voltages and Currents

DIMENSIONS In inches (and millimeters)

PC Mount Style



Note: Common location for a single pole per deck switch. For common location on multi-pole switches, see circuit diagrams.

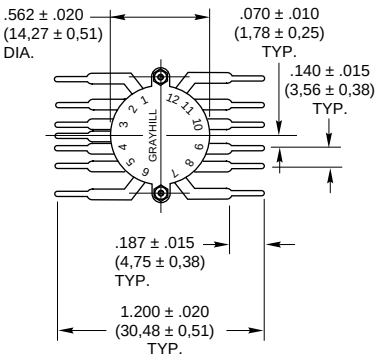
***Termination**
A standard switch uses the entire 360° of each deck as required by the circuitry. Thus one-sided termination is standard for Series 08, 36°, 1 pole switches with 1 to 5 positions per pole; it is also standard for Series 09, 30°, 1 pole switches with 1 to 6 positions per pole. Two-sided termination is standard for 1 pole switches with more positions per pole and for switches of 2 or more poles per deck.

Special switches with one-sided termination can be made for circuitry which would require two-sided termination in standard switches. Contact Grayhill for a special part number. See also Special Options, page F-10.

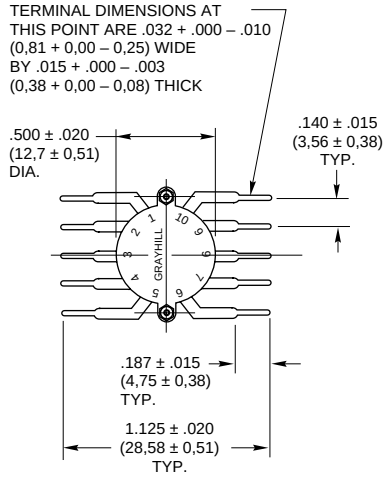
Grayhill part number and date code marked on detent cover label. Customer part number marked on request.

Rear Views

Series 09
30° Angle of Throw



Series 08
36° Angle of Throw



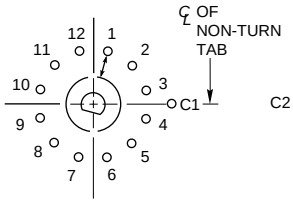
See pages F-49 and F-50 for specifications and ordering information.

CIRCUIT DIAGRAMS: PC Mount

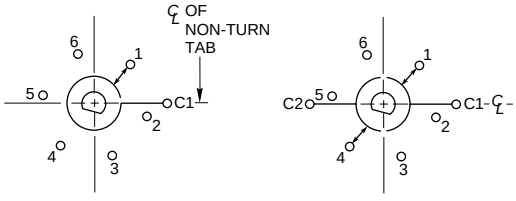
Switch is Viewed From Shaft End and Shown in Position No. 1

Note: All common terminals are located above base terminals as shown.

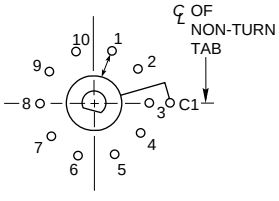
Series 09 30° Angle of Throw



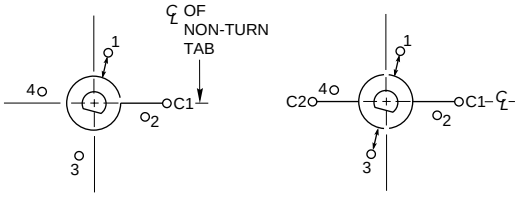
Series 09 60° Angle of Throw



Series 08 36° Angle of Throw

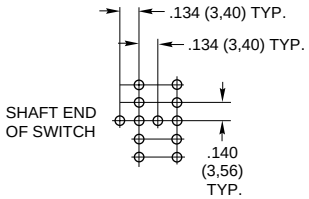


Series 09 90° Angle of Throw

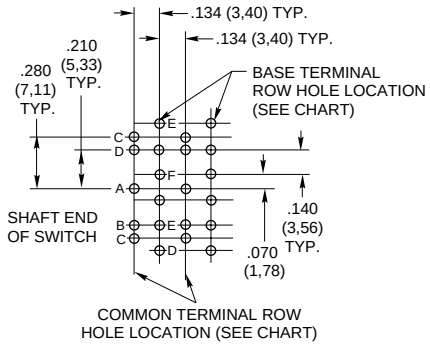


PC BOARD MOUNTING PATTERN

36° Angle of Throw



30°, 60° and 90° Angle of Throw



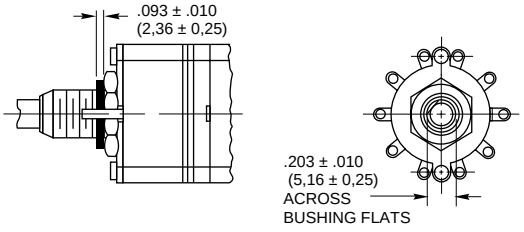
Number of Poles Per Deck	Common Terminal Hole Location
1 Pole Per Deck	A
2 Poles Per Deck	A

Angle of Throw	Base Terminals Hole Location
30°	All
60°	E and F
90°	D and F

Diagrams shown for a two deck switch. Bushing mounting is recommended for all PC mount rotary switches.

SHAFT AND PANEL SEAL

A shaft and panel seal is available to provide watertight mounting of the Series 08 and 09. Standard and Military Style rotary switches. Sealing is accomplished by O-ring shaft seal and panel seal washer. Panel seal dimensional differences are shown in the accompanying drawing. When the panel seal is compressed, dimensions are approximately the same as an unsealed switch. Sealed switches are provided with a double flat bushing. Non-turn feature can be accomplished by proper fit of this bushing into panel hole and/or by allowing non-turn tab to extend into (but not through) panel. Military Style rotary sealed switches do not have a non-turn tab.



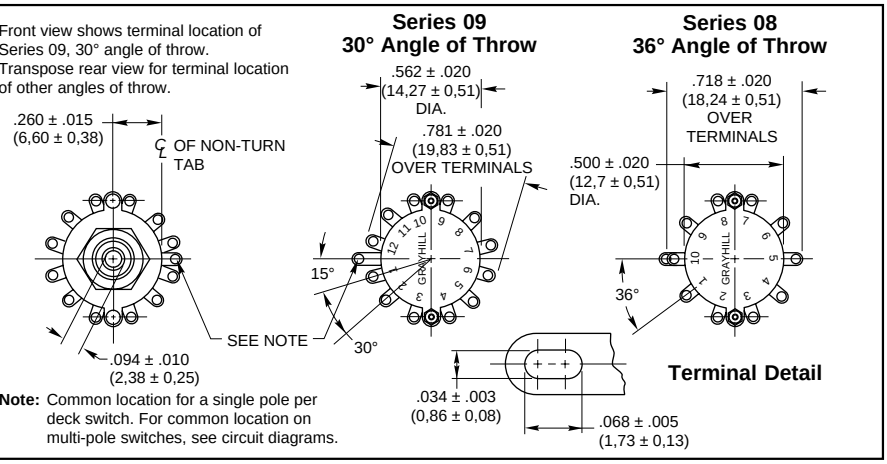
See pages F-49 and F-50 for specifications and ordering information.

MILITARY QUALIFIED

Series 08 and 09 military switches are qualified to MIL-S-3786/13. They include 30°, 36°, 45° and 60° angles of throw with solder lug terminals in sealed and unsealed styles. See front and rear views at right. Standard variations which do not affect switch performance can also be marked as qualified product–contact Grayhill.

The military style is dimensionally the same as the standard except for the solder lug. Convert standard style switch drawings to military style drawings by including this terminal detail and changing the over-terminal dimensions shown here. Grayhill can provide complete specification drawings. Qualified switches can be ordered by the Grayhill number or the "M" number; they will be marked per MIL-S-3786/13.

Front view shows terminal location of Series 09, 30° angle of throw. Transpose rear view for terminal location of other angles of throw.



Note: Common location for a single pole per deck switch. For common location on multi-pole switches, see circuit diagrams.

SPECIFICATIONS

Electrical Ratings
Standard Style

Rated: To make and break the following loads: 1/4 amp, 115 Vac resistive; 1/4 amp, 6-28 Vdc resistive; 20 mA, 115 Vdc resistive; 50 mA, 115 Vac inductive; 20 mA, 28 Vdc inductive; to carry 4 amps continuous.
Contact Resistance: After 25,000 cycles of operation, 50 milliohms maximum
Insulation Resistance: 1,000 megohms minimum between terminals and shaft
Voltage Breakdown: 1,000 Vac initially (500 Vac or better after most environmental tests)
Life Expectancy: 50,000 mechanical cycles of operation. *Note:* Actual life is determined by a number of factors, including electrical loading, rate of rotation and environment, as well as maximum contact resistance, minimum insulation resistance, and minimum voltage breakdown required at the end of life.

Electrical Ratings
Military Qualified

Qualified to the following MIL-S-3786/13 Circuit Values: (Also see Standard Style description.) The Series 08M and 09M have been tested to meet the requirements of MIL-S-3786, Style SR13, the majority of which are listed. At 85°C, approximately 68% relative humidity and sea level pressure, the switches have been tested to make and break the following loads, as stated in MIL-S-3786/SR13: 125 milliamperes at 28 Vdc resistive: 75 milliamperes at 115 Vac resistive.

The switches have also been tested at reduced barometric pressure (70,000 feet), 25°C at approximately 68% relative humidity to make and break the following loads as stated in MIL-S-3786/SR13. 50 milliamperes 28 Vdc resistive; 20 milliamperes 115 Vac resistive. When tested to the above loads at the stated conditions, the Series 08M and 09M switches meet the following life-limiting criteria after 25,000 cycles of operation in accordance with MIL-S-3786.

Contact Resistance: 50 milliohms maximum after life
Insulation Resistance: 1,000 megaohms minimum between terminals and shaft
Dielectric Strength: 500 Vac (atmospheric pressure) and 350 Vac (reduced pressure) between mutually insulated parts.

The Series 08M and 09M also meet the requirements of MIL-S-3786 SR13 for moisture resistance, stop strength, rotational torque, vibration (10 to 2,000 cps), medium and high shock, salt spray, explosion, thermal shock (-65°C to 85°C) and terminal pull. When tested at sea level, 25°C and 68% relative humidity with failure criteria of 50 milliohms maximum contact resistance and 500 Vac breakdown voltage, these switches will make and break 250 mA at 28 Vdc inductive (250 millihenries): 1/2 amp: at 28 Vdc resistive: 1/2 amp; at 115 Vac: 60 Hz resistive for 10,000 cycles of operation.

Materials and Finishes
Standard Style

Switch Bases: Melamine per (MIL-M-14) ASTM-D-5948
Cover, Deck Separators and End Plate: Phenolic per (MIL-M-14) ASTM-D-5948
Rotor Mounting Plate: Thermoplastic
Mounting Bushing and Nuts: Brass, cadmium-plated
Shaft, Retaining Rings, Through Bolts, Shaft Extension, Stop Washers, Stop Arm, Thrust Washers, Nuts, Cover Plate and Rear Support Plate: Stainless steel
Detent Balls: Steel, nickel-plated
Detent Springs: Tinned Music wire
Terminals, Stator (Base) Contacts and Common Plate: Brass, gold plate .00001" minimum over silver plate .0003" minimum
Rotor Contact: Silver alloy, gold-plated .00001" minimum
Mounting Hardware: Two mounting nuts .062" (1,57) thick by .312" (7,92) across flats and one internal lockwasher are supplied with switch.

Materials and Finishes
Military Qualified

Deck Separators, End Plate and Switch Bases: Diallyl per (MIL-M-14) ASTM-D-5948
Rotor Mounting Plate: Thermoplastic
Mounting Bushing and Nuts: Brass, cadmium-plated per QQ-P-416, Class 2, Type II
Shaft, Cover, Stop Plate, Retaining Ring, Through Bolts, Shaft Extension, Stop Arm, Thrust Washers, Cover Plate and Rear Support Plate, Lockwashers, and Nuts: Stainless steel
Detent Balls: Steel, nickel-plated
Detent Springs: Tinned music wire
Terminals, Stator (Base) Contacts and Common Plate: Brass, gold plate .00001" minimum over silver plate .0003" minimum
Rotor Contact: Silver alloy, gold-plated .00001" minimum
Mounting Hardware: Two mounting nuts .062" (1,57) thick by .312" (7,92) across flats and one internal tooth lockwasher are supplied with this switch.

ADDITIONAL CHARACTERISTICS
Standard Style and Military Qualified

Contacts: Shorting or Non-shorting contacts available in 30°, 36° and 45° angle of throw rotary switches. Non-shorting contacts available in 60° and 90° angle of throw switches. All are wiping contacts with over 100 grams of contact force.
Stop Strength: 12 lb-inches minimum
Rotational Torque: 8-64 oz-in depending upon the number of poles per deck and the number of decks
Extended Studs: Switches of six decks or more have longer studs with extra stud nuts for recommended double end mounting.

ADJUSTABLE STOPS
See Series 71 Rotary Switches, page F-41.

STANDARD OPTIONS
See Options, pages F-9 and F-10. Terminals, Shielding, etc.

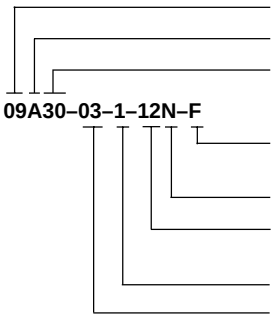
ADDITIONAL FEATURES
Spring Return, Keylocks, Isolated Positions. See Features selection chart, page F-7.

ACCESSORIES
Control knobs available, see page E-39.

CHOICES AND LIMITATIONS

Series	Style and Designation	Angle of Throw	Stops	Terminals	Number of Decks Shorting	Number of Decks Non-Shorting	Poles Per Deck	Number of Positions/Pole
08	A = Standard S = Standard, Shaft/Panel Seal M = Military Style MS = Style M, Shaft/Panel Seal	36°	Fixed	Solder	01 thru 12 01 thru 09	01 thru 12 01 thru 09	1 2	02 thru 10 02 thru 05
	P = Standard, PC Mount SP = Style P, Shaft/Panel Seal MP = Military Style, PC Mount MSP = Style MP, Shaft/Panel Seal			Printed Circuit	01 thru 12 01 thru 09	01 thru 12 01 thru 09	1 2	02 thru 10 02 thru 05
09	A = Standard S = Standard, Shaft/Panel Seal M = Military Style MS = Style M, Shaft/Panel Seal	30°	Fixed	Solder	01 thru 12 01 thru 09 01 thu 06 01 thru 04 01 thru 03 01 thru 03	01 thru 12 01 thru 09 01 thru 06 01 thru 04 01 thru 03 01 thru 03	1 2 3 4 5 6	02 thru 12 02 thru 06 02 thru 04 02 or 03 02 02
	P = Standard, PC Mount SP = Style P, Shaft/Panel Seal MP = Military Style, PC Mount MSP = Style MP, Shaft/Panel Seal			Printed Circuit	01 thru 12 01 thru 09	01 thru 12 01 thru 09	1 2	02 thru 12 02 thru 06
	A = Standard, S = Standard, Shaft/Panel Seal M = Military Style MS = Style M, Shaft/Panel Seal	45°		Solder	01 thru 12 01 thru 06 01 thru 04 01 thru 03	01 thru 12 01 thru 06 01 thru 04 01 thru 03	1 2 3 4	02 thru 08 02 thru 04 02 02
	A = Standard, S = Standard, Shaft/Panel Seal M = Military Style MS = Style M, Shaft/Panel Seal	60°			Not Available	01 thru 06 01 thru 03 01 or 02	1 2 3	02 thru 006 02 or 03 02
	P = Standard, PC Mount SP = Style P, Shaft/Panel Seal MP = Military Style, PC Mount MSP = Style MP, Shaft/Panel Seal			Printed Circuit	Not Available	01 thru 06 01 thru 03	1 2	02 thru 06 02 or 03
	A = Standard S = Standard, Shaft/Panel Seal	90°		Solder	Not Available	01 thru 06 01 thru 03	1 2	02 thru 04 02
	P = Standard, PC Mount SP = Style, Shaft/Panel Seal			Printed Circuit	Not Available	01 thru 06 01 thru 03	1 2	02 thru 04 02

ORDERING INFORMATION



Series: determined by the angle of throw
Style*: Letter(s) from the Choices and Limitations chart
Angle of Throw: Must agree with Series Number
Stop Arrangement: Add letter F to a one pole per deck switch with the maximum number of positions for a stop between position 1 and the last position. Leave blank for continuous rotation
Type of Contacts: N = Non-shorting; S = Shorting
Positions Per Pole: Requires 02 positions as a minimum to the maximum allowable dependent on the angle of throw and poles per deck
Poles Per Deck: As limited by angle of throw and switch style
Number of Decks: As limited by the angle of throw, the poles per deck, switch style and types of contacts

** All rotary switches that are required to have military designated markings and testing adhering to MIL-3786 are to be ordered by specifying the military part number identified on the appropriate slash sheet.*

Available from your local Grayhill Distributor For prices and discounts, contact a Local Sales Office, an authorized local Distributor, or Grayhill.

