

## Using the Accurate Gas Control Systems AT-HTZ-Bottle Heating System In NEC1999 Class 1 Division 2 Special Occupancy Areas

### Purpose

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Often the AT-HTZ-Bottle Heating System is required to be used in areas where there is a potential for the ignition of combustible materials. In these areas the system can be used safely, under normal operation. This paper presents a discussion of specific NEC1999<sup>1</sup> Code requirements that apply to the use of the AT-HTZ-Bottle Heating System. The intention of the information presented is to present safety features and interpretation of applicable codes required for Special Occupancy Areas.

### System Background

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The AT-HTZ-Bottle Heating System is composed of 3 devices that are assembled and wired by the customer.

The first device is a controller unit – typically the AT-NEALC product. The controller unit is fitted with a programmable limiting-type primary controller and a fixed limiting-type secondary controller. The primary controller uses a thermocouple to measure the vessel temperature. The secondary controller uses a separate thermocouple to measure the heater element temperature. In the event that the vessel temperature exceeds a user programmed alarm limit the primary controller will disconnect power from the system. In the event that the heater elements exceed a fixed temperature of 125°F<sup>2,3</sup> the secondary controller will disconnect power from the system.

The second device is a heated blanket, which is fitted around the vessel. This blanket is made from layers of silicone rubber molded around two circuits. One circuit is an array of nickel-chromium wire that forms a resistive load. When powered, this resistive load heats and produces a specific heat load per square inch. The second circuit is a ground screen, which is connected to the ground leg of the power lead. In the event that the heater is punctured or internally fails the screen will cause a ground circuit. The layers of silicone form a hermetic jacket around the circuits and power cord connections.

The third device is an insulation blanket. This blanket is designed to prevent air currents around the vessel, from causing temperature disturbances. The materials in the blanket have very high ignition temperatures and are suitable for use well above 125°F.

In a typical application the controller will be mounted outside of a gas delivery cabinet. Inside the gas delivery cabinet will be the heater blanket and insulation blanket. If properly ventilated, only the interior of the gas delivery cabinet is designated as a Special Occupancy Area. The controller is not suitable for use in Special Occupancy Areas.

## Interpretation of the National Electric Code

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The National Electric Code, 1999 Edition, defines the requirements for classes, divisions and groups of flammable materials in Article 500-5. Each location should be classified based on the properties of flammable vapors, liquids, gasses, dusts or fibers. To this end, the end user must know and evaluate each application of the system. Furthermore, all interpretation of code herein should be known and evaluated for each application. For this discussion only the NEC1999 "Class 1, Division 2 all Groups" will be considered.

Following is an itemized list of applicable codes and discussion of design safety.

### **Article 500-4-(f) Nonincendive Protection Technique**

A nonincendive device, as defined in Article 100, is one that is non-arcing device and has thermal effects, under normal operating conditions, that are not capable of igniting combustible materials. The AT-HTZ heater blanket, under normal operating conditions, is a non-arcing device. The closed circuit current, of power applied to the heater elements, creates heat. Additionally, the lowest "Maximum Temperature" for electrical devices, defined in Article 500-5-(d), is 185°F. The system will not permit, under normal operation, any part of the heater blanket or vessel to exceed 125°F.

### **Article 500-4-(h) Hermetically Sealed Protection Technique**

By the nature of construction, the AT-HTZ heater blanket is a hermetic device. All circuits and circuit connections are hermetically sealed in the layers of silicone. Furthermore, all heater panels are limited to 2.5 Watts/square inch. This watt density, under no load and full power, will prevent the materials in the heater from degrading.

### **Article 501-3-(b)-3 Enclosures**

The heater blanket is without an explosion proof enclosure. The AT-HTZ heater blanket does not have "make or break" contacts. Under normal operating conditions, the current carrying circuits and ground circuit do not open or close. This article states that devices without "make or break" contacts do not require "explosion proof" enclosures.

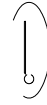
### **Article 501-15 Live Parts**

This article requires that any electrical device in a Class 1 Division 2 Area can not have exposed live parts. The AT-HTZ heater blanket does not have any exposed live parts. The entire device is covered with silicone rubber and hermetically sealed.

### **Article 427-23 Grounding Apparatus**

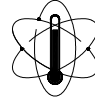
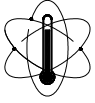
The AT-HTZ heater blanket is fitted with a ground screen for use with a ground fault interrupt power supply. The ground screen is designed specifically to meet this requirement. An isolated ground fault interrupt power source is required when connecting the system.

The AT-HTZ-Bottle Heating System is not certified, by any nationally recognized testing laboratory, for use in any special occupancy areas.



*References*

- 1.) National Electric Code 1999 Edition, National Fire Protection Agency, Inc., One Batterymarch Park, Quincy, Massachusetts 02269.*
- 2.) Code of Federal Regulations Revised July 1, 1993, Parts §1910.111(3), National Archives and Records Administration 1985.*
- 3.) Safe Handling of Compressed Gases in Containers, Section 3.3.3 – Page 9, Compressed Gas Association Inc. 1991.*



*Revision History*

<i>Rev</i>	<i>ECN</i>	<i>Date</i>	<i>By</i>	<i>Description</i>
<i>A</i>	<i>169</i>	<i>10/30/00</i>	<i>CD</i>	<i>Released</i>