ADVANCED PRESSURE TECHNOLOGY

Product Note, PN 405, Revision 1
Explosive Atmospheres and the AP74 and AP74B Flow Switches

January 09, 2013

Introduction

On 23 March 1994, directive 94/9/EC of the European Parliament was issued regarding equipment and protective systems intended for use in potentially explosive atmospheres. This directive is commonly called the “ATEX directive”. AP Tech manufactures the AP74 and AP74B Flow Switches that are electro-mechanical devices used in flammable gas systems.

Product Description

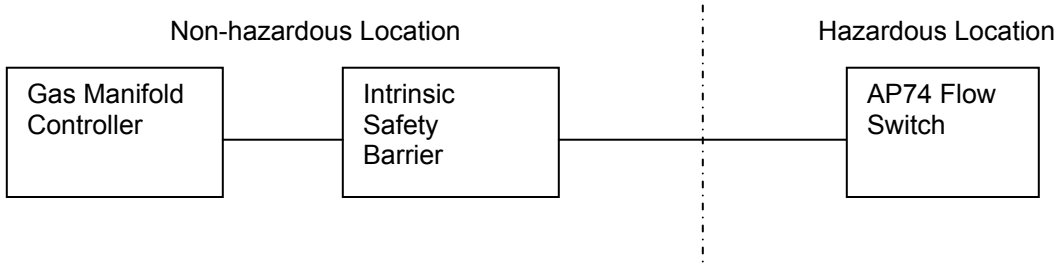
The AP74 and AP74B Flow Switches are primarily intended for installation into semiconductor facility piping systems for hazardous gases (including flammable gases) to send a closed or open switch signal if the flow rate exceeds a preset trip point. An encapsulated magnet within the flow switch moves upward when the trip point is exceeded to induce a hermetically sealed reed switch to actuate. The reed switch is soldered to a three-wire cable that the system builder uses to connect the signal (normally open or normally closed) to a controller. The controller supplies power (30 VDC, 3 W, 0.5 A maximum) to monitor for an open switch or closed switch signal.

Why Explosion Protection for the AP74 and AP74B Flow Switches?

In the event of a leak in the flammable gas piping system, a potentially explosive atmosphere can envelop the reed switch, cable, and associated field wiring. Typically, the location where the AP74/AP74B Flow Switch is installed would be classified Equipment-group II, Category 3 G per the ATEX directive because flammable gases would only be present for a short period of time in the event of a leak. The ATEX directive requires equipment and protective systems used in the location to have explosion protection. Please note that the system owner, not AP Tech, is responsible for determining the classification of a particular installation. Some owners may classify the location as Equipment-group II, Category 2 G because they believe that gases will be present occasionally.

Directive Solution

The AP74/AP74B Flow Switch does not generate or store energy and therefore, is designated a “simple device”. As such, the AP74/AP74B Flow Switch does not require ATEX approval when used with an ATEX approved “intrinsic safety barrier” that meets the requirements of EN50020. A typical installation is shown below. The intrinsic safety barrier typically consists of a resistor to limit the current and a zener diode to limit the voltage. The use of an intrinsic safety barrier would make the installation acceptable for Equipment-group II, Category 2 G or 3 G locations.



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Intrinsic safety barriers are available with a variety of operating conditions (maximum power, open circuit voltage, short circuit current, allowed capacitance, allowed inductance, etc.) that must be evaluated based on the application (gas type, location classification, manifold controller design, etc.) When selecting a barrier, the user will need to consider the below information relative to the AP74/AP74B Flow Switch. Please note that intrinsic safety requirements will likely limit the electrical circuit to values much less than detailed below.

Reed switch electrical characteristics:
- Maximum power: 3W
- Maximum voltage: 30VDC
- Maximum switching current: 0.2 A
- Maximum carrying current: 0.5 A
- Maximum capacitance: 1.5 pF

Cable electrical characteristics:
- Capacitance: 34 pF/ft
- Inductance: 0.14µH/ft
- Maximum voltage: 300 V

In addition to consideration of the AP74 Flow Switch design characteristics, the user must select appropriate associated field wiring (cable, connectors, etc.) between the AP74/AP74B Flow Switch and the intrinsic safety barrier and must follow proper installation techniques.

Conclusion

A review of the ATEX directive has determined that the AP74 and AP74B Flow Switches do not need to be ATEX approved when used with an intrinsic safety barrier. Information regarding selection of an appropriate barrier is provided in this Product Note.