SERIES 42, 43, 44 and 54

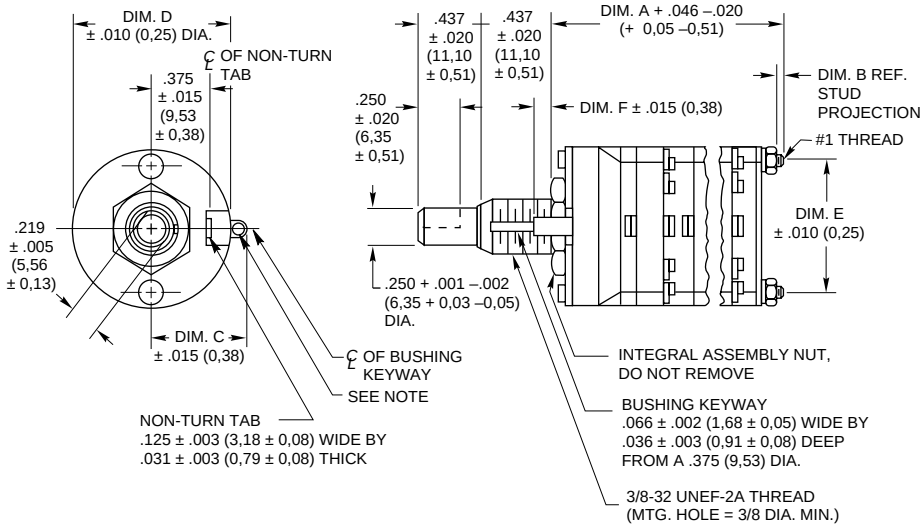
1" Diameter, 1 Amp, 10 Max. Positions/Pole, Standard, Military SR04

FEATURES

- Rugged Construction Insures Switch Operation for the Life of Your Equipment
- Many Circuitry Options
- MIL Qualified Versions MIL-S-3786/04
- Features Choice Include: Shaft/ Panel Seal, Adjustable Stops, PC Termination, UL Recognized

DIMENSIONS In inches (and millimeters)

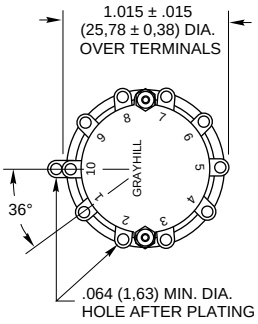
Standard, UL Recognized and Military Qualified Solder Lug Styles



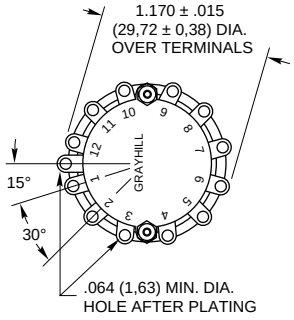
Note: Common location for a single pole per deck switch. For common location on multi-pole switches, see circuit diagrams.

Rear Views

Series 42



Series 44



For rear view of 45°, 60° and 90°, see circuit diagram.

No. of Decks	Dimension A	Dimension B Style A	Dimension B Style M or H	Approx. Weight Grams 42	Approx. Weight Grams 44	No. of Decks	Dimension A	Dimension B Style A	Dimension B Style M or H	Approx. Weight Grams 42	Approx. Weight Grams 44
1	1.025 (26,04)	.062 (1,57)	.030 (0,76)	40.0	48	7	3.351 (85,16)	.312 (7,92)	.280 (7,11)	73.0	90
2	1.371 (34,82)	.062 (1,57)	.030 (0,76)	45.5	55	8	3.697 (93,90)	.312 (7,92)	.280 (7,11)	78.5	97
3	1.717 (43,61)	.062 (1,57)	.030 (0,76)	51.0	62	9	4.043 (102,69)	.312 (7,92)	.280 (7,11)	84.0	104
4	2.063 (52,40)	.062 (1,57)	.030 (0,76)	56.5	69	10	4.389 (111,48)	.312 (7,92)	.280 (7,11)	89.5	111
5	2.409 (61,19)	.062 (1,57)	.030 (0,76)	62.0	76	11	4.735 (120,27)	.312 (7,92)	.280 (7,11)	95.0	118
6	3.005 (76,33)	.312 (7,92)	.280 (7,11)	67.5	83	12	5.081 (129,06)	.312 (7,92)	.280 (7,11)	100.5	125

Grayhill part number and date code marked on detent cover label. Customer part number marked on request. Military part number marked when required. UL recognized markings as required.

Dimension	C	D	E	F
Series 42	.562 (14,27)	1.000 (25,4)	.830 (21,08)	.093 (2,36)
Series 44	.642 (16,31)	1.162 (29,51)	1.000 (25,4)	.121 (3,07)

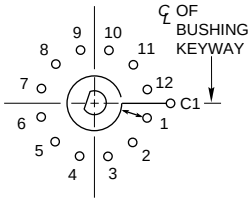
See pages F-57 through F-60 for specifications, accessories and ordering information.

CIRCUIT DIAGRAMS: Solder Lug Terminals

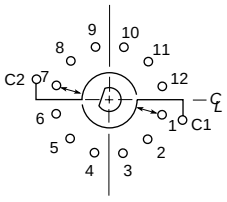
Switch is Viewed From Shaft End and Shown in Position No. 1

Note: All common terminals are located above base terminals as shown.

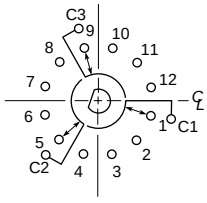
Series 44 & 54 30° Angle of Throw



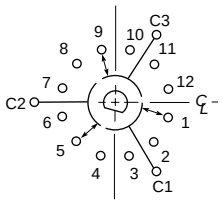
ONE POLE



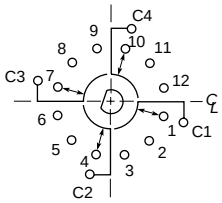
TWO POLE



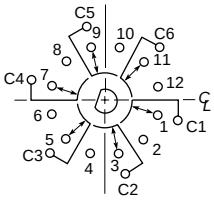
THREE POLE
Styles A, D and S



THREE POLE
Styles M, MS, H and HS

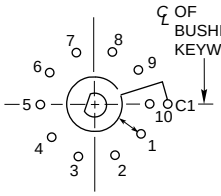


FOUR POLE

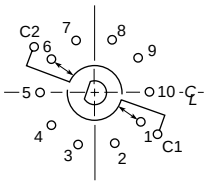


FIVE OR SIX POLE

Series 42 & 43 36° Angle of Throw



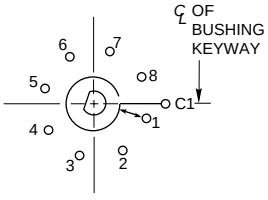
ONE POLE



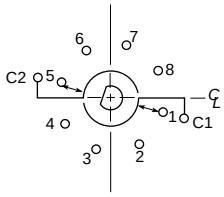
TWO POLE

Rear Views

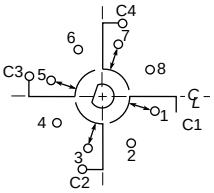
Series 44 45° Angle of Throw



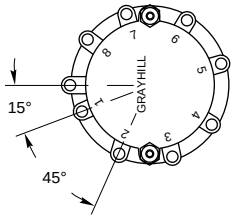
ONE POLE



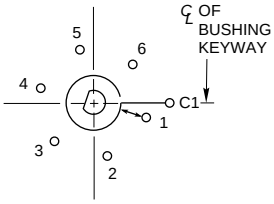
TWO POLE



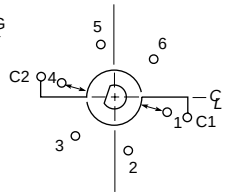
THREE OR FOUR POLE



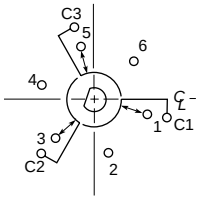
Series 44 60° Angle of Throw



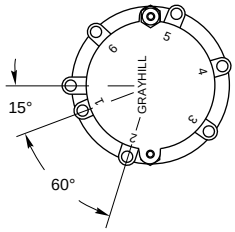
ONE POLE



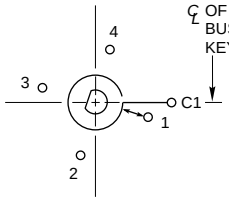
TWO POLE



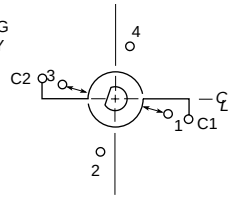
THREE POLE



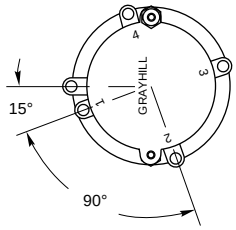
Series 44 90° Angle of Throw



ONE POLE



TWO POLE



See pages F-57 through F-60 for specifications, accessories and ordering information.

SERIES 42

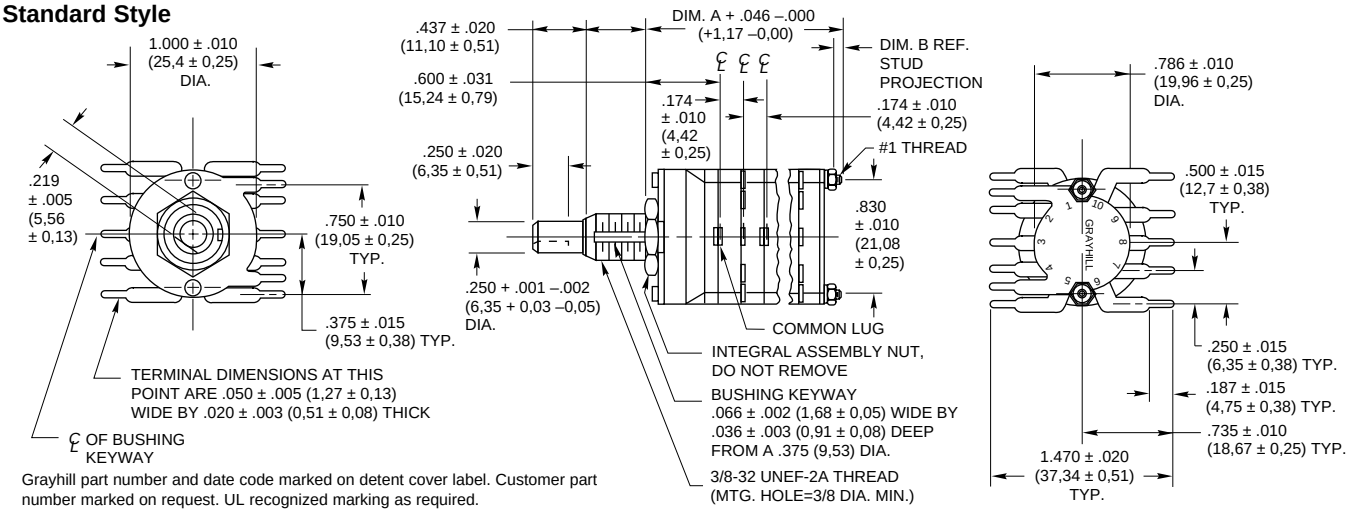
1" Diameter, 1 Amp, 10 Max. Positions/Pole, PC Mount

FEATURES

- Satisfies High Current Board Level Applications
- 36° Angle of Throw Permits up to Ten Positions
- UL Recognized Versions

DIMENSIONS In inches (and millimeters)

Standard Style



Grayhill part number and date code marked on detent cover label. Customer part number marked on request. UL recognized marking as required.

CIRCUIT DIAGRAM: PC Mount

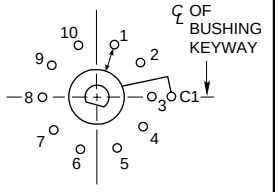
Switch is Viewed From Shaft End and Shown in Position No. 1

Note: All common terminals are located above base terminals as shown.

Termination

One-sided termination is standard for switches with 2 to 5 positions per pole. Two-sided termination is standard for switches with 6 thru 10 positions per pole.

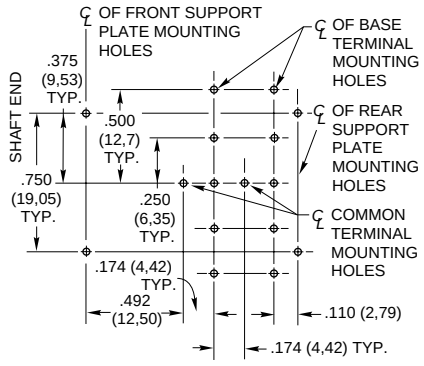
6 thru 10 positions per pole and terminals from one side of switch are available on special order. See Special Options, page F-10 or contact Grayhill.



ONE POLE

PC BOARD MOUNTING PATTERN

Shown for a two deck switch



SHAFT AND PANEL SEAL: Srs. 42 & 44

Standard Style

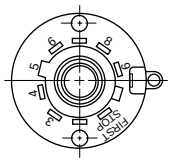
The Series 42/44 Styles, which include the letter "S" with the exception of style "HS", are watertight sealed to the mounting panel by utilizing the panel seal kit. These switches are built with a front plate that does not have a non-turn tab. The panel seal kit consists of a grooved hex nut, a keyed washer and a keyed panel seal. The grooved hex nut is assembled to the switch bushing. The keyed washer is slid down the bushing slot and seated into the hex nut groove. The seal is likewise assembled to the bushing and hex nut. The keyed washer is required to provide seal integrity in the bushing slot. When assembled to the panel, the grooved nut, backing washer and seal require the same space as a normal mounting nut. Hence, the seal kit does not alter the dimensions. Panel seal kit includes a non-turn washer to be used into a blind hole in the back panel. For panel seal kit part dimensions, see Accessories. Style "HS" switches use a similar sealing method, except the integral assembly nut retains the panel seal. All sealed style switches are provided with a shaft to bushing internal seal.

ADJUSTABLE STOP SWITCHES: Series 42 and 44

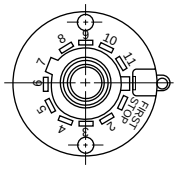
The standard and UL recognized switches are also available with adjustable stops. Two removable stop washers allow you to limit the number of switch positions as needed. A knurled nut is supplied to secure the washers if desired. *These switches have no bushing keyway.* All other dimensions, ratings and characteristics are the same as the standard fixed stop styles. Although not military qualified, the adjustable styles are useful in military equipment prototypes. However, when submitting the equipment for government approval, the fixed stop qualified style should be substituted.

See additional adjustable stop switch information at the beginning of the Rotary Switch section. For ordering information, see page F-60.

Front Views



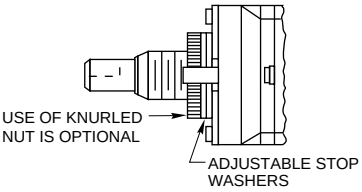
Series 42



Series 44

Equivalent Styles

For style 42A36, use 42D36
For style 44A30, use 44D30
For style 42M36, use 42D36 initially
For style 44M30, use 44D30 initially
For style 42U36, use 42UD36
For style 44U30, use 44UD30



See page F-63 for specifications, accessories and ordering information.

SERIES 43
SERIES 54

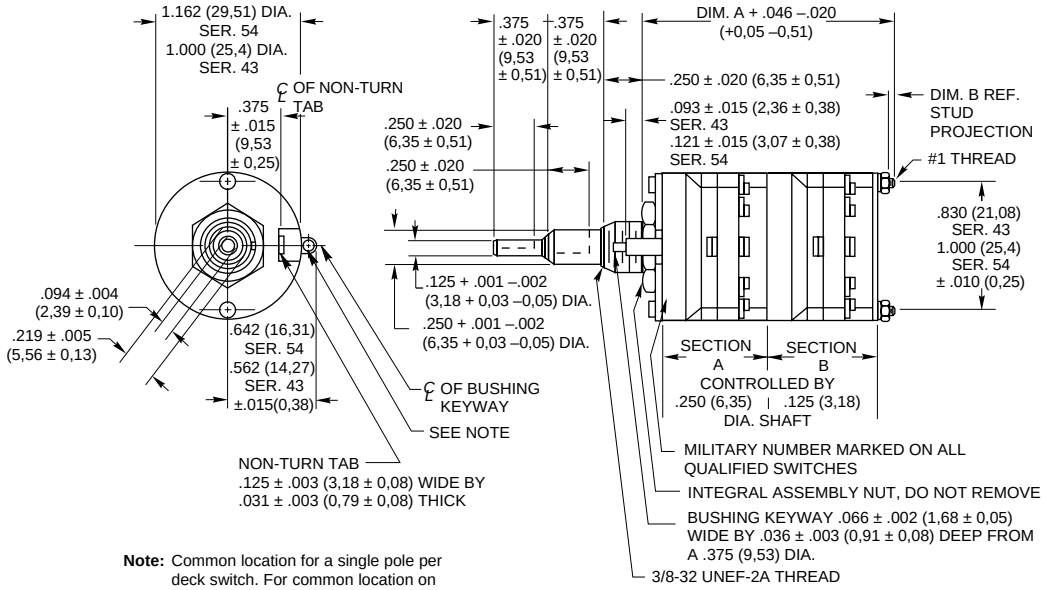
1" Diameter, 1 Amp, 10 Max. Positions/Pole, Concentric Shafts

FEATURES

- Two Switches in the Panel Space of a Single Shaft Rotary
- Military Qualified Versions MIL-3786/04
- Choice of 10 Positions (Series 43) or 12 Positions (Series 54)

DIMENSIONS In inches (and millimeters)

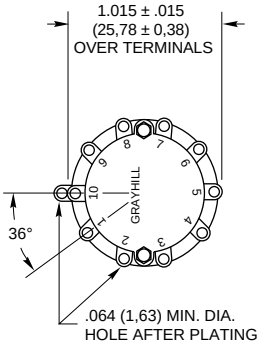
Standard Style and Military Qualified



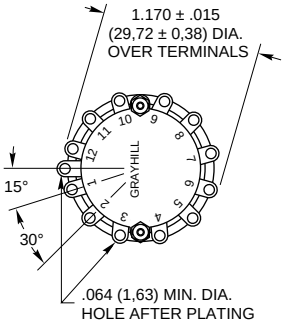
Note: Common location for a single pole per deck switch. For common location on multi-pole switches, see circuit diagrams.

