Honeywell

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Technical Note
Electrical Components in Hazardous Location Environments: Intrinsically Safe or Explosion-Proof

Introduction

Hazardous location environments are areas where there is an explosive or ignitable substance in the local atmosphere. Many areas around or in oil and gas, mining, grain, and other processing facilities are classified as hazardous environments. A possible source of ignition for these substances is the sparks and electrical events that all electronic components and equipment create.

To protect against ignition and the possibility of an explosion, design engineers seek to integrate electrical equipment into hazardous environments. There are several options:

- The electrical equipment can be housed in a environmentally sealed housing, an option that is often used for large pieces of equipment such as motors and drives.

- For smaller components that are required to function outside of sealed environments, possibly directly in the hazardous substances, other methods must be employed to ensure reduced risk of ignition.

Explosion-Proof

Simply put, explosion-proof components are designed to not generate an external source of ignition (such as a flame or an explosion). Closer examination of one of Honeywell's MICRO SWITCH LSX, BX, or V15W2 hazardous location switches will reveal such designs and techniques.

These switches have been designed such that any electrical event, a spark from the contacts or an arc between terminals, will be contained inside the main housing. Furthermore, even though the switch is designed to be sealed, it is possible that the hazardous substance will find its way inside of the switch, perhaps through an unsealed electrical conduit.

Even though the substance on the inside of the switch cavity may ignite, the switch has been designed with flame paths that ensure the resulting hot gasses and flames will be cooled to such a point where they are no longer capable of igniting the external atmosphere.

Typically, these explosion-proof products carry certifications from globally accepted boards such as Underwriters Laboratories Inc. (UL) in North America, IEC EX in APAC, and ATEX in the European Union. These boards establish classifications for hazardous location equipment, and not all of them are equal. Some products will be deemed acceptable for use in environments that others are not.

Intrinsically Safe

Intrinsically safe products and systems are also found in hazardous environments. However, they are utilized and specified differently than explosion-proof products.

Intrinsically safe products are products that are inherently capable of being used in hazardous environments. They are intrinsically, or inherently safe, because the electrical signal they carry is not capable or large enough to create an event that would result in an ignition source. These devices carry small amounts of voltage and current, or their design is such that there is no chance of electrical sparking.
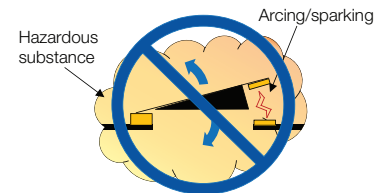

Figure 1. Normal Atmosphere

Arcing/sparking
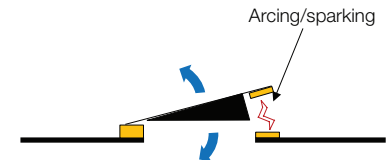
Actuating Switch

This illustrates a normal switch in a normal atmosphere. As it is positioned outside the hazardous substances, there is little to no risk of an explosion.

Figure 2. Hazardous Atmosphere

Arcing/sparking

Hazardous substance

Actuating Switch

This illustrates an unsafe situation where a switch is exposed to a hazardous substance outside of a hazardous-location approved enclosure that can result in an explosion when the switch is actuated.

Sensing and Internet of Things

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Asia Pacific   +65 6355-2828
Europe   +44 1698 481481
USA/Canada   +1-800-537-6945

Honeywell Sensing and Internet of Things

9680 Old Bailes Road
Fort Mill, SC 29707
www. honeywell.com

Honeywell