

## Switches & Circuit Breakers: To Hermetically Seal or Not

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APM Hexseal

Not every unsealed or sealed panel switch, potentiometer, or circuit breaker needs environmental exposure protection from adverse conditions on the ground, in the air or on or under the water. But, for those controls that must operate where dust, dirt, moisture, water, lubricants, fungus, snow, ice and extreme temperatures prevail, there is a definite need to protect (armor) them from contaminant invasions that interfere with their ability to perform reliably. There may also be RFI/EMI spurious signals seepage that must be prevented from migrating through the control mechanism enclosure and mounting hole cut out.

It isn't just contact-corrosion or fungus build-up that is problematic. Actuator freedom must be maintained during all operating conditions. Water or snow turning to ice, and/or dust, dirt and other material build-up in a toggle's bushing cavity are just two conditions that can prevent smooth toggle, pushbutton or rocker operation. Individually or together, these negative factors can greatly affect the life, performance and reliability of these unprotected controls.

### Do Sealed Switches Need Sealing Boots? Yes & No.

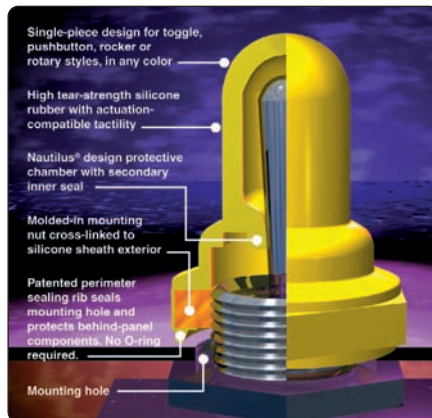
Why do many specifiers of hermetically sealed switches and circuit breakers also specify silicone rubber sealing boots? At first glance, this may seem counter intuitive, but there are several very compelling reasons for this.

In the real world, even "sealed" switches frequently require additional external sealing. For example, these sealed switches can suffer from exposure to high-pressure wash-downs, or extreme hostile weather conditions. Ice or other material build up in the actuator cavity can easily happen, preventing toggle movement and interfering with operational reliability.

The one sure way to completely protect them is to mount an elastomeric non-gassing silicone rubber hermetic sealing boot with molded-in mounting-nut over their exposed surface. It is important to note that the silicone rubber is a high performance, non-gassing type that conforms to A-A-59588 or type ASTM D-1418. This prevents the possibility of silicone molecules from reaching and coating sensitive contact surfaces.

The control's panel mounting hole cut-out is also an accident waiting to happen. Spilled soda, coffee or any liquid, lubricant, dust or moisture can easily penetrate the switch/breaker mounting hole and contaminate sensitive

internal circuit boards and mechanisms. The APM Hexseal sealing boot features a perimeter sealing flange that completely surrounds the mounting-hole and vacuum seals it. When there's an EMI/RFI migration issue, APM offers a number of models that include suppression capabilities.



The anatomy of a hermetic sealing boot

For sealed switches that don't require the total environmental benefits of a sealing boot, APM developed a special reusable switch-breaker bushing sealing washer that solidly locks into the bushing, and can replace any O-Ring or conventional washer. This specially designed stainless steel washer has a bonded high-tear strength silicone sealing ring, strong enough to effectively stop hostile contaminants and wash-downs from penetrating the panel. An inside I.D. finger locks into the vertical bushing groove preventing rotation.

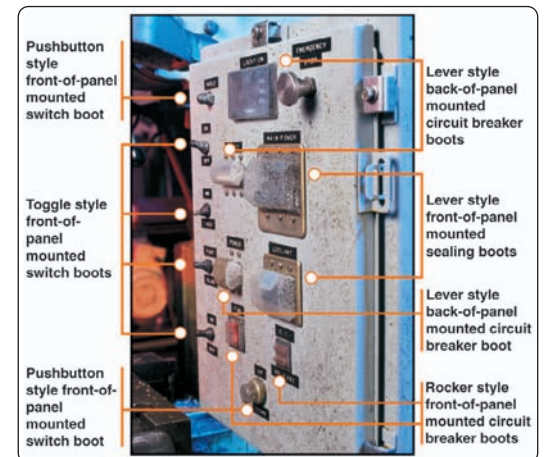


Bushing seal for sealed switches

The final determination of which sealing technology, if any, is required is generally based on product experience with the selected switches/breakers - beyond and including environmental lab testing. When a specified component does not meet the desired NEMA/IP rating, Hexseal hermetic boots provide the added protection required; plus the other desirable benefits.

Finally, factored into every decision are the equipment warranty period and the cost of field servicing, and the prospect of unwanted recalls. Hexseal sealing boots are a reasonable cost solution. Hexseal sealing boots were first

developed for the US Navy soon after the end of World War II. They have since become standard military equipment in a wide variety of combat and non-combat applications, from missile launch control systems to night vision goggles to construction vehicle electrical systems, effectively preventing invasion of a wide variety of environmental attacks from salt air & spray to high pressure wash-downs. Industry has benefited from this military experience. Today millions of these hermetic sealing boots are in use throughout the world mounted on a myriad of communications equipment and instrumentation, commercial marine, medical, process industries and wherever hostile conditions exist.



NEMA mounted enclosure samples of switch and circuit breaker boots

Since 1947, APM Hexseal has specialized in the design and manufacture of molded elastomeric rubber seals for environmental protection of electrical controls for industrial, marine, medical, consumer, and military applications. Most products, including self-sealing and self-locking fasteners, are UL and CSA-recognized and designed to meet military specifications. Their Custom Molding Department can design unique prototype solutions for dynamic seals. For more information please visit [www.apmhexseal.com](http://www.apmhexseal.com) or 800-498-9034.

### Hermetic Sealing Boots for All Season & Reasons

Several hundred sealing boot part numbers, matching most popular switches, potentiometers and circuit breaker types and sizes, are available to choose from APM Hexseal. Switch and potentiometer boots are manufactured in standard grey or black. An increasingly popular option, APM will color match to any PMS color for panel matching or to indicate a specific function.

A wide range of circuit breaker sealing boots are available to match most panel-mounted breakers. For lever (single and multi-pole) operated breakers, there are a number of different sizes to choose from and they are molded in clear silicone rubber for easy, see-through lever operation. Front and back-of-panel mounting methods are available to choose from -- both styles are provided standard with high-pressure, reusable self-sealing panel mounting screws.

For toggle, push button, push-pull (clear silicone), and rocker (clear silicone) styles, there is also a wide choice of silicone sealing boots in standard clear, black, grey or matched color. APM also offers a class of Severe-Operating Armored Boot Seals. These stainless steel armored boots provide the same sealing protection combined with the ability to withstand extreme rough treatment that is sometimes found in some machine shops, production lines and other challenging situations.

Operational temperature is -94°F to 400°F (-70°C to 204°C). DFARS and RoHS compliant. Most are UL 50 tested and recognized, meet military specifications and provide IEC IP66/68 ingress enclosure protection. For non-standard devices and applications, APM offers a custom seal program that giving the customer the full benefit of APM HEXSEAL's over 60 years of electronic component sealing experience.