Rear Views

Series 43



Series 54



Number of Decks		Dimension A	Dimension B		Approx. Weight Grams	
Section "A"	Section "B"	Style A, M or H	Style A	Style M or H	Series 43	Series 54
1	1	1.818 (46,18)	.062 (1,57)	.030 (0,76)	48	60
2	1	2.164 (54,97)	.062 (1,57)	.030 (0,76)	54	67
3	1	2.510 (63,75)	.062 (1,57)	.280 (7,11)	60	74
1	2	2.164 (54,97)	.062 (1,57)	.030 (0,76)	54	67
2	2	2.510 (63,75)	.062 (1,57)	.280 (7,11)	60	74
3	2	3.105 (78,87)	.312 (7,92)	.280 (7,11)	66	81
1	3	2.510 (63,75)	.062 (1,57)	.280 (7,11)	60	74
2	3	3.105 (78,87)	.312 (7,92)	.280 (7,11)	66	81
3	3	3.451 (87,66)	.312 (7,92)	.280 (7,11)	72	88

Grayhill part number and date code marked on detent cover label. Customer part number marked on request. Military part number marked when required.

See page F-52 circuit diagrams, 1 pole/deck, 10 and 12 positions; 2 poles/deck, 12 positions.

See page F-63 for specifications, accessories and ordering information.

SERIES 43 and 54

1" Diameter, 1 Amp, 10 Max. Positions/Pole

Add-A-Pot

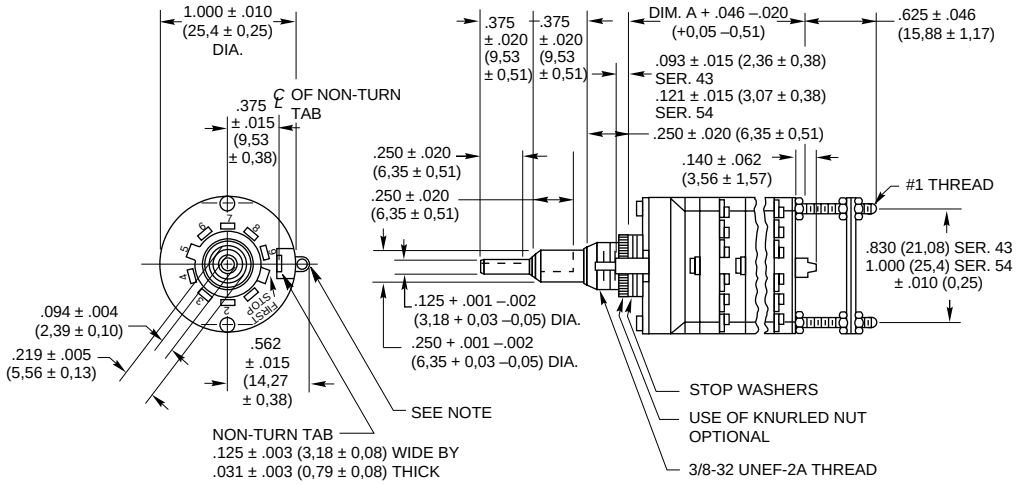
FEATURES

- Central Shaft Designed to Operate an Add-On Potentiometer
- Potentiometer Mounting Plates Provided
- Adjustable Stop Standard, Fixed Stop by Order
- Choice of 10 Positions (Series 43) or 12 Positions (Series 54)

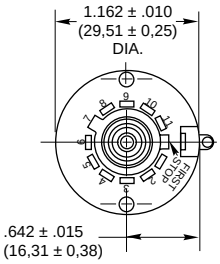
DIMENSIONS In inches (and millimeters)

Standard Style

Series 43



Series 54

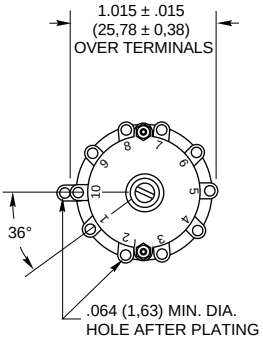


Note: Common location for a single pole per deck switch. For common location on multi-pole switches, see circuit diagrams.

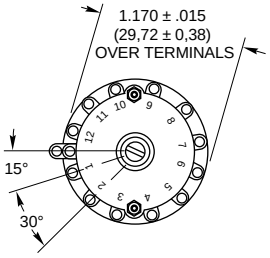
Number of Decks	Dimension A	Approx. Weight Grams	
		Series 43	Series 54
1	.974 (24,74)	48	60
2	1.320 (33,53)	54	67
3	1.666 (42,32)	60	74

Rear Views

Series 43



Series 54



Two potentiometer mounting plates are supplied. Mounting plates have .261 (6,63) and .380 (9,65) diameter holes respectively for mounting potentiometers with 1/4" and 3/8" bushings. Additional nuts for the through bolts of the switch are provided for adjustment of mounting plate location. Tapered tongue on 1/8" shaft provides coupling to screwdriver slots in potentiometer shafts.

Plated brass spacers for ease of positioning mounting plate driving assembly are available on special request (sold only with switches). The use of spacers is recommended for other than prototype requirements. When ordering switches with spacers, give full details regarding special length, potentiometer being used, etc.

Standard style, concentric shaft, add-a-pot switches have adjustable stops. See Adjustable Stop description. Fixed stop types are also available, see Standard Options page F-10.

Grayhill part number and date code marked on detent cover label. Customer part number marked on request. Military part number marked when required.

See page F-52 circuit diagrams, 1 pole/deck, 10 and 12 positions; 2 poles/deck, 12 positions.

See page F-63 for specifications, accessories and ordering information.

SERIES 54

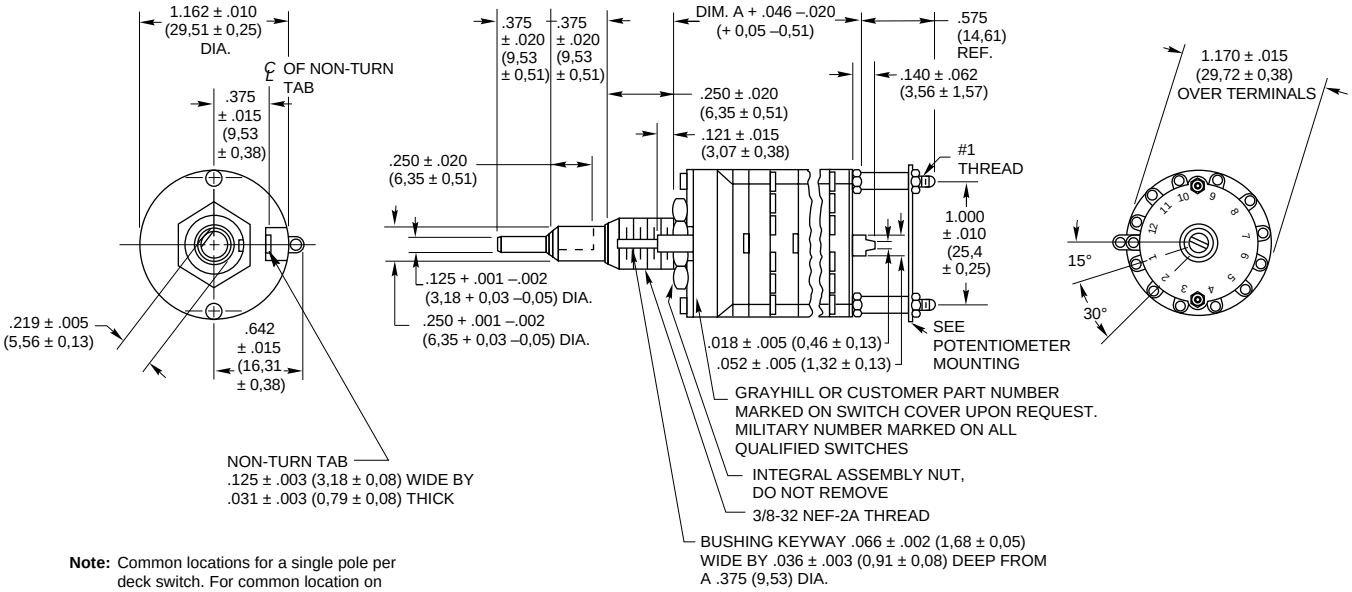
1" Diameter, 1 Amp, 10 Max. Positions/Poles, Add-A-Pot

FEATURES

- Military Qualified MIL-3786/04
- Central Shaft Designed to Operate MIL Potentiometer
- Mounting Plate Options Provide Choice of Potentiometer
- Fixed Distance from Switch to Mounting Plate

DIMENSIONS In inches (and millimeters)

Military Qualified Style



Note: Common locations for a single pole per deck switch. For common location on multiple switches, see circuit diagram.

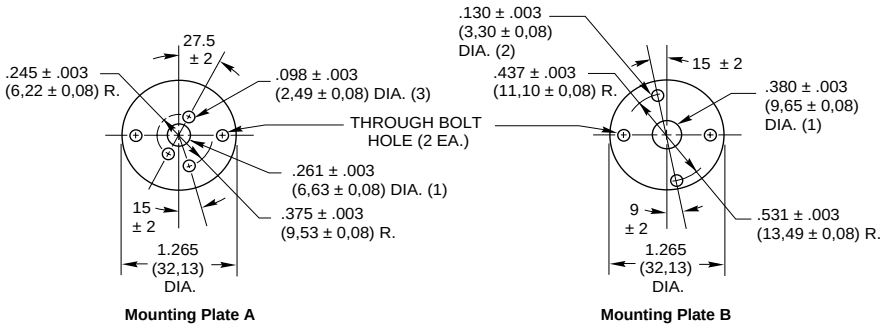
Number of Decks	Dimension A	Approximate Weight Grams
1	1.024 (26,01)	60
2	1.370 (34,80)	67
3	1.716 (43,59)	74

Series 54M Add-A-Pot Switch is a concentric shaft unit with provision for potentiometer mounting. Outer shaft operates switch decks. Inner shaft terminates in tapered tongue, which allows any desired potentiometer to be mounted. The Series 54M Add-A-Pot is qualified to MIL-S-3786/4-3. Patent No. 3,297,830.

Grayhill part number and date code marked on detent cover label. Customer part number marked on request. Military part number marked when required.

Potentiometer Mounting

The two mounting plates shown below are supplied with each switch.



See page F-52 circuit diagrams, 1 pole/deck, 12 positions.

See page F-63 for specifications, accessories and ordering information.

MILITARY QUALIFIED

Single Shaft Switches

The military styles of the single shaft Series 42 and 44 rotary switches are qualified to MIL-S-3786/4, specifically SR04-1. Qualification includes two temperature ranges. Unsealed styles M, MB, MG and MBG are qualified for -65 to 85°C. Unsealed styles H, HB, HG and HBG, plus sealed styles HS, HBS, HGS and HBGS are qualified for -65°C to 125°C. Qualification includes low level switching and shaft grounding as specified in MIL-S-3786. Qualification includes 30°, 36°, 45°, 60° and 90° angles of throw with solder lug terminals. The military styles are dimensionally the same as the standard styles with two exceptions. The location of the common for the 3-pole switch differs (see circuit diagrams), and the non-turn tab for styles HS, HBS, HGS and HBGS differs per the Shaft and Panel Seal description following.

Two Switches, Concentric Shafts

The M style of the concentric shaft Series 43 and 54 switches is qualified to MIL-S-3786/4, specifically SR04-2. Unsealed switches are qualified for -65°C to 85°C in 30°, 36°, 45°, 60° and 90° throws. The standard and military styles of the concentric switches have the same dimensions with the exception of the location of the 3 pole common (see circuit diagrams). The 30° and 36° throws are described in the ordering information. If the 45°, 60° and 90° throws are required, they can be provided in Section A of the Series 54 Rotary Switches; see Standard Options, page F-9.

Add-A-Pot Switches

The military style of the add-a-pot Series 54 switch is qualified to MIL-S-37864, specifically SR04-3. These unsealed switches are qualified for -65°C to 85°C in 30°, 45°, 60° and 90° throws. The dimensions of the military style add-a-pot switches are not the same as the standard add-a-pot switches; see drawings.

All Qualified Switches

Complete electrical ratings and characteristics for all of these qualified switches are listed on the following pages. Standard variations such as terminals, shaft and/or bushing length etc., which do not affect performance, can be marked as qualified product. Adjustable stops cannot be qualified. Contact Grayhill for details about variations.

Military qualified switches may be ordered by the military M number listed in MIL-S-3786/4 or by the Grayhill part number. They will be marked to specifications.

MILITARY QUALIFIED SHAFT AND PANEL SEAL:

Styles HS, HBS, HGS and HBGS

The shaft is sealed to the bushing by an internal O-ring per MIL-P-5516B. The bushing is sealed to the panel with a silicone rubber washer and a stainless steel backing washer. The combined uncompressed thickness is 0.055" (1,40). Since this switch has a flat cover, a non-turn washer is supplied (see Panel Seal Kit). If using it, mount it in front of the panel. For Panel Seal Kit, see pages F-60.

SPECIFICATIONS

Electrical Ratings
Standard Style

Rated: To make and break the following loads:

	Angle of Throw		
	30° or 36°	45° or 60°	90°
115 Vac resistive	1 amp	5 amps	5 amps
6-28 Vdc resistive	1 amp	1 amp	2 amps
115 Vac inductive	0.25 amp	2 amps	2 amps
115 Vdc inductive	0.02 amp	—	—
6-28 Vdc inductive	0.10 amp	—	—
115 Vdc resistive	0.10 amp	—	—

To carry 10 amps continuously.

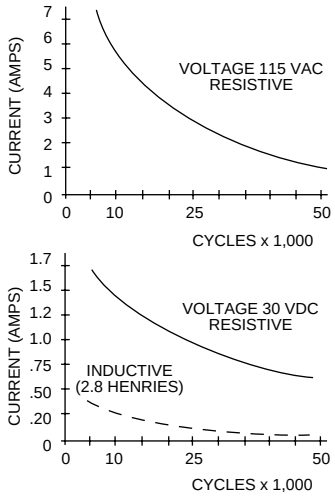
Contact Resistance: 50 milliohms maximum
Insulation Resistance: 1,000 megaohms minimum
Voltage Breakdown: 1,000 Vac initially (500 Vac or better after most environmental tests)
Life Expectancy: 100,000 mechanical cycles of operation. *Note:* Actual life is determined by a number of factors, including electrical loading, rate of rotation, and environment, as well as maximum voltage breakdown required at the end of life.

UL Recognition–
Styles UA, UD, UM, UP, US and USP

Grayhill styles A and M and their variations (D, P, S and SP) of the Series 42, 43, 44 and 54 rotary switches have been tested by Underwriters Laboratories. The letter U in the style indicates proper marking as required by Underwriters Laboratories. These switches are recognized under file number E35289. The UL rating for the Series 42, 43, 44 and 54 is as follows:
Electrical Parameters: style UA = 1.0 ampere at 125 Vac. Style UM = 1.0 ampere at 125 Vac and also .5 ampere at 125 Vac, inductive load, 0.75 to 0.8 power factor.
Rating based on the following criteria:
Overload: 50 operations at 150% rated AC load
Endurance: 6000 operations at the rated load with 1000 Vac dielectric strength before and after test
Temperature Rise: Not to exceed 30°C when carrying rated AC load after test.
Note: all dimensional drawings for the standard style Series 42, 43, 44 and 54 also apply to these switches, with the exception that switches are marked per specifications.

Electrical Ratings
Military Style

General Rating: This rating is based on standard Grayhill tests of the Military style switch done at ambient conditions. It is provided for comparison to the Standard Style switch.



Charts shown for non-shorting contacts (break before make)
Voltage and Load: As listed in the chart
One cycle is 360° rotation and a return through all switch positions to the starting position. The data for the curves was measured at sea level, 25°C and 68% relative humidity.

The Series 42, 43, 44 and 54, style M, H and HS switches are made to meet requirements of MIL-S-3786, style SR04. Diallyl phthalate molded parts and the design of internal switching elements provide exceptional performance.

Curves shown are typical load-life curves for Series 42, 43, 44 and 54, style M, H and HS switches with 30° or 36° angles of throw. They show the numbers of cycles of rotational life expectancy for the types of loads shown. Thus, with a 5 amp, 115 Vac resistive load, 10,000 cycles of life is expected. If the load is reduced to 3 amps, life is increased to 25,000 cycles. The larger angles of throw (45°, 60° or 90°) switch larger currents for a like number of cycles.

Life limiting or failure criteria for these curves are:
Contact Resistance: 50 milliohms maximum
Insulation Resistance: 1,000 megaohms minimum between mutually insulated parts
Voltage Breakdown: 1,000 Vac minimum between mutually insulated parts. These switches will carry 10 amps with maximum contact temperature rise of 20°C. Life can be predicted by Grayhill if less critical life characteristics, elevated temperature or reduced pressure is involved.

SPECIFICATIONS

MIL-S-3786 Electrical Values
Military Style

Style M switches, at 85°C, approximately 68% humidity and sea level pressure and style H and HS at 125°C have been tested to make and break the following loads as stated in MIL-S-3786/SR04; 250 milliamperes at 28 Vdc resistive, 100 milliamperes at 28 Vdc inductive (2.8 henries); 75 milliamperes at 115 Vac resistive.

These switches have also been tested at reduced barometric pressure (70,000 feet), 25°C at approximately 68% relative humidity to make and break the following loads as stated in MIL-S-3786/SR04; 200 milliamperes, 28 Vdc resistive; 25 milliamperes, 28 Vdc inductive (2.8 henries); 20 milliamperes, 115 Vac resistive. When tested to these loads and conditions the style M, H and HS switches meet the following life limiting or failure criteria after 25,000 cycles in accordance with MIL-S-3786.

Contact Resistance: 50 milliohms maximum
Insulation Resistance: 1,000 megaohms minimum between terminals and shafts
Dielectric Strength: 1,000 Vac (atmospheric pressure) and 450 Vac (reduced pressure) minimum between mutually insulated parts.

When tested at sea level 25°C and 68% relative humidity with failure criteria of 50 milliohms max. and 750 Vac breakdown voltage, these switches will make and break the following loads: 250 mA at 28 Vdc, inductive (2.8 henries); 1.25 amps at 28 Vdc resistive; 2.0 amps at 115 Vac, 60 Hz resistive, for 10,000 cycles.

