Steam Drum Level Gauges For Hazardous Locations

Hazardous (Classified) Locations are areas where the potential for fire or explosion may exist due to flammable gases or vapors, flammable liquids, combustable dust, or ignitable fibers. These materials must be present in sufficient concentrations to present a potential explosion hazard. Typical applications are petroleum refineries and the steam furnaces used in the ethylene production process.

Hazardous location electrical codes and standards throughout the world have taken two distinct paths. In North America, a "Class", Division" system has been used. The requirements are defined by the National Electric Code (USA) and the Canadian Electric Code. Classes (3) are based on the type of hazard and the explosive characteristics of the material. Divisions (2) are based on the risk of fire or explosion that the material presents.

In other parts of the world, a "Zone" classification system is used. These requirements are defined by the international Electrotechnical Commission (IEC) and the European Committee for Electrotechnical Standardization (CENELEC). Zones are based on the number of hours per year that the explosive conditions can be expected to exist.

These electrical standards are constantly evolving. Recently, the United States and Canada have incorporated a "Zone" system for hazardous locations. On the right is a comparison of these two classification systems.

Frequency of Occurance	Class, Division System	Zone System
Continuous	Class 1, Div 1	Zone 0
Intermittent	Class 1, Div 1	Zone 1
Abnormal	Class 1, Div 2	Zone 2

Hazardous locations are further divided into various "Groups" because different materials have different explosion and ignition characteristics. On the right is a comparison of these material groups.:

Gas	Class, Division Gas Groups	Zone Gas Groups
Acetylene	A	IIC
Hydrogen	B	IIC
Ethylene	C	IIB
Propane	D	IIA
Methane	D	IIA

The ignition temperature, or auto-ignition temperature (AIT) is the minimum temperature required to initiate or cause self-sustained combustion in a substance without any apparent source of ignition. "T" codes (T1 to T6) are used to specify the maximum allowable equipment temperatures for a specific area.

In order for a fire or explosion to occur, three conditions must exist: Fuel, Oxygen, and Ignition. There are a number of ways of protecting electrical equipment so that it can not cause an explosion when used in a flammable atmosphere.

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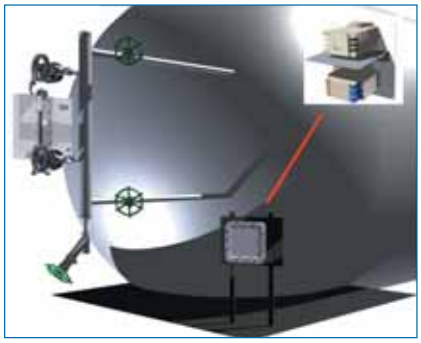
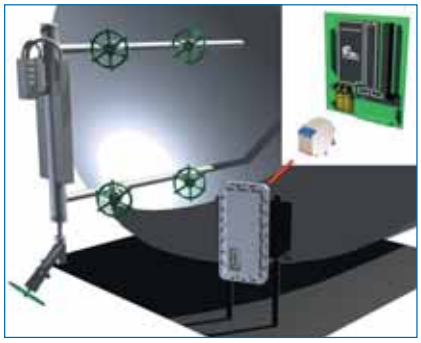
The optimum method will depend on equipment size, power consumption, equipment function, and customer preference. Every protection may not satisfy every area and every gas. Some of the available protection methods include:

1. Explosion Proof (also called "Flameproof"), type "d" protection. Based on containment, the equipment is installed inside a heavy enclosure. This prevents the release of hot debris or gas to the atmosphere if an explosion should occur inside the enclosure.
2. Intrinsic Safety, type "ia" and "ib" protection. This equipment limits the energy to the field device to a safe value. A common component of this system is the "Zener Barrier". This is a system approach, so that all components, including the wiring, must be considered.
3. Purged and Pressurized, type "p" protection. This approach prevents the entry of hazardous gas into an enclosure by maintaining a positive pressure within the enclosure.
4. Moulded/Encapsulated, type "m" protection. Parts are enclosed in a resin (plastic) sufficiently resistant that the explosive atmosphere cannot be ignited.
5. Increased Safety, type "e" protection. This is for equipment that, under normal conditions, does not produce ignition-capable arcs, sparks, or high temperatures. It provides increased spacing between live parts, special insulating materials, special terminals, and temperature control.
6. Hermetically sealed, type "nC" protection. The ignition source is eliminated by a fusion process such as soldering, brazing, or welding.
7. Non-Incendive, type"nC" protection. The contact mechanism is constructed so that the component is incapable of igniting the specified flammable gas.
8. Oil Immersion, type "o" protection. The ignition source is eliminated by maintaining it in oil.
9. Powder Filling, (also called "sand filling") type "q" protection. The enclosure or apparatus is filled with a granulated material so that the electrical arc will not ignite the surrounding atmosphere.

Shown below are typical Visual & Electronic Gauge arrangements.



Visual Gauge Installation

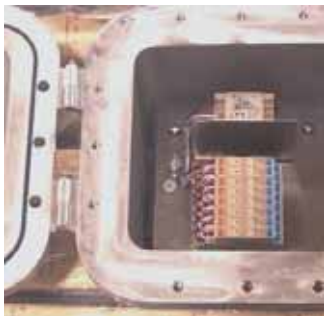


Electronic Level System Installation

Fossil Aquarian Level Equipment Application

Both the Fossil Aquarian Visual Level Gauge and the Electronic Level Gauges have a relatively low power requirement. In addition, the power supplies and electronics portions of this equipment are relatively small. For these reasons, Fossil uses a combination of Intrinsic Safety Protection with Explosion Proof Protection to meet every area and gas classification requirement. The level equipment requires no modification and functions exactly as it would in an un-classified location.

Shown below are a few photos of this equipment:



Gauge Power Supply with Zener Barriers

Level Electronics with Zener Barriers

References

1. Hubbell Killark Catalog-2001
2. Fossil Aquarian 3000M Electronic Level Gauge Brochure, PN 9340-1103
3. Fossil Aquarian 3000V Visual Level Gauge Brochure, PN 9340-1106

Fossil Power Systems Inc.
10 Mosher Drive Dartmouth, Nova Scotia
B3B 1N5 Canada
Phone: 1-902-468-4701
Fax: 1-902-468-2323

Sales: Aquarian@Fossil.ca
Technical: Aqsupport@Fossil.ca
www.Fossil.ca
AN ISO REGISTERED COMPANY

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