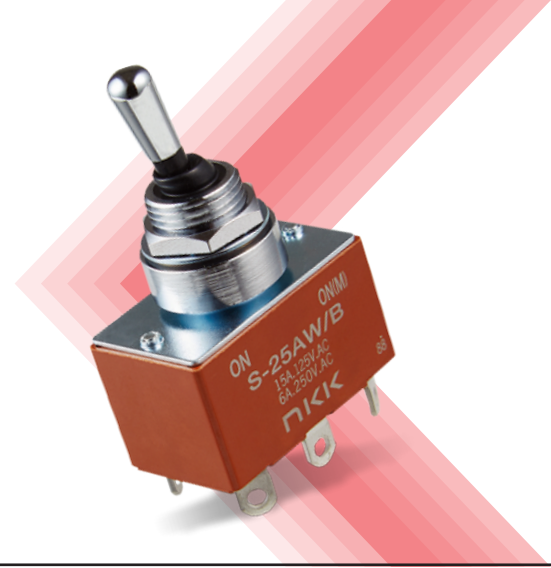


# Using **Sealed Switches** in Harsh Environments



## WHITE PAPER

## Detailed Explanation of IP Ratings:

### IP60:

Offers complete protection against dust but no protection against water.

### IP64:

Ensures dust tightness and protection against water splashed from all directions.

### IP65:

Guarantees dust tightness and protection against low-pressure water jets from any direction.

### IP67:

Provides dust tightness and protection against the effects of immersion between 15 cm and 1 meter in depth.

### IP68:

The highest protection within the IP rating system, IP68 certified devices are dust tight and suitable for continuous immersion in water under conditions specified by the manufacturer—often beyond 1 meter.

## Introduction

In the diverse world of electronic equipment, certain applications are subjected to extreme environmental conditions that demand the use of sealed switches. Neglecting the importance of adequately sealed switches can result in drastically reduced operational lifespans and frequent, costly replacements. Hence, understanding environmental factors is foundational when designing and manufacturing electronic devices intended to endure and operate reliably over time. These factors often include potential exposure to extreme temperatures, moisture, aggressive chemicals, pervasive dust, oil, and various other contaminants.

## Understanding Sealed Switch Options

Selecting the right sealed switches involves considering several options, each tailored to meet specific environmental demands

- **IP Rated Devices:** These are switches that have been process sealed during manufacturing, to protect against water and dust. The individual ratings are defined by the International Electrotechnical Commission, which provides a guideline to the degree of protection against water and dust as provided
- **Splashproof Boots:** These do not provide a comprehensive seal but offer sufficient protection against a variety of environmental factors. Effective use of splashproof boots depends on correct installation, which must consider panel material, panel thickness, the appropriate boot for the switch, correct torque application or assembly techniques, and adequate thread engagement.
- **IP Rated Devices with Splashproof Boots:** For maximum environmental defense, combining IP rated devices with splashproof boots is recommended. This setup may be considered over-engineered for standard applications but is crucial in environments where safety and failure risks must be minimized.

## Traditional Materials for Switch Boots:

The material choice for splashproof boots is crucial as each type offers different protective qualities:

- **Silicone Rubber:** Offers excellent resistance to heat, cold, ozone, aging, and UV light. It maintains great flexibility and tensile strength across a broad temperature range but is less resistant to tearing.
- **Natural Rubber:** Ideal for panel seals and gaskets due to its robust elasticity and sealing capabilities.
- **Polyvinyl Chloride (PVC):** Mainly used for dust proof covers, as it provides minimal protection against harsher environmental conditions.
- **Nitrile Butadiene Rubber (NBR):** Known for its excellent balance of oil and cold resistance, good elasticity, and durable performance, though it offers limited ozone resistance.
- **Ethylene Propylene Rubber (EPR):** Provides good resistance to heat, cold, dust, ozone, and water but is less effective against oils.

## Application-Specific Considerations:

- **Industrial Controls :** Typically require IP rated switches to withstand harsh substances like oils and industrial solvents. In these environments, reliable switch performance is critical to safety and operational integrity.
- **Medical Environments:** Must consider switches capable of withstanding repeated exposure to sterilization chemicals without performance degradation. While IP rated devices might not always be necessary, splashproof boots can provide adequate protection against routine exposures.
- **Automotive/Transportation/Heavy Equipment:** Demands switches that can endure prolonged exposure to contaminants such as dust, dirt, and liquids, as well as withstand significant temperature fluctuations and vibrations.

## Conclusion

Selecting the appropriate sealed switch solution is a meticulous process that involves balancing environmental demands with functional and safety requirements. Whether employing IP rated devices, splashproof boots, or a combination of both, ensuring that switches can withstand harsh conditions while maintaining performance is essential for the longevity and reliability of electronic equipment. With a thoughtful approach to selecting sealed switches, manufacturers can achieve not just compliance with technical specifications and safety standards, but also deliver dependable products that meet the expectations of end-users in various sectors.