These switches also meet MIL-S-3786/SR04 for moisture resistance, medium and high shock, vibration (10 to 2000 cps), thermal shock (-65°C to 125°C), salt spray, explosion and terminal pull.

Materials and Finishes
Standard Style

Bases: Melamine per (MIL-M-14) ASTM-D-5948
Cover, Deck Separators, End Plate and Rotor Mounting Plate: Phenolic per (MIL-M-14) ASTM-D-5948
Mounting Bushings, Lockwashers and Nuts: Brass, cadmium-plated per QQ-P-416, Class 2, Type II
Shaft, Cover Plate, Retaining Rings, Through Bolts, Shaft Extensions, Stop Arm, Thrust Washers Stop Washers and Rear Support Plate: Stainless Steel
Detent Balls: Steel, nickel-plated
Detent Springs: Tinned music wire
Rotor Contact, Stator (Base) Contacts: Silver alloy
Terminals (Except Common): Brass, lead-tin plated and fused
Common Plate, Including Solder Lug: Brass, silver-plated .0003" minimum
Mounting Hardware: Two mounting nuts .094" (2,39) thick by .562" (14,27) across flats and one internal tooth lockwasher are supplied with each switch.

Materials and Finishes
Military Qualified

Bases: Diallyl per (MIL-M-14) ASTM-D-5948
Cover, Deck Separators, End Plate and Rotor Mounting Plate: Diallyl per (MIL-M-14) ASTM-D-5948
Mounting Bushings , Lockwasher and Nuts: Brass, cadmium-plated per QQ-P-416, Class 2, Type II
Shaft, Cover Plate, Retaining Rings, Through Bolts, Shaft Extensions, Stop Arm, Stop Washers, Thrust Washers and Rear Support Plate: Stainless steel
Detent Balls: Steel, nickel-plated
Detent Springs: Tinned music wire
Rotor Contact: Silver alloy
Terminals, Common Plate including Solder Lug: Brass, silver-plated .0003" minimum
Mounting Hardware: Two mounting nuts .094" thick by .562" across flats and one internal tooth lockwasher are supplied with each switch.

Additional Characteristics
Standard Style and Military Qualified

Contact: Shorting or non-shorting wiping contacts with over 150 grams of contact force
Rotational Torque: 8-115 ounce-inches depending upon the number of poles per deck, number of decks and angle of throw
Mechanical Life Expectancy: 100,000 cycles of operation
Shaft Flat Orientation: Flat opposite contacting position of pole number one (See circuit diagram).
Stop Strength: For Standard style: 15 pound-inches minimum. For Adjustable stop styles: 12 pound-inches
Extended Stud: Single shaft switches of six or more decks and concentric shaft switches of a combination of five or more decks (Standard style) or four or more decks (Military style) have longer studs with extra mounting nuts for recommended double end mount.

CHOICES AND LIMITATIONS: Series 42, 43, 44 and 54

A = Standard, Solder Lugs
P = Standard, PC Mount Terminals
D = Standard, Adjustable Stops

S = Shaft and Panel Seal
U = UL Recognized
M = Military Qualified 85°C[4]

H = Military Qualified, 125°C
B = Military, Grounded Shaft
G = Military, Low Level Rating

SINGLE SHAFT SWITCHES

Series	Style Choices Unsealed	Style Choices Shaft/Panel Seal	Angle of Throw	Number of Decks	Poles Per Deck	Positions Per Pole[1,3]	Shorting or Non-Shorting
42	A UA UM[5] M MB MG MBG H HB HG HBG	S US — MS[4] MBS[4] MGS[4] MBGS[4] HS HBS HGS HBGS	36°	01 thru 12 01 thru 12	1 2	02 thru 10[3] 02 thru 05	N or S N or S
44			30°	01 thru 12 01 thru 12 01 thru 08 01 thru 06 01 thru 04 01 thru 04	1 2 3 4 5 6	02 thru 12[3] 02 thru 06 02 thru 04 02 or 03 02 02	N or S N or S N or S N or S N or S N or S
			45°	01 thru 12 01 thru 06 01 thru 04 01 thru 03	1 2 3 4	02 thru 08[3] 02 thru 04 02 02	N or S N or S N N
			60°	01 thru 12 01 thru 06 01 thru 04	1 2 3	02 thru 06[3] 02 or 03 02	N N N
			90°	01 thru 12 01 thru 06	1 2	02 thru 04[3] 02	N N
44	D UD	— —	30°	01 thru 12 01 thru 12 01 thru 08 01 thru 06	1 2 3 4	AJ (2 thru 12)[1] AJ (2 thru 6)[1] AJ (2 thru 4)[1] AJ (2 or 3)[1]	N or S N or S N or S N or S
42			36°	01 thru 12 01 thru 12	1 2	AJ (2 thru 10)[1] AJ (2 thru 5)[1]	N or S N or S
42	P UP	SP USP	36°	01 thru 12	1	02 thru 10[3]	N or S

Concentric Shaft Switches

Series	Style Choices	Angle of Throw	Section A (Front) Decks	Poles	Position	N or S	Section B (Rear) Decks	Poles	Position	N or S
CONCENTRIC SHAFT, 2 SWITCHES										
54	A[2] UA[2] M[2]	30°	01 thru 03 01 thru 03	1 2	02 thru 12[3] 02 thru 06	N or S N or S	01 thru 03 01 thru 03 01 or 02 01 01 01	1 2 3 4 5 6	02 thru 12[3] 02 thru 06 02 thru 04 02 or 03 02 02	N or S N or S N or S N or S N or S N or S
43		36°	01 thru 03	1	02 thru 10[5]	N or S	01 thru 03 01 thru 03	1 2	02 thru 10[3] 02 thru 05	N or S N or S
ADD-A-POT SWITCHES										
54	D UD	30°	01 thru 03 01 thru 03	1 2	AJ (2-12)[1] AJ (2-6)[1]	N or S N or S	Second shaft operates a potentiometer supplied by the customer. Rear mounting plates are provided.			
43		36°	01 thru 03	1	AJ (2-10)[1]	N or S				
54	M	30°	01 thru 03 01 thru 03	1 2	02 thru 12[5] 02 thru 06	N or S N or S				

[1]For Adjustable Stop (with the letter D), use AJ instead of number of positions when ordering.
[2]For 45°, 60° or 90° throws in Series 54 switches of these styles, see Standard Options.
[3]For single pole switches with the maximum positions per pole, continuous rotation is possible. Specify fixed stop or continuous rotation when ordering single shaft switches. Concentric shaft switches have continuous rotation.
[4]Styles which include both M and S are not qualified but are made of the same materials and construction as qualified types. For qualified switches with shaft and panel seal, use equivalent HS style.
[5]UM switches are made of the same materials and construction as the M style switches. For military switch UM is not required; use M style.

STANDARD OPTIONS

Terminals, military qualified shielding, additional angles of throw, etc., see Options, page F-9.

ADDITIONAL FEATURES

For single shaft switches with spring return, isolated positions, keylocks, see the Features Selection Chart, page F-7.

ACCESSORIES

Internal Tooth Lockwasher–Figure A
For a 3/8" bushing. Approximately 0.500" (12,7) outside diameter, .022" (0,56) thickness. Material is cadmium-plated steel. Part **No. 12Q1272-1**
For a 1/4" bushing. Approximately 0.400" (10,16) outside diameter, .018" (0,46) thickness. Material is passivated stainless steel. **Part No. 8J1026**

FIGURE A

Non-Turn Washer–Figure B
Can be ordered as extra hardware for the Series 5000, 24, 42, 43, 44, 54, 71B, 53, 57 and 59 rotary switches. The internal key of the washer slides into the bushing keyway. The right angle tab locks into a predrilled hole on the back side of the mounting panel. Material is brass, cadmium plates. **Part No. 12C1087-1**

Panel Seal Kit–Figure C
Sold as a separate item to seal the switch bushing to the panel. The kit consists of four items: a grooved hex nut, a keyed washer, a keyed seal and a non-turn washer. Assembly is described on Page F-53. Dimensions of panel seal kit items are shown in Figure C. This kit seals the bushing to the panel; it does not seal the shaft to the bushing. Not usable with adjustable stop switches. **Part No. 42-24**

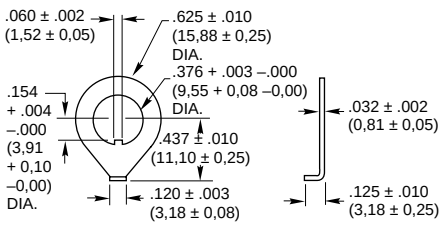


FIGURE B

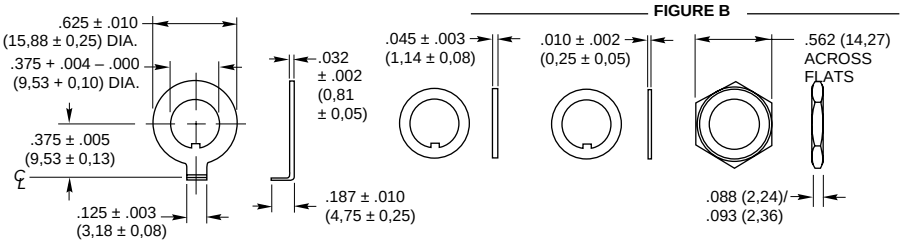


FIGURE C

ORDERING INFORMATION: Single Shaft Switches, Add-A-Pot Switches

44M30–02–1–12N–F

Series: Determined by the type of switch and the angle of throw
Style*: Letter(s) from the Choices and Limitations chart
Angle of Throw: Must agree with Series Number
Number of Decks: As limited by the angle of throw, the poles per deck, switch style, and type of contacts
Stop Arrangement: Add letter F to a one pole per deck switch with the maximum number of positions for a stop between position 1 and the last position. Leave blank for continuous rotation
Type of Contacts: N = Non-shorting; S = Shorting
Positions Per Pole: Requires 02 positions as a minimum to maximum allowable dependent on the angle of throw, and poles per deck. Use AJ for adjustable stops (Styles D and UD).
Poles Per Deck: As limited by angle of throw, switch series and style

Control knobs available.
See page E-39.

** All rotary switches that are required to have military designated markings and testing adhering to MIL-3786 are to be ordered by specifying the military part number identified on the appropriate slash sheet.*

ORDERING INFORMATION: Concentric Shaft Rotary Switches

43M02110N–M03203S

Series: Determined by the angle of throw, applicable to both sections
Style*: Letter(s) from the Choices and Limitations chart

Section A (front)
Number of Decks: As limited by the number of poles per deck
Poles Per Deck: As limited by the angle of throw
Positions Per Pole: Requires 02 positions as a minimum to the maximum allowable dependent on the angle of throw and the poles per deck
Type of Contacts: N=Non-shorting, S=Shorting. All one pole per deck switches with the maximum number of positions are continuous rotation

Section B (rear)
The limitations listed for Section A apply to Section B
Type of Contacts
Positions Per Pole
Poles Per Deck
Number of Decks
Style

Control knobs available.
See page E-39.

** All rotary switches that are required to have military designated markings and testing adhering to MIL-3786 are to be ordered by specifying the military part number identified on the appropriate slash sheet.*

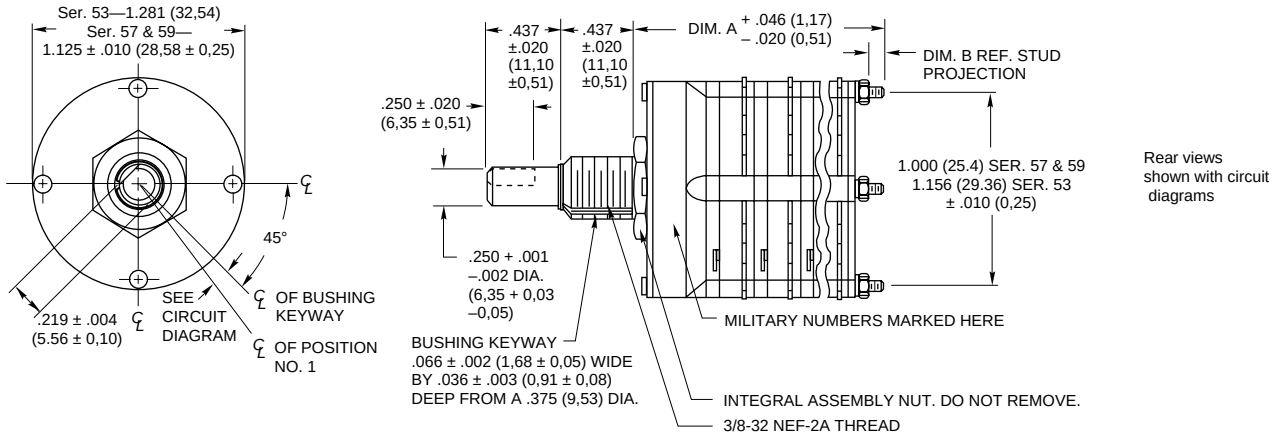
Available from your local Grayhill Distributor For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

SERIES 53, 57 and 59
1.125" Diameter, 1/4 Amp, 24 Max. Positions/Pole

FEATURES
- Smallest Diameter Rotary Switch With This Number of Positions and Current Capacity
- Military Qualified MIL-S-3786/36
- Gold-plated Contact System Compatible with Logic Circuitry

DIMENSIONS In inches (and millimeters)

Military Style

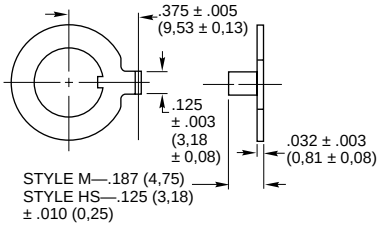


No. of Decks	Dimension A	Dimension B	Approx. Weight Grams	No. of Decks	Dimension A	Dimension B	Approx. Weight Grams
1	.916 (23,27)	.032 (0,81)	50	7	3.164 (80,37)	.281 (7,14)	110
2	1.249 (31,72)	.032 (0,81)	60	8	3.497 (88,82)	.281 (7,14)	120
3	1.582 (40,18)	.032 (0,81)	70	9	3.830 (97,28)	.281 (7,14)	130
4	1.915 (48,64)	.032 (0,81)	80	10	4.163 (105,74)	.281 (7,14)	140
5	2.248 (57,10)	.032 (0,81)	90	11	4.496 (114,20)	.281 (7,14)	150
6	2.831 (71,91)	.281 (7,14)	100	12	4.829 (122,66)	.281 (7,14)	160

Mounting Hardware: Two mounting nuts, .094" (2,39) thick by .562" (14,27) across flats, one internal tooth lockwasher and one non-turn washer (see detail D for dimensions), are supplied with switch.

Grayhill part number and date code marked on detent cover label. Customer part number marked on request. Military part number marked when required.

Non-Turn Washer Detail D



STANDARD STYLE MILITARY QUALIFIED

The Series 53, 57 and 59 rotary switches are all military type switches. Grayhill manufactures these switches in two styles: M and HS. Style M is unsealed and is *not* qualified; Style HS is shaft and panel sealed and *is* qualified. The non-qualified Style M can be regarded as our Standard Style for types of switches. Although it is not qualified, Style M is constructed of the same military grade materials and will provide comparable performance in all areas. For example, the Style 'M' switches, in addition to the electrical ratings listed elsewhere in these pages, will meet the following requirements of MIL-S-3786:

Moisture Resistance: Medium and High Shock; Vibration (10 to 500 cps); Thermal Shock (-65 °C to 125 °C); Salt Spray; Explosion; Terminal Strength (pull, 2 lbs. minimum); and Stop Strength (15 pound-inches minimum).

The line drawings shown above are applicable to the Style M and Style HS. The only difference between the two is the length of the tab of the non-turn washer. The shorter tab for the HS is explained in the following paragraph.

The Series 53, 57 and 59 Style HS rotary switches are qualified to MIL-S3786/36. The Style HS is shaft and panel sealed. The panel is sealed by an O-ring at the base of the bushing. The shaft is sealed by an O-ring inside the bushing. These seals do not alter the dimensions shown in the line drawings when the switch is mounted.

A non-turn washer, supplied with the mounting hardware, may be used with the Style HS switches. It is suggested that the non-turn washer be mounted in the following manner to preserve the seal: from the front of the panel into a hole that does not go through the panel.

The qualification of the Series 53, 57 and 59 rotary switches does not extend to all possible combinations listed in the Choices and Limitations chart. The limitations on the qualification are described in the chart shown below.

Standard variations, such as shaft and/or bushing length, etc., that do not affect switch performance can also be marked as qualified product. For complete details contact Grayhill. Military qualified Series 53, 57 and 59 Style HS rotary switches may be ordered by the 'M' number listed in MIL-S-3786/36, or by the Grayhill part number. Military style switches will be marked to the specification.

Style HS Switches are MIL-S-3786/36 Qualified for the Following Characteristics

Series	Max. No. of Decks	Max. No. Poles/Deck	Max. No. Total Poles/Switch
53	5	8	24
57	5	4	20
59	5	5	20

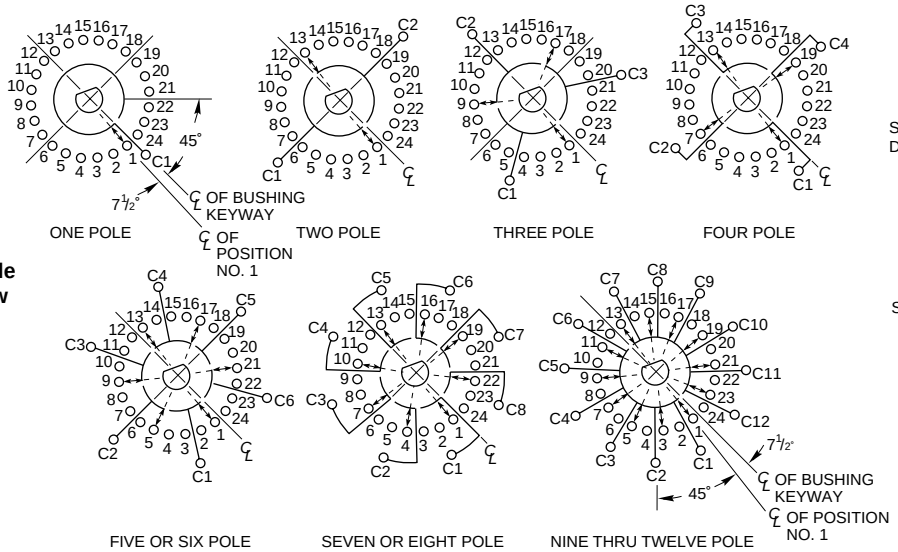
Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

CIRCUIT DIAGRAMS: Series 53

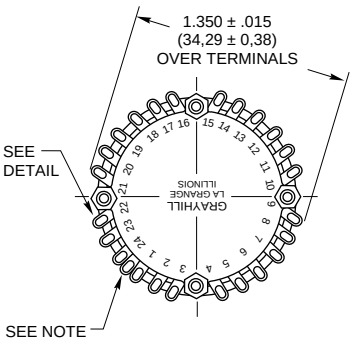
Switch is Viewed From Shaft End and Shown in Position No. 1

Note: All common terminals are located above base terminals as shown.

15° Angle of Throw

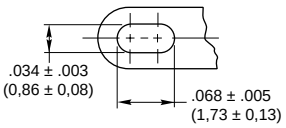


Rear View



Note: Common location for a single pole per deck switch. For common location on multipole switches see circuit diagrams.

Terminal Detail

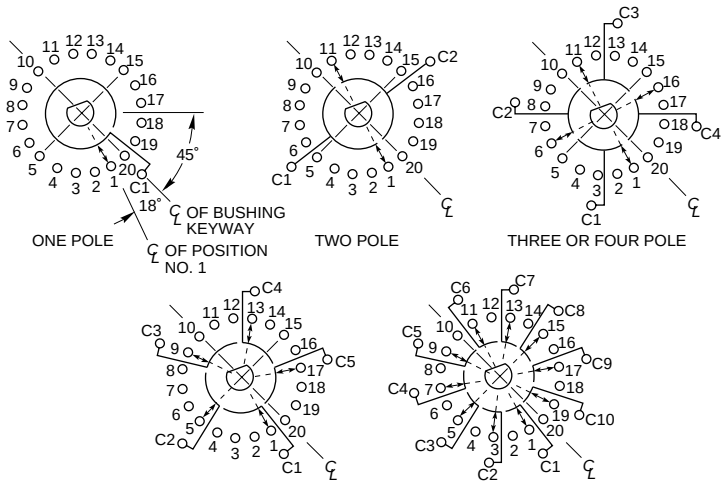


CIRCUIT DIAGRAMS: Series 59

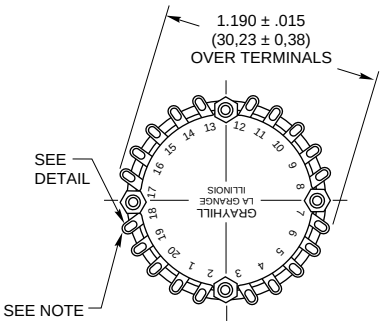
Switch is Viewed From Shaft End and Shown in Position No. 1

Note: All common terminals are located above base terminals as shown.

18° Angle of Throw



Rear View



Note: Common location for a single pole per deck switch. For common location on multipole switches see circuit diagrams.

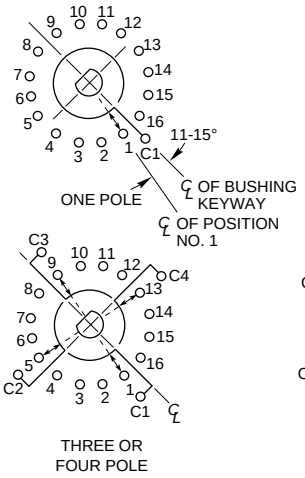
See following page for Series 57, 22½° angle of throw circuitry.

CIRCUIT DIAGRAMS: Series 57

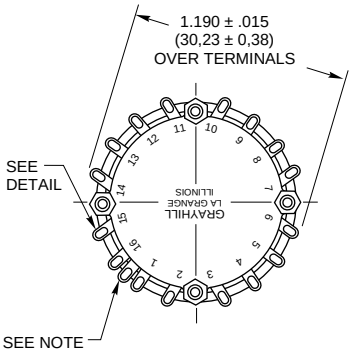
Switch is Viewed From Shaft End and Shown in Position No. 1.

Note: All common terminals are located above base terminals as shown.

22½° Angle of Throw



Rear View

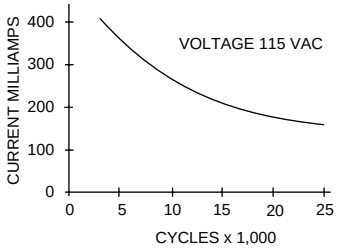


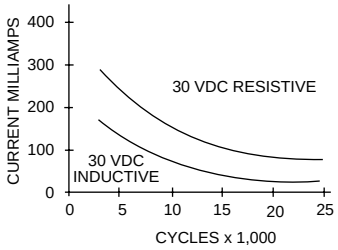
Note: Common location for a single pole per deck switch. For common location on multipole switches see circuit diagrams.

SPECIFICATIONS

Electrical Ratings
General

Switch rating for break before make contacts.
Voltage: As listed in the chart.





Curve data based on test data conducted at sea level, 25°C and relative humidity. Cycle equals 360° rotation and 360° return. Cycling rate is 10 cycles per minute. The curves shown are typical load life curves for a Series 53M, 57M and 59M Rotary Switch. They show the number of cycles of rotational life that can be expected for the voltages, currents and types of loads shown. Thus, with a 250 milliamperes, 30 Vdc resistive load, 10,000 cycles of life can be expected. Life limiting or failure criteria for these curves are:

Contact Resistance: 50 milliohms maximum (20 milliohms initially).

Insulation Resistance: 1,000 megohms minimum between mutually insulated parts.

Voltage Breakdown: 500 Vac minimum between mutually insulated parts. These switches will carry 4 amperes with a maximum contact temperature rise of 20°C. If the life limiting characteristics are less critical than those shown above, or if elevated temperatures or reduced pressures are involved, Grayhill can predict the switch life for the application.

Electrical Ratings
Military Qualified

The Series 53, 57 and 59 Style HS, Rotary Switches have been tested to make and break the following loads as stated in MIL-S-3786/36: 70,000 ft. altitude for 10,000 cycles: 10mA, 28 Vdc, inductive (250 mH); 50 mA, 28 Vdc, resistive; 20 mA, 115 Vac, resistive. Atmospheric pressure, 125°C for 10,000 cycles: 25 mA, 28 Vdc inductive (250 mH); 75 mA, 28 Vdc, resistive; 50 mA, 115 Vac resistive. Atmospheric pressure, 25°C for 10,000 cycles: 75 mA, 28 Vdc, inductive (250 mH); 250 mA, 28 Vdc resistive; 150 mA, 115 Vac, resistive. Life limiting criteria for these loads are:

Contact Resistance: 50 milliohms maximum.

Dielectric Strength: 500 Vac (350 Vac—reduced pressure).

Insulation Resistance: 1,000 megohms minimum. These switches also meet MIL-S-3786/36 for moisture resistance, medium and high shock, vibration, thermal, thermal shock, salt spray, explosion, terminal strength, and stop strength.

Materials and Finishes

Cover, Base, Spacer, and Rotor Mounting Plate: Diallyl per (MIL-M-14) ASTM-D-5948

Mounting Bushing and Nut, Lockwasher: Brass, cadmium-plated per QQP-416, Class 2, Type II.

Shaft, Stop Pins, Retaining Rings, Through Bolts, Shaft Extension, Stop Arm, Thrust Washers, Lockwashers, Nuts, Non-turn Washer, Stop Pins, Cover Plate and Rear Support Plate: Stainless steel, passivated

Detent Balls: Steel, nickel-plated

Detent Springs: Tinned music wire

Rotor Contact: Silver alloy, gold-plated .00001" minimum.

Terminals and Common Plate Including Solder Lug: Brass, gold plate .00002" minimum over silver plate .0003" minimum.

Panel Seal: Silicone rubber.

Shaft Seal: O-ring per MIL-M-5516B.

Additional Characteristics

Rotational Torque: 20-80 in-ozs., depending on the number of poles per deck and the number of decks.

Contacts: Shorting or non-shorting wiping contacts with over 100 grams of contact force.

Shaft Flat Orientation: Flat opposite contacting position pole #1 (See Circuit Diagrams).

Extended Studs: Switches of 6 decks or more have longer studs with extra stud nuts for recommended double end mounting.

Terminals: Switch is provided with full complement of base or position terminals regardless of the number of active positions.

Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

CHOICES AND LIMITATIONS

Series	Style and Designation	Angle of Throw	Stops	Terminals	Number of Decks Shorting	Number of Decks Non-Shorting	Poles Per Deck	Number of Positions/Pole
53	M = Military Style HS = Military Qualified, Shaft/Panel Seal	15°	Fixed	Solder Lug	01 thru 12 01 thru 12 01 thru 08 01 thru 06 01 thru 04 01 thru 03 01 or 02	01 thru 12 01 thru 12 01 thru 08 01 thru 06 01 thru 04 01 thru 03 01 or 02	1 2 3 4 5 or 6 7 or 8 9, 10, 11 or 12	02 thru 24 02 thru 12 02 thru 08 02 thru 06 02 thru 04 02 or 03 02
57	M = Military Style HS = Military Qualified, Shaft/Panel Seal	221/2°	Fixed	Solder Lug	01 thru 12 01 thru 12 01 thru 06 01 thru 03	01 thru 12 01 thru 12 01 thru 06 01 thru 03	1 2 3 or 4 5, 6, 7 or 8	02 thru 16 02 thru 08 02 thru 04 02
59	M = Military Style HS = Military Qualified, Shaft/Panel Seal	18°	Fixed	Solder Lug	01 thru 12 01 thru 12 01 thru 06 01 thru 04 01 or 02	01 thru 12 01 thru 12 01 thru 06 01 thru 04 01 or 02	1 2 3 or 4 5 6, 7, 8, 9 or 10	02 thru 20 02 thru 10 02 thru 05 02 thru 04 02

MIL Spec. provides for qualification up to and including five decks. Switches of longer length, although not specifically qualified, are built of the same materials and are of the same construction.

STANDARD OPTIONS

Terminals, shielding, additional angles of throw, etc. see Options, pages F-9 and F-10.

ORDERING INFORMATION

Control knobs available.
See page E-39.

57M22–01–1–16N–C

Series

Style*: Letter(s) from the Choices and Limitations chart

Angle of Throw: Must agree with Series Number

Number of Decks: As limited by Choices and Limitations chart

Stop Arrangement: Use suffix only when ordering 1 pole with maximum positions.
C = Continuous rotation; F = Stop between last and first positions

Type of Contacts: N = Non-shorting; S = Shorting

Positions Per Pole: requires 02 as a minimum to the maximum allowable dependent on the angle of throw and poles per deck

Poles Per Deck: As limited by angle of throw

** All rotary switches that are required to have military designated markings and testing adhering to MIL-3786 are to be ordered by specifying the military part number identified on the appropriate slash sheet.*

Available from your local Grayhill Distributor For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

KEYLOCK ROTARY SWITCHES

- Protection From Unauthorized Use
- Static Damage Protection
- High Quality, Enclosed Switches
- Low Current, Wiping Contacts
- Choices of Size, Circuitry, Rating

Page

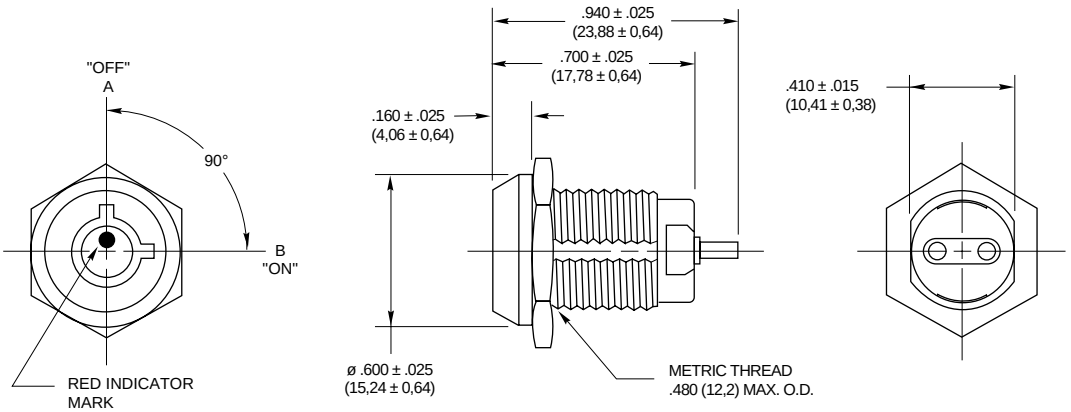
SERIES 03

Low Cost, Miniature On/Off

FEATURES

- Miniature Size, Requires 0.6" Panel Space
- 2 Keyed Alike Keys Supplied
- Operating Position Indicator

DIMENSIONS In inches (and millimeters)



SPECIFICATIONS

Rating Criteria

Contact Rating: 2 Amps at 120 Vac or 1 Amp at 240 Vac, resistive load
Electrical Life: 20,000 operations or 10,000 cycles
Life Limiting Criteria:
Contact Resistance: 10 Milliohms maximum initially
Insulation Resistance: 500 Megohms minimum at 500 Vdc
Voltage Breakdown: 1000 Vac RMS between mutually insulated parts.

Materials and Finishes

Body of Switch, Bezel, Core: Zinc, chrome-plated
Contact System: Brass, silver-plated
Terminals: Turret type, brass, silver-plated
Keys: Brass, nickel-plated

OPTIONS

- Additional Keys
- Key Marking; Custom Key ID
- Black Chrome Finish
- Gold contact plating

ORDERING INFORMATION

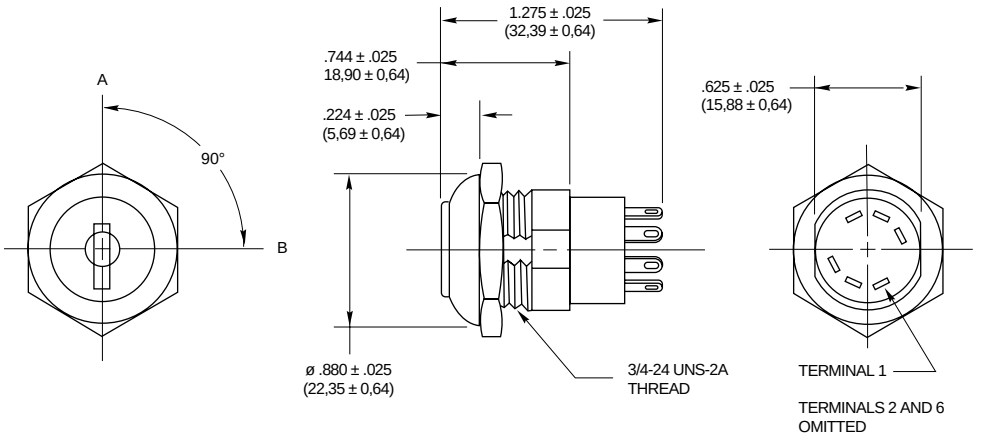
Part Number: 03S501

Available from your local Grayhill Distributor.
For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

SERIES 03
Low Cost, DPDT

FEATURES
- Two Positions, DPDT Function
- 2 Keyed Alike Keys Supplied
- Key Pulls in Each Position
- Drop-In Replacement for Industry Standard

DIMENSIONS In inches (and millimeters)



SWITCHING FUNCTION

Position	Contacts Make
A	8 & 1 AND 4 & 5
B	1 & 3 AND 5 & 7

SPECIFICATIONS
Rating Criteria
Contact Rating: 4 Amps at 120 Vac or 2 Amps at 240 Vac, resistive load
Electrical Life: 20,000 operations or 10,000 cycles
Life Limiting Criteria:
Contact Resistance: less than 10 milliohms initially
Insulation Resistance: 1000 megohms min. at 500 Vdc
Voltage Breakdown: 1000 Vac RMS between mutually insulated parts.

Materials and Finishes
Switch Housing: Glass-filled polyester
Lock and Bezel: Zinc alloy, nickel-plated
Mounting Nut: Brass or steel, nickel or bright zinc-plated
Contact System: Brass, silver-plated
Terminals: Solder lug type, brass, silver-plated
Keys: Brass, nickel-plated

OPTIONS
- Additional Keys
- Key Marking; Custom Key ID
- Black Chrome Finish
- Stiffer or lighter switch “feel”
- Gold contact plating

ORDER INFORMATION
Part Number: 03S603

Available from your local Grayhill Distributor.
For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

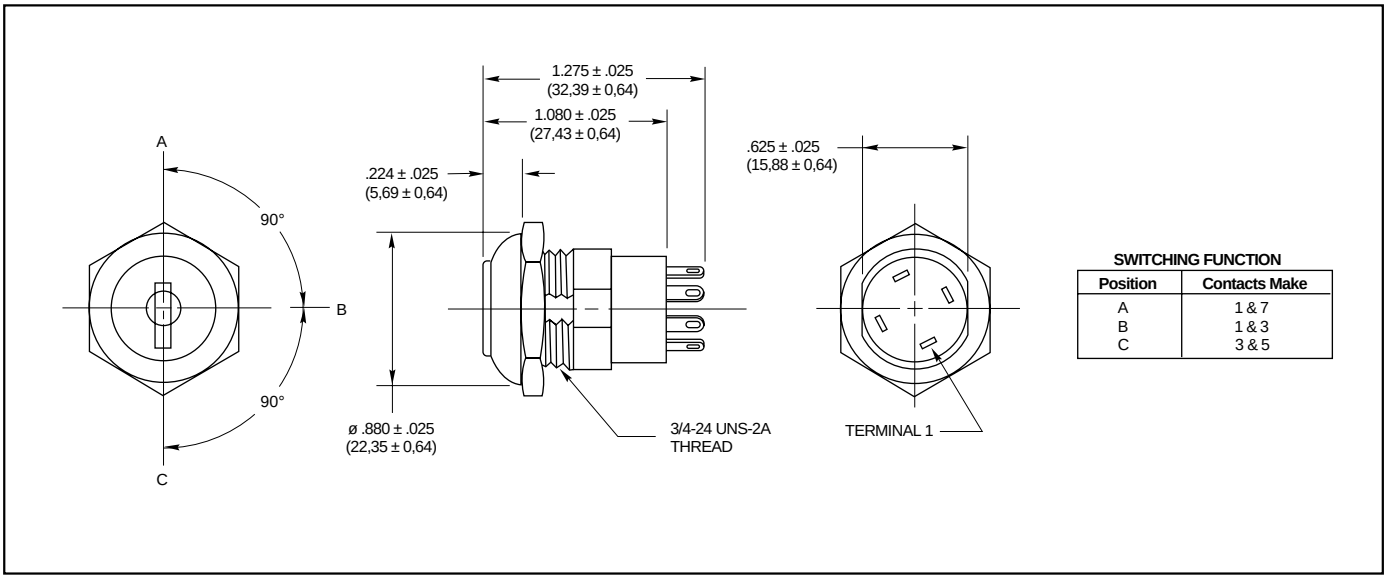
SERIES 03

Low Cost, Progressive Contact

FEATURES

- Three Positions, Progressive Contact
- 2 Keyed Alike Keys Supplied
- Key Pulls in Each Position
- Drop-In Replacement for Industry Standard

DIMENSIONS In inches (and millimeters)



SWITCHING FUNCTION

Position	Contacts Make
A	1 & 7
B	1 & 3
C	3 & 5

SPECIFICATIONS

Rating Criteria

Contact Rating: 4 Amps at 120 Vac or 2 Amps at 240 Vac, resistive load
Electrical Life: 10,000 cycles of operation
Life Limiting Criteria:
Contact Resistance: less than 10 Milliohms initially
Insulation Resistance: 1000 Megohms min. at 500 Vdc
Voltage Breakdown: 1000 Vac RMS between mutually insulated parts

Materials and Finishes

Switch Housing: Glass-filled polyester
Lock and Bezel: Zinc alloy, nickel-plated
Mounting Nut: Brass or steel, nickel or bright zinc-plated
Contact System: Brass, silver-plated
Terminals: Solder lug type, brass, silver-plated
Keys: Brass, nickel-plated

OPTIONS

- Additional Keys
- Key Marking; Custom Key ID
- Black Chrome Finish
- Stiffer or lighter switch “feel”
- Gold contact plating

ORDERING INFORMATION

Part Number: 03S604

Available from your local Grayhill Distributor.
For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

Grayhill, Inc. • 561 Hillgrove Avenue • LaGrange, Illinois 60525-5997 • USA • Phone: 708-354-1040 • Fax: 708-354-2820 • www.grayhill.com

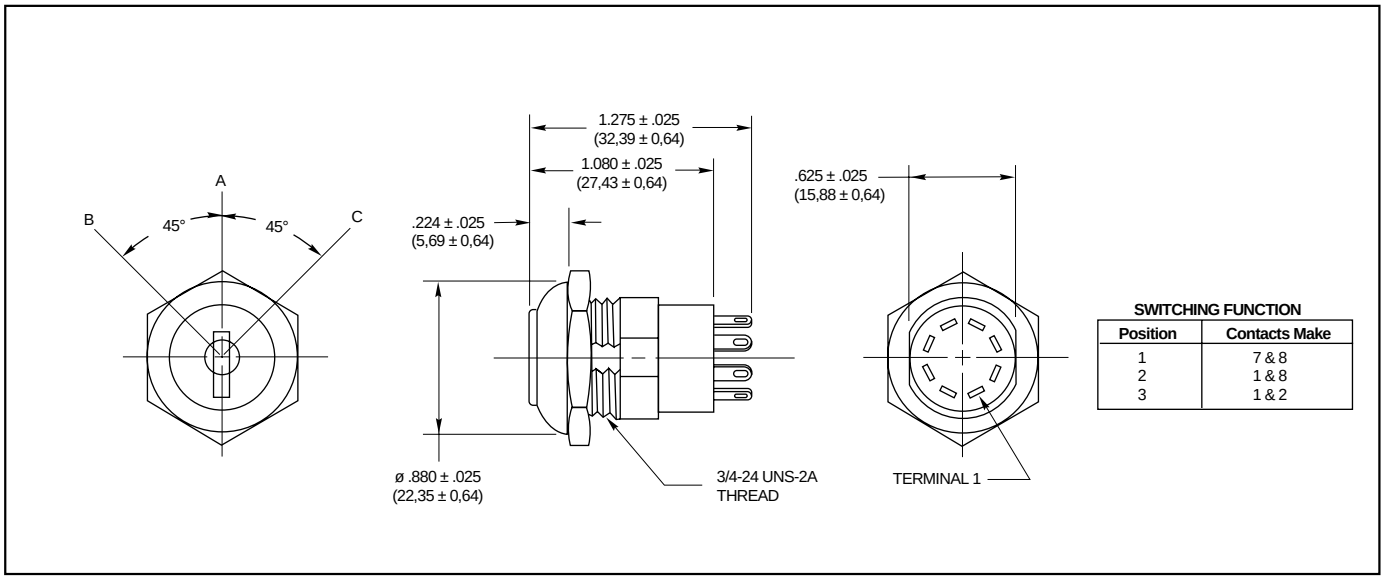
SERIES 03

Low Cost, Position, Center Pull

FEATURES

- Three Positions, Progressive Contact
- 2 Keyed Alike Keys Supplied
- Key Pulls in Center Position
- Drop-In Replacement for Industry Standard

DIMENSIONS In inches (and millimeters)



SWITCHING FUNCTION

Position	Contacts Make
1	7 & 8
2	1 & 8
3	1 & 2

Rotary Switches

SPECIFICATIONS

Rating Criteria

Contact Rating: 4 Amps at 120 Vac or 2 Amps at 240 Vac, resistive load
Electrical Life: 10,000 cycles of operation
Life Limiting Criteria:
Contact Resistance: less than 10 milliohms initially
Insulation Resistance: 1000 megohms minimum at 500 Vdc
Voltage Breakdown: 1000 Vac RMS between mutually insulated parts

Materials and Finishes

Switch Housing: Glass-filled polyester
Lock and Bezel: Zinc alloy, nickel-plated
Mounting Nut: Brass or steel, nickel or bright zinc-plated
Contact System: Brass, silver-plated
Terminals: Solder lug type, brass, silver-plated
Keys: Brass, nickel-plated

OPTIONS

- Different Key Pulls
- Additional Keys
- Key Marking; Custom Key ID
- Black Chrome Finish
- Stiffer or lighter switch “feel”
- Gold contact plating

ORDERING INFORMATION

Part Number: 03S606

Available from your local Grayhill Distributor.
For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

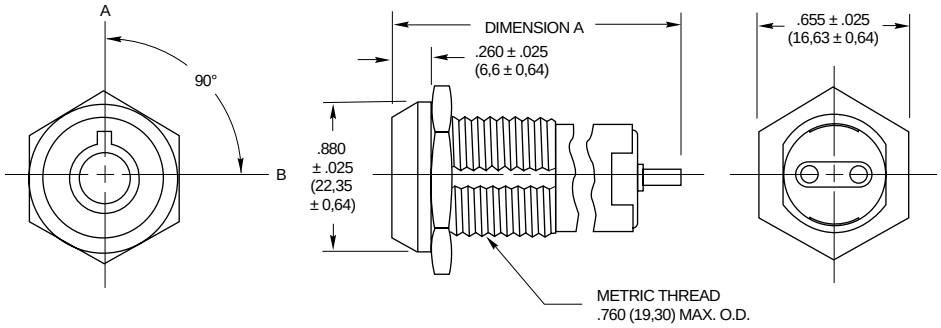
SERIES 03

Low Cost, On/Off, Select Key Pull

FEATURES

- Choose Key Pull Location
- 2 Keyed Alike Keys Supplied

DIMENSIONS In inches (and millimeters)



SWITCHING FUNCTION

Part No.	Dimension A
03S702S	1.520 ± .025 (38,61 ± 0,64)
03S702L	1.780 ± .025 (45,21 ± 0,64)

SPECIFICATIONS

Rating Criteria

Contact Rating: 4 Amps at 120 Vac or 2 Amps at 240 Vac, resistive load
Electrical Life: 20,000 operations or 10,000 cycles
Life Limiting Criteria:
Contact Resistance: less than 10 milliohms initially
Insulation Resistance: 500 megohms min. at 500 Vdc
Voltage Breakdown: 1500 Vac RMS between mutually insulated parts

Materials and Finishes

Body of Switch, Bezel, Core: Brass or zinc die cast
Contact System: Brass, silver-plated
Terminals: Turret type, brass, silver-plated
Keys: Brass, nickel-plated

OPTIONS

- Additional Keys
- Key Marking; Custom Key ID
- Black Chrome Finish
- Gold Contact Plating

ORDERING INFORMATION

Part Number	Description
03S702S	Key pull at A and B
03S702L	Key pull at A only

Available from your local Grayhill Distributor
For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

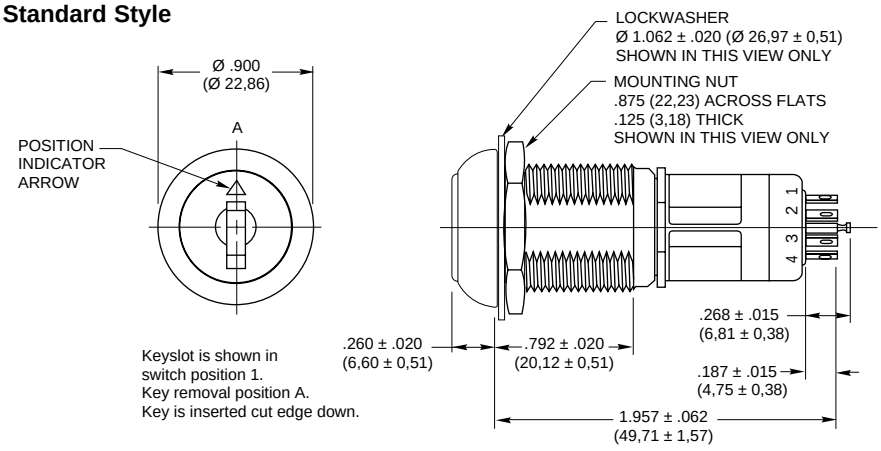
SERIES 58
Single Deck, Antistatic

LOCK FEATURES
- Minimum Space Behind Panel
- 15,000 Vdc Static Protection
- 5 Tumbler-Plate Security
- In-Panel Key Recoding

SWITCH FEATURES
- Economical
- Solder Lug or PC Mount
- 36°, 45°, 60°, or 90° Throws
- 1 or 2 Poles Per Switch
- Up to 10 Positions for 1 Pole
- 200 mA for 25,000 Cycles

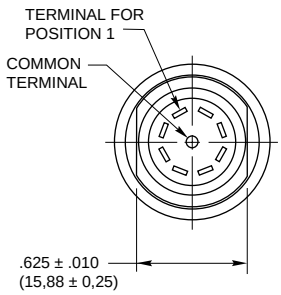
DIMENSIONS In inches (and millimeters)

Standard Style



Keyslot is shown in switch position 1.
Key removal position A.
Key is inserted cut edge down.

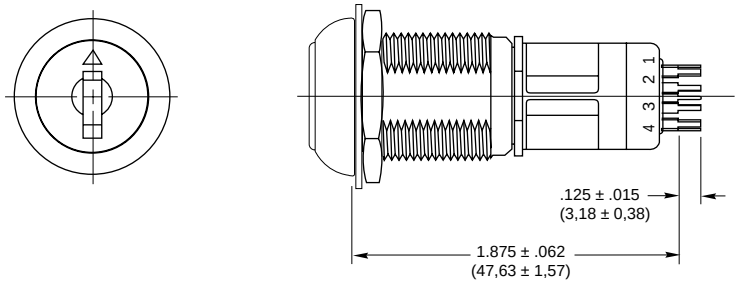
36°, 45°, 60°, or 90° Angle of Throw



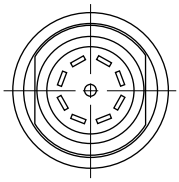
All terminals are provided regardless of the number of active switch positions.

PC Mount Style

Dimensions not shown are the same as above.



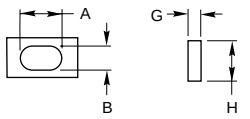
36°, 45°, 60, or 90° Angle of Throw



Grayhill part number and date code marked on label. Customer part number marked on request.

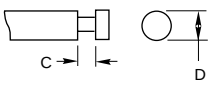
TERMINAL DETAIL

Solder Lug



A = .064 ± .005 (1,63 ±0,13)
B = .032 ± .004 (0,81±0,10)

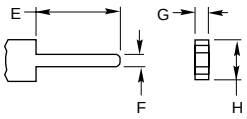
Solder Lug Common



C = .050 ± .010 (1,27 ±0,25)
D = .062 Ø ± .002 (1,58 Ø ±0,51)

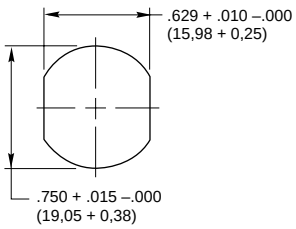
G = .020 ± .003 (0,5 ±0,08)
H = .062 ± .004 (1,6 ±0,10)

PC Mount



E = .125 ± .015 (3,2 ±0,4)
F = .020 ± .003 (0,5 ±0,08)

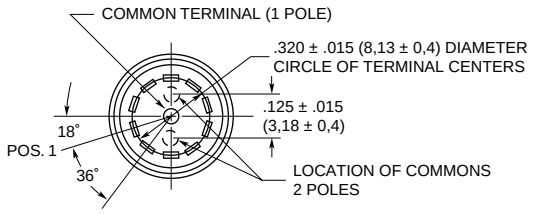
RECOMMENDED PANEL CUT



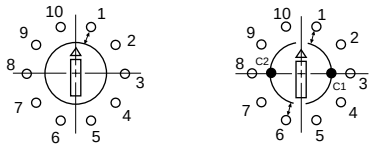
CIRCUITRY

36° Angle of Throw

REAR VIEW

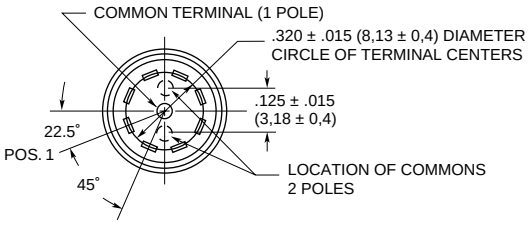


VIEWED FROM FRONT END; SHOWN IN POSITION 1.

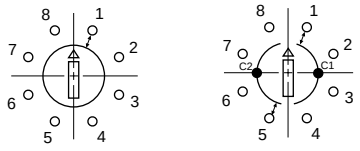


45° Angle of Throw

REAR VIEW

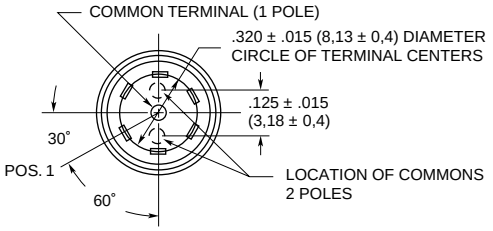


VIEWED FROM FRONT END; SHOWN IN POSITION 1.

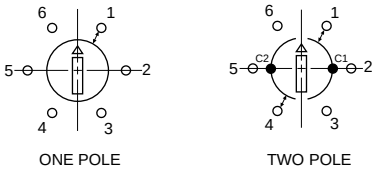


60° Angle of Throw

REAR VIEW

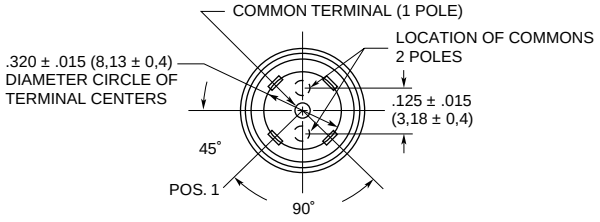


VIEWED FROM FRONT END; SHOWN IN POSITION 1.

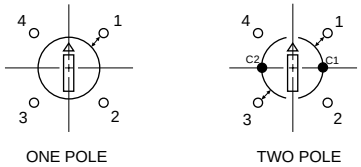


90° Angle of Throw

REAR VIEW



VIEWED FROM FRONT END; SHOWN IN POSITION 1.



LOCK SPECIFICATIONS

General Characteristics

Mounting: By bushing, nut and lockwasher
Keying: All locks keyed alike except by special order
Orientation of Keylock Switch: Lock flats on both sides with key upright (cut side down) in position 1.
Key Removals:

36° Throw Switch	At every position or At 0° & 180°
45° Throw Switch	At every position or At 0°, 90°, 180°, 270°
60° Throw Switch	At every position or At 0°, 180°
90° Throw Switch	At every position or At 0°, 180°
Optional pulls	*Contact Grayhill*

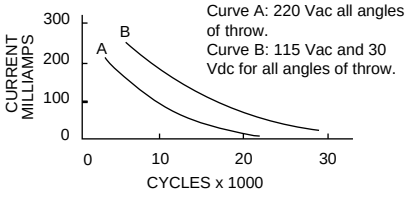
Materials & Finishes

Keys: Brass; 2 supplied
Lock Barrel & Plug: Zinc, clear chromate
Lockwasher: Steel, cadmium-plated
Mounting Nut: Steel, nickel-plated
Tumbler Plates: Brass

SWITCH SPECIFICATIONS

Electrical Characteristics

Chart is shown for non-shorting contacts and resistive load and for the life limiting criteria indicated below. The data for the curve was measured at sea level, 25°C and 68% relative humidity. Contact Grayhill for more information if any of the following is true: life limiting criteria are more critical than those listed; more cycles of operation are required; a larger make and break current is required; the operating environment includes elevated temperatures or reduced pressures.



SWITCH SPECIFICATIONS *Continued*

Contact Resistance:
Initially: less than 10 mΩ
End of life: less than 50 mΩ
Insulation Resistance: (Between mutually insulated parts)
Initially: ≥ 50,000 MΩ
Minimum: ≥ 10,000 MΩ
Breakdown Voltage: (Between mutually insulated parts) more than 600 Vac
Life Expectancy: Per chart; cycle is 1 rotation thru all active positions plus a full return.
Carry Current: 6A; maximum temperature rise 20°C

Anti-Static Voltage: Anti-static types tested to withstand 15,000 Vdc

Mechanical Characteristics

Switching Mode: Shorting (make before break) or non-shorting (break before make) as limited by the Choices chart
Type of Contact: Wiping
Number of Terminals: All switches are provided with the full circle of terminals regardless of the number of active positions
Stop Strength: 1.70 Nm maximum (15.0 in-lbs)
Switching Torque: 8 to 16 in-ozs

Materials and Finishes

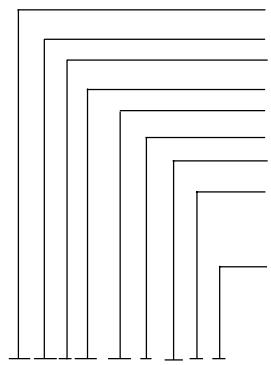
Switch Base: Thermoset plastic
Switch Housing: Nylon
Detent Rotor: Nylon
Detent Balls: Steel, nickel-plated
Detent Springs, and Contact Springs: Stainless steel
Common Ring: Brass, gold plate over silver plate
Terminals: Brass, gold over silver and nickel plate
Rotor Contact: Precious metal, gold alloy

CHOICES AND LIMITATIONS

Lock Style and Description*	Switch Style and Description	Angle of Throw	No. Of Decks	Poles/ Deck	Positions Per Pole**	Shorting or Non-Shrtg.
Series 58J Switches						
J4: Standard–Key pulls at Position 1 and at 90 Degree Increments	**A** = Standard, Solder Lugs **P** = Standard PC Mount	45°	1	1 2	02 to 8 02 to 04	N or S N or S
J8: Standard–Key Pulls at Each Position	**A** = Standard, Solder Lugs **P** = Standard, PC Mount	36°	1	1 2	02 to 10 02 to 05	N or S N or S
		45°	1	1 2	02 to 08 02 to 04	N or S N or S
		90°	1	1 2	02 to 04 02	N N
J9: Standard–Key Pulls at Position 1 and at 180 Degrees	**A** = Standard, Solder Lugs **P** = Standard, PC Mount	36°	1	1 2	02 to 10 02 to 05	N or S N or S
		45°	1	1 2	02 to 08 02 to 04	N or S N or S
		60°	1	1 2	02 to 06 02 to 03	N N
		90°	1	1 2	02 to 04 02	N N

*Standard Keylock has anti-static protection. All keylock versions available without anti-static protection, with a reduced overall body length. Contact Grayhill for more information.
**For single pole switches with maximum positions, specify continuous rotation or fixed stop when ordering.

ORDERING INFORMATION



Series
Lock Style: per Choices Chart J4, J8, J9
Switch Style: per Choices Chart A or P
Angle of Throw: 36, 45, 60 or 90 (per Choices chart)
Number of Decks: 01
Poles per Deck: = 1 or 2 (per Choices chart)
Positions per Pole: 02 thru 10 (per Choices chart)
Type of Contacts: (per Choices chart)
N = Non-shorting
S = Shorting (per Choices chart)
Stop Arrangement Suffix:
(needed only for 1-pole switches with maximum positions)
F = Fixed stop between last and first positions
C = Continuous rotation

58J8A36-01-1-10N-F

Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

SERIES 71 J and L

Multi-Deck, Standard & Anti-Static

LOCK FEATURES

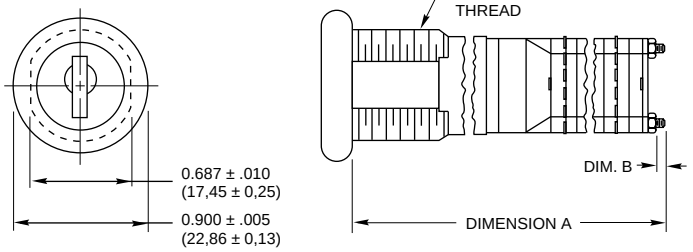
- Economical
- Standard or Anti-Static Style
- 5-Plates, 1-Sided Key

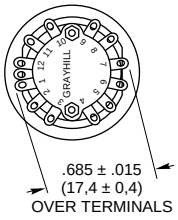
SWITCH FEATURES

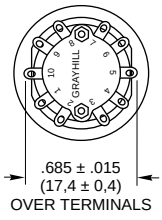
- Economical
- 36° or 30° Throws
- Up to 16 Poles Per Switch
- 250 mA for 15,000 Cycles

DIMENSIONS In inches (and millimeters)

Key slot shown in position 1.
Key to be inserted with cut side down.







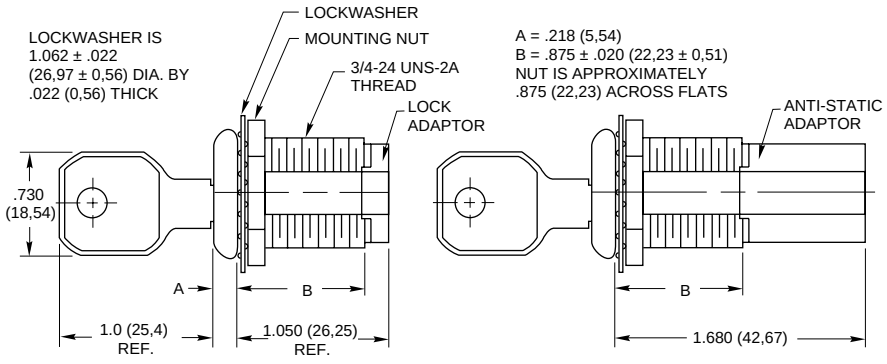
Note: Switch/key positions are not aligned with terminal positions.

Number of decks	1	2	3	4	5	6	7	8	9	10	11	12
Dim. A, Style J (In.)	2.441	2.659	2.877	3.095	3.313	3.811	4.029	4.247	4.465	4.683	4.901	5.119
Dim. A, Style L (In.)	1.811	2.029	2.247	2.465	2.683	3.181	3.399	3.617	3.835	4.053	4.271	4.489
Dim. B Style J & L(In.)	.031	.031	.031	.031	.031	.312	.312	.312	.312	.312	.312	.312
Dim. A, Style J (mm)	62,00	67,54	73,08	78,61	84,15	96,80	102,34	107,87	113,41	118,95	124,49	130,02
Dim. A, Style L (mm)	46,00	51,54	57,07	62,61	68,15	80,80	86,33	91.87	97,41	102,95	108.48	114,02
Dim. B Style J & L(mm)	0,79	0,79	0,79	0,79	0,79	7,92	7,92	7,92	7,92	7,92	7,92	7,92

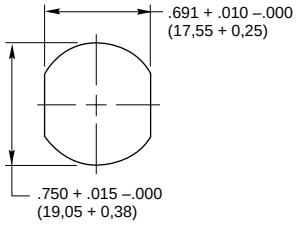
For switch specifications and additional dimensions, see Standard Switch Pages.

Grayhill part number and date code marked on label.
Customer part number marked on request.

LOCK DETAIL



RECOMMENDED PANEL CUT



Rotary Switches

CHOICES

Style	Description	Angle of Throw	No. Of Decks	Poles/ Deck	Positions Per Pole	Shorting or Non-Shrtg.
Series 71 Switches						
L **J**	Standard, Solder Lugs Anti-static, Solder Lugs	30°	01 to 12 01 to 08 01 to 05 01 to 04 01 to 03 01 or 02	1 2 3 4 5 6	02 to 12* 02 to 06 02 to 03 02 to 03 02 02	N or S N or S N or S N or S N or S N or S
		36°	01 to 12 01 to 08	1 2	02 to 10* 02 to 05	N or S N or S

*For single pole switches with maximum positions, specify continuous rotation or fixed stop when ordering.

LOCK SPECIFICATIONS

Mounting: By bushing, nut and lockwasher
Static Voltages: Anti-static style withstands 15,000 Vdc
Keying: All locks have identical keys unless specially ordered otherwise

Key Removal
30° Throw: Position 1 and 180°
Special key removal: Every 90°

36° Throw: All positions
Special key removal: Position 1 only

Orientation of Keylock Switch: Bushing flats are on both sides of the mounting thread with the key upright in the first position with cut side down.

LOCK MATERIALS & FINISHES

Keys: Brass; 2 supplied
Lock Bezel: Stainless steel
Lock Barrel & Plug: Zinc treated with chromate
Lock Adaptor/Extension: Thermoplastic

ORDERING INFORMATION

Series
Style Letter: L for standard; J for anti-static
Angle of Throw: 30 or 36
Number of Decks: 01 thru 12 (per Choices chart)
Poles per Deck: 1 thru 6 (per Choices chart)
Positions per Pole: 02 thru 12 (per Choices chart)
Type of Contacts:
N = Non-shorting
S = Shorting
Stop Arrangement Suffix:
(needed only for 1-pole switches with maximum positions)
F = Fixed stop between last and first positions
C = Continuous rotation

71 L 30-03-1-12N-F

STANDARD SWITCH PAGES

For additional switch dimensions, ratings, circuitry, and specifications, see Series 71. Switches beginning on page F-31.

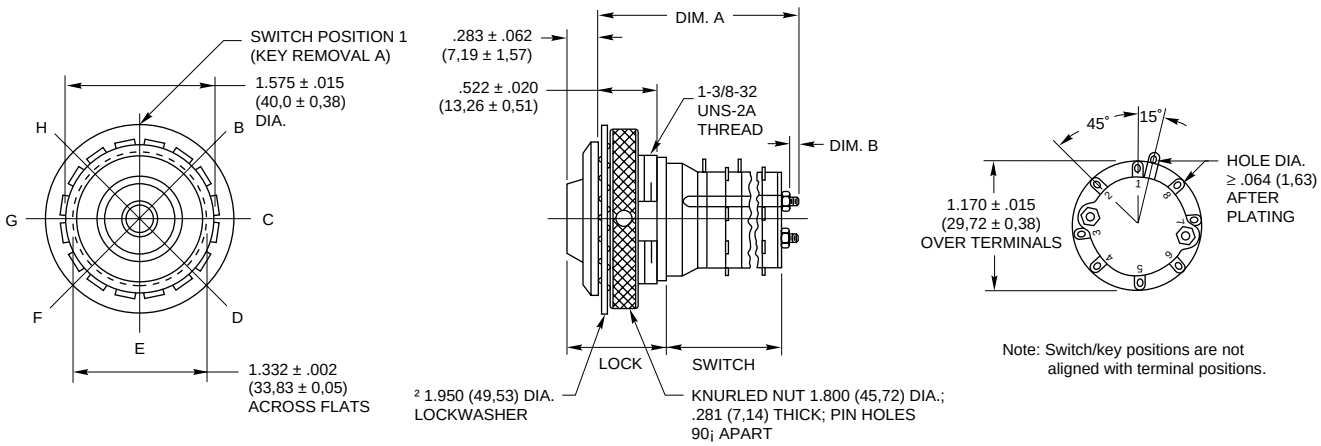
Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

SERIES 44L
High Current, 5 Amp

LOCK FEATURES
- 8-Pin, Round Key Security
- Options for Flat Keys, Special Keying, and Key Removals

SWITCH FEATURES
- High, 5 Amp Current Switching
- 45°, Up to 8 Poles Per Switch
- 25,000 Cycles of Operation
- Options for Military Qualified Switch & More Switching Decks

DIMENSIONS In inches (and millimeters)



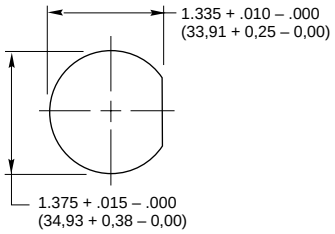
Note: Switch/key positions are not aligned with terminal positions.

No. of decks	1	2	3	4	5	6
Dim. A (In.) Dim. B (in.)	1.556 .062	1.902 .062	2.248 .062	2.594 .062	2.940 .062	3.536 .312
Dim. A (mm) Dim. B (mm)	39,52 1,57	48,31 1,57	57,10 1,57	65,89 1,57	74,68 1,57	89,81 7,92

No. of Decks	1	2	3	4	5	6
Approx. Weight in Grams	123	120	127	144	151	158

Grayhill part number and date code marked on label.
Customer part number marked on request.

RECOMMENDED PANEL CUT



LOCK SPECIFICATIONS
Keying: Each lock is keyed differently
Key Removal: All positions (45°, etc)
Special Options: Flat key with 90° or 180° increment key removals; 7 thru 12 decks; and Military-qualified switches.

LOCK MATERIALS AND FINISHES
Bushing and Knurled Spanner Nut: Aluminum, black anodized
Keying Washer, Cover Support Plate, Shaft Extension: 302 Stainless steel
Internal and External Lockwashers: Steel, cadmium-plated
Keys, Cylindrical: Stainless steel; 2 supplied

CHOICES AND LIMITATIONS

Style	Description	Angle of Throw	No. Of Decks	Poles/ Deck	Positions Per Pole	Shorting or Non-Shrtg.
Series 44 Switches						
L	Standard, Solder Lugs	45°	01 to 06 01 to 03 01 or 02 01 or 02	1 2 3 4	02 to 08 02 to 04 01 or 02 01 or 02	N or S N or S N N

SWITCH SPECIFICATIONS

Electrical Characteristics
Industrial Grade Switch

Switching Current and Life

The load-life values indicate the number of cycles of operation expected for the voltage, current and type of load. End of life is defined using the resistance and breakdown failure criteria listed below.

5A at	115 Vac, resistive
1A at	6 to 28 Vdc, resistive
2A at	115 Vac, inductive

Cycle of Operation: 360° rotation plus a 360° return

Test Conditions: 25°C, 68% relative humidity, atmospheric pressure

Life Expectancy:

With loads above:	25,000 cycles
Without load:	100,000 cycles

Contact Resistance:

End of life:	less than 20 mΩ

Insulation Resistance:
(Between mutually insulated parts)

Initially:	≥ 50,000 MΩ

Breakdown Voltage:
(Between mutually insulated parts)

Initially:	≥ 1,000 Vac
End of life:	≥ 500 Vac

Carry Current: 10A; maximum temperature rise 20°C

Mechanical Characteristics

Switching Mode:
45°, 1 or 2 poles: Shorting or non-shorting
45°, 3 or 4 poles: Non-shorting
Type of Contact: Wiping contacts
Contact Force: greater than 150g
Number of Terminals: Switches are provided with only the number of terminals needed
Stop Strength: greater than 15 in-lbs (1.70 Nm)
Switching Torque: 8-115 in-ozs (28 to 230 mNm), depending on the number of poles, number of decks, and angle of throw

Additional Characteristics

Switches of 6 or more decks have longer studs with extra mounting nuts for recommended double end mount

Materials and Finishes: Switch

Switch Bases: Melamine per MIL–M–14, 4
Switch Bases:
Industrial Grade: Melamine per MIL–M–14
Military: Diallyl per MIL–M–14
Cover, Deck Separators, End Plate, and Rotor Mounting Plate: Phenolic per MIL–M–14
Shaft, Shaft Extension, Stop Arm, Stop Washers, Rear Support Plate, Cover Plate, Retaining Ring, Studs, Nuts: Stainless steel, passivated
Detent Balls: Steel, nickel-plated
Detent Springs: Tinned music wire
Rotor Contact, and Stator (Base) Contacts: Silver alloy
Common Plate, and Common Terminal: Brass, ≥ 300µ inch, (7.6 µm) silver plate
Base Terminals: Brass, lead-tin plated and fused

ORDERING INFORMATION

Series
Style Letter: L
Angle of Throw: 45°
Number of Decks: 01 thru 06 (per Choices chart)
Poles per Deck: 1 thru 4 (per Choices chart)
Positions per Pole: 02 thru 08 (per Choices chart)
Type of Contacts:
N = Non-shorting
S = Shorting (per Choices chart)
Stop Arrangement Suffix: (needed only for 1-pole switches with maximum positions)
F = Fixed stop between positions 8 and 1
C = Continuous rotation

44 L 45-02-1-08N-F

Available from your local Grayhill Distributor. For prices and discounts, contact a local Sales Office, an authorized local Distributor or Grayhill.

SPECIAL FUNCTION ROTARY SWITCHES

- Spring Return Switches With Choices of Maintained and Momentary Positions
- Pull-To-Turn and Push-To-Turn Switches With Choices of Isolated Positions

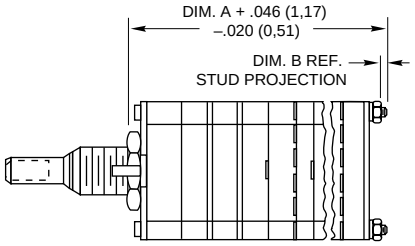
SERIES 08,09,42,44,50
Spring Return

FEATURES
- Hold-To-Test, Hold-To-Calibrate, And Other Momentary Applications
- Choice of Configurations, Ratings, Styles and Circuitry

DESCRIPTION
A spring return rotary switch has 1 or more momentary positions. Maintaining contact at momentary positions requires rotational force. Releasing the force allows the mechanism to return the contact to a normal, or detent, position.

DIMENSIONS

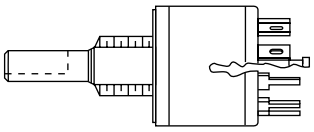
Series 08 & 09

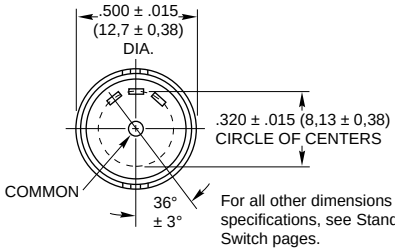


No. of Decks	Dim A	Dim B
1	.960 (24,38)	.062 (1,57)
2	1.228 (31,19)	.062 (1,57)
3	1.496 (38,0)	.062 (1,57)
4	1.764 (44,81)	.062 (1,57)
5	2.032 (51,61)	.062 (1,57)
6	2.550 (64,77)	.312 (7,92)

For all other dimensions and specifications, see Standard Switch pages.

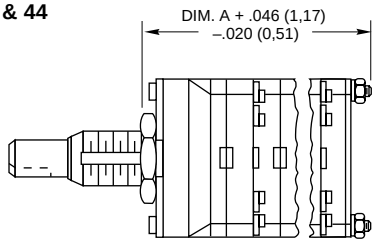
Series 50
Equivalent to Series 50 Standard Switches





For all other dimensions and specifications, see Standard Switch pages.

Series 42 & 44



No. of Decks	Dim. A
1	1.025 (26,04)
2	1.371 (34,82)
3	1.717 (43,61)

For all other dimensions and specifications, see Standard Switch pages.

STANDARD SWITCH PAGES

Series 08 & 09	Pages F-45
Series 42 & 44	Pages F-51
Series 50	Pages F-15

CONFIGURATIONS
This configuration indicates a counterclockwise force is required to hold the switch at position #1. "M" indicates a momentary position counterclockwise of "D" and "D", detented ones.

Positions	1	2	3
	M	D	D

Releasing this force breaks contact with position #1 and returns the switch to #2. Normal rotary switch detent action occurs when the switch is rotated between position #2 and #3.

All of the configurations (except *MDM*) list a basic 2 position arrangement which is shown in italics. Example: *MD*DDDD or DDDD*DM*. Several positions can be added during the switch construction at the factory; but, any configuration must always contain the 2 basic positions.

SELECTING A SWITCH
1. Select a Configuration: The total number of positions always includes the 2 basic positions. A (4) position switch of DDD*DM* configuration would have 3 detent positions counterclockwise of the momentary position.

2. Select Series, Angle of Throw, and Style: See the Choices Chart. The basic switch description, series, and throw are as follows:

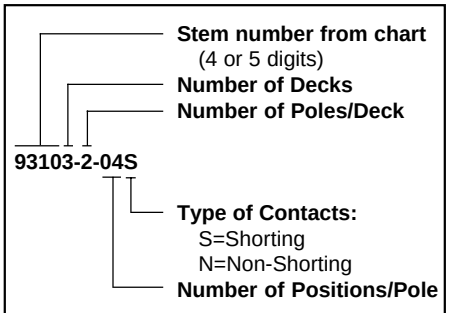
1/2", 1/4 Amp, multi-deck	08 = 36° 09 = 30°
1", 1 Amp, multi-deck	42 = 36° 44 = 30°
1/2", 200 mA, single deck	50 = 36°

Electrical ratings are the same as those of the conventional switches with the exception of life. Life is limited to 10,000 cycles of operation (25,000 cycles for Series 50) due to the spring arrangement. Dimensions are the same as for conventional types except for the shaft flat orientation of the 3, 4, 5, and 6 pole, Series 09 and 44 in the DDDD*DM* configuration (see chart).

3. Select Poles & Positions Per Pole: If you do not find the poles and positions per pole you need in one series, try another or contact the factory. If the behind panel length is a problem, select a multi-pole type instead of a single deck.

OPTIONS
Watertight panel seal; Multi-pole switches that exceed the limits noted in the Selector Chart; Series 50 *MD* or *DM* configurations in Military styles; Series 08, 09, & 44 in MM*MDM*MM, and in MM*DD*MM, and in MMM*MMD*.
Not available through Distributors

ORDERING INFORMATION
Create the part number using this example.



Exception: Numbers beginning with 5 are already complete part numbers.

Control knobs available, see page E-39.

CHOICES AND LIMITATIONS

Con-figur-ation	Conven-tional Switch	Description Of Style	Spring Return Stem Number (See Ordering Info.)	No. Of Decks	Poles Per Deck	Positions Per Pole & Contact Type	Location Of Unique Position, Detent or Momentary	Term. Opp. Flat**
DDDD***DM***	08A36	Standard	8317	1 to 6 1 to 3	1 2	02 to 05 (N or S) 02 to 05 (N or S)	M 5 M 5, 10	5 5
	09A30	Standard	9310	1 to 6 1 to 3 1 or 2 1 1	1 2 3 4 5 or 6	02 to 06 (N or S) 02 to 06 (N or S) 02 to 04 (N or S) 02 or 03 (N or S) 02 (N or S)	M 6 M 6, 12 M 4, 8, 12 M 3, 6, 9, 12 M 2, 4, 6, 8, 10, 12	6 6 4 3 2
	42A36	Standard	42349	1 to 3 1	1 2	02 to 05 (N or S) 02 to 05 (N or S)	M 5 M 5, 10	5 5
	42M36	Military	42352	1 to 3 1	1 2	02 to 05 (N or S) 02 to 05 (N or S)	M 5 M 5, 10	5 5
	44A30	Standard	44346	1 to 3 1	1 2	02 to 06 (N or S) 02 to 06 (N or S)	M 6 M 6, 12	6 6
	44M30	Military	44350	1 to 3 1	1 2	02 to 06 (N or S) 02 to 06 (N or S)	M 6 M 6, 12	6 6
MDDDDD	08A36	Standard	8319	1 to 6 1 to 3	1 2	02 to 05 (N or S) 02 to 05 (N or S)	M 1 M 1, 6	1 1
	09A30	Standard	9312	1 to 6 1 to 3 1 or 2 1 1	1 2 3 4 5 or 6	02 to 06 (N or S) 02 to 06 (N or S) 02 to 04 (N or S) 02 or 03 (N or S 02 (N or S)	M 1 M 1, 7 M 1, 5, 9 M 1, 4, 7, 10 M 1, 3, 5, 7, 9, 11	1 1 1 1 1
	09M30	Military	9356	1 to 3 1 1	1 2 3	02 to 06 (N or S) 02 to 06 (N or S) 02 to 04 (N or S)	M 1 M 1, 7 M 1, 5, 9	1 1 1
	42A36	Standard	42350	1 to 3 1	1 2	02 to 05 (N or S) 02 to 05 (N or S)	M 1 M 1, 6	1 1
	42M36	Military	42353	1 to 3 1	1 2	02 to 05 (N or S) 02 to 05 (N or S)	M 1 M 1, 6	1 1
	44A30	Standard	44312	1 to 3 1	1 2	02 to 06 (N or S) 02 to 06 (N or S)	M 1 M 1, 7	1 1
	44M30	Military	44351	1 to 3 1	1 2	02 to 06 (N or S) 02 to 06 (N or S)	M 1 M 1, 7	1 1
MDM	50A36	Std., Solder Lug	503265-1-03N*	1	1	03N	D 2	2
	50P36	Std., PC Mount	503267-1-03N*	1	1	03N	D 2	2
	8A36	Standard	8316	1 to 6 1 to 3	1 2	03 (N or S) 03 (N or S)	D 2 D 2, 7	2 2
	9A30	Standard	9311	1 to 6 1 to 3 1 or 2 1	1 2 3 4	03 (N or S) 03 (N or S) 03 (N or S) 03 (N or S)	D 2 D 2, 8 D 2, 6, 10 D 2, 5, 8, 11	2 2 2 2
	42A36	Standard	42348	1 to 3 1	1 2	03 (N or S) 03 (N or S)	D 2 D 2, 7	2 2
	42M36	Military	42351	1 to 3 1	1 2	03 (N or S) 03 (N or S)	D 2 D 2, 7	2 2
	44A30	Standard	44345	1 to 3 1	1 2	03 (N or S) 03 (N or S)	D 2 D 2, 8	2 2
	44M30	Military	44349	1 to 3 1	1 2	03 (N or S) 03 (N or S)	D 2 D 2, 8	2 2

*This is a complete (not stem) part number.
**Terminal opposite shaft flat when switch is in its unique (detent or momentary) position.

Available from your local Grayhill Distributor

For prices and discounts, contact a local Sales Office, an authorized local Distributor, or Grayhill.

SERIES 09, 42, 44, 50, 51
Isolated Position

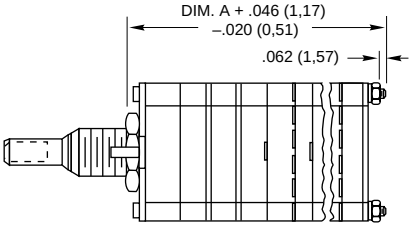
FEATURES
- Protected Switch Positions For Safety, Calibration, or Stand-by
- Choice of Push- or Pull-To-Turn
- 1/2" Diameter, 200 mA and 1" Diameter, 1 Amp Switch
- 10,000 Cycles of Operation

DESCRIPTION
An isolated position is one which cannot be reached by the normal rotation. An additional action is required by the operator. It could be either Push-To-Turn, or Pull-To-Turn. After the switch is rotated to the isolated position, releasing the shaft locks the switch in that position. Push or pull again to rotate the switch again.

Use isolated positions to protect a switch position from indiscriminate rotation. Such safety positions might include “calibrate”, “off” and/or “stand-by”.

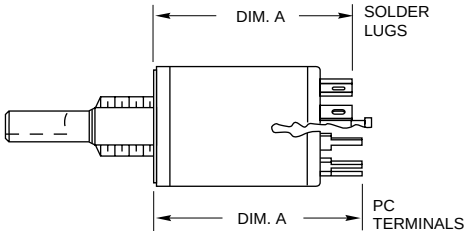
DIMENSIONS

Series 09



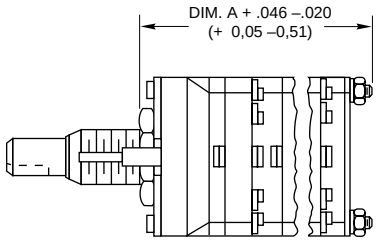
	Dimension A
1 Deck	1.228 (31,19)
2 Decks	1.496 (38,0)
3 Decks	1.764 (44,81)
4 Decks	2.032 (51,61)

Series 50 & 51



	Dimension A
Solder Lug	.893 ± .025 (22,68 ± 0,64)
PC Style	.897 ± .025 (22,78 ± 0,64)

Series 42 & 44



	Dimension A
1 Deck	1.371 (34,82)
2 Decks	1.717 (43,61)
3 Decks	2.063 (52,40)
4 Decks	2.409 (61,19)

For all other dimensions and for circuit diagrams, see Standard Switch pages.

Grayhill part number and date code marked on label. Customer number marked on request.

EXTERNAL DIFFERENCES
The isolated position mechanism increases the depth of the Series 50 and 51 by 0.217" (5,51 mm). All other dimensions remain unchanged. In Series 9, 42 and 44, it has the appearance of an additional deck section without terminals, located directly behind the detent system.

SHAFT AND PANEL SEALS
For detailed important dimensions of the bushing to panel seal, see Standard Switch Pages.

STANDARD SWITCH PAGES:

Series 09	Page F-45
Series 42 and 44	Page F-51
Series 50 and 51	Page F-15

ACCESSORIES
Control knobs available, see page E-39.

SPECIFICATIONS

Electrical Ratings
The switching elements, and therefore ratings, are the same in an isolated position switch as in a conventional rotary switch. Mechanical life is also the same. See Standard Switch pages.

Additional Characteristics
Shaft Movement or Vertical Travel:

Series 09	.062 ± .020 (1,57 ± 0,51)
Series 42 & 44	.070 ± .020 (1,78 ± 0,51)
Series 50 & 51	.080 ± .020 (2,03 ± 0,51)

Push or Pull Force Required:

Series 09	1.75 ± .5 lbs
Series 42 & 44	2 ± .5 lbs
Series 50 & 51	2 ± .5 lbs

Stops: Single pole per deck switches with the maximum number of positions are supplied with stops only on request: 12 positions in 30° throw, 10 in 36°, and 8 in 45°.

Stop Strength: Approximately 7.5 pound-inches for the isolated position stop. Refer to Standard Switch Specifications for remaining standard stops.

Materials and Finishes
Materials and finishes for the isolation mechanism are listed here. See Standard Switch Pages for all other materials.

Series 50 and 51

Housing: Zinc, cadmium-plated per QQ–P–416
Shaft: 303 stainless steel, passivated
Stop Pin and Stop Post: 303 stainless steel
Spring: Tinned music wire

Series 09

Housing: Phenolic for style A; Diallyl, for M
Shaft: 303 stainless steel, electro-polished
Stop Pin and Stop Post: 303 stainless steel
Spring: Tinned music wire

Series 42 and 44

Housing: Diallyl per MIL-M-14
Shaft: 303 stainless steel, passivated
Lock Plate: 302 stainless steel, passivated
Lock Arm: 316 stainless steel, passivated
Lock Post: Brass, cadmium-plated
Compression Spring: Tinned music wire

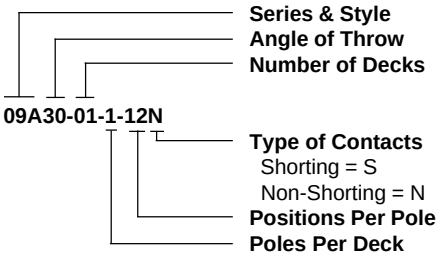
CHOICES AND LIMITATIONS

Standard Style	Military Style**	Style Description	Angle Of Throw	No. Of Decks	Poles Per Deck	Positions Per Pole	Shorting Or Non-Shorting
09A	09M	Solder Lug	30°	01 to 04 01 to 04 01 to 04 01 to 04 01 to 04 01 to 03	1 2 3 4 5 6	02 to 12 02 to 06 02 to 04 02 or 03 02 02	N or S N or S N or S N or S N or S N or S
42A 42S — —	42M — 42H 42HS	Solder Lug Sealed 125° Temperature Rating 125° Temp Rating, Sealed	36°	01 to 04 01 to 04	1 2	02 to 10 02 to 05	N or S N or S
44A 44S — —	44M — 44H 44HS	Solder Lug Sealed 125° Temperature Rating 125° Temp Rating, Sealed	30°	01 to 04 01 to 04 01 to 04 01 to 04 01 to 04 01 to 04	1 2 3 4 5 6	02 to 12 02 to 06 02 to 04 02 or 03 02 02	N or S N or S N or S N or S N or S N or S
			45°	01 to 04 01 to 03 01 or 02 01 or 02	1 2 3 4	02 to 08 02 to 04 02 02	N or S N or S N or S N
-- -- -- --	50C 50CP 50M* 50MP*	Solder Lug PC Mount Solder Lug, Sealed Sealed, PC	36°	01	1 2	02 to 10 02 to 05	N or S N or S
-- -- -- --	51C 51CP 51M* 51MP*	Solder Lug PC Mount Solder Lug, Sealed PC Mount, Sealed	30°	01	1 2 3 4	02 to 12 02 to 06 02 or 03 02 or 03	N or S N or S N or S N or S

*(Pull-to-Turn only) **For specifics on military qualified products, see Standard Switch Pages.

CONVENTIONAL NUMBERS

Start by creating a conventional switch number in the manner which follows:



Note: No stop arrangement suffix is needed. See Describing Stops.

DESCRIBING POSITIONS

The Grayhill system for isolating positions lets you choose the positions to be isolated. Grayhill inserts isolation posts next to the positions to be isolated. Consider a continuous rotation switch of the Series 09A with a 30° angle of throw. The terminals are listed here from 1 through 12 with a space between each to indicate where isolation posts might be inserted.

12 1 2 3 4 5 6 7 8 9 10 11 12

Let's isolate position 1 and position 2 from all other positions and from each other. We indicate isolation posts as shown here:

12P1P2P3 4 5 6 7 8 9 10 11 12

To isolate just position 1, describe like this:

12P1P2 3 4 5 6 7 8 9 10 11 12

To isolate positions 1 and 2 from all other positions, but not from each other, do this:

12P1 2P3 4 5 6 7 8 9 10 11 12

DESCRIBING STOPS

When a 1-pole switch has less than the maximum number of positions, consider also the stop system. Following is the arrangement for a 6 position switch with the position 1 isolated.

STOP 1P2 3 4 5 6 STOP

The word "STOP" indicates the conventional switch stops, which limit rotation to positions 1 through 6. To isolate position 1 we insert only one isolation post–between terminals 1 and 2. The stop system already prevents rotation beyond terminal 1.

In multi-pole switches, the stop system and isolation system described for the first pole, automatically affects the other poles. In the example above, isolating position #1 on the first pole isolates the first position (terminal #7) of the second pole. See Standard Switch Pages for a 2 pole circuit diagram for a 30° throw switch.

ORDERING INFORMATION

Indicate this as a SPECIAL switch to ensure that no error is made when the order is entered. Sample part number:

SPECIAL
09A30-04-1-12N
PULL 12P1P2P3 4 5 6 7 8 9 10 11 12

This sample part number orders a Series 9 standard style, four deck, one pole per deck, twelve positions per pole rotary switch with non-shorting contacts and isolation posts between positions 12 and 1, between 1 and 2, and between 2 and 3.

This lengthy order number is required to prevent any possible confusion in ordering the switch. When we receive your order, we will assign a special "short form" part number to facilitate future identification of this special switch. This number is sequentially assigned as the need arises, and is non-descriptive. A typical "short form" special part number might be 09YY12345. Contact Grayhill for price.

Not available through Distributors.