COMMON

Hazloc Terminology

EXPLAINED

WHEN RELIABILITY MATTERS

CONNECT TO CONFIDENCE

Common Hazloc Terminology

Explosion proof. Intrinsically safe. Non-arcing. Hazardous approved. When creating an electronic system within a hazardous location, these terms often get used interchangeably. However, the specific term used to describe the setup can make a big difference and, in turn, impact the entire system's integrity. This white paper explores some of the more common terms on a broad level and the situations that they are used in.

Hazardous Location

Also commonly referred to as "Hazloc," this is a simply a general term for any location that is potentially hazardous. In particular, it is an area that a fire or explosion could occur as a result of flammable gases, vapors, liquids, dust, fibers/flyings in sufficient quantities to cause ignition. This term does not, however, indicate how large the risk of ignition is or what the best method of prevention is. Those items are broken down in Classes and Zones and Protection Methods respectively.

Protection Methods

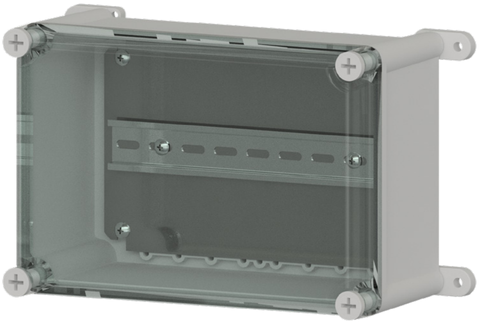
To adequately explain what protection methods are in hazardous locations, it is beneficial to provide some background into what factors can cause fires and explosions. In order to achieve ignition, you need to have 3 items: an ignition source, fuel, and an oxidizing agent (usually oxygen). Removal of any one of these will either extinguish or prevent a fire.

There are different risk levels for every environment in regards to these three combustion elements. For example, a spark from static that you have generated walking over carpet is less likely to be a sufficient source of heat to cause ignition than a propane torch. However, that static electricity could become sufficient when you are in a room filled with hydrogen.

Therefore, it is important to assess the location that the electronic system is being installed in order to determine where the largest risk factor is and how restrictive the components need to be. This is why there are different methods of protection. In one environment you may need have electronic items that can be an ignition source and the best path is to contain that potential explosion as to not cause harm to any person or piece of equipment. In another, it may be most practical to purge all the oxygen so the system can run as normal without fear of combustion. In many cases, the only course of action is to eliminate all sources of ignition altogether so you can work safely with the flammable material. These are all defined in different protection methods.

Intrinsically Safe

One of the most stringent protection methods which is aimed at eliminating any arcs and sparks with enough energy to ignite a vapor. As the name suggests, these products are safe by design and can be located directly in the hazardous zone without the need of an additional enclosure. As this protection method is used for the most volatile environments, a barrier is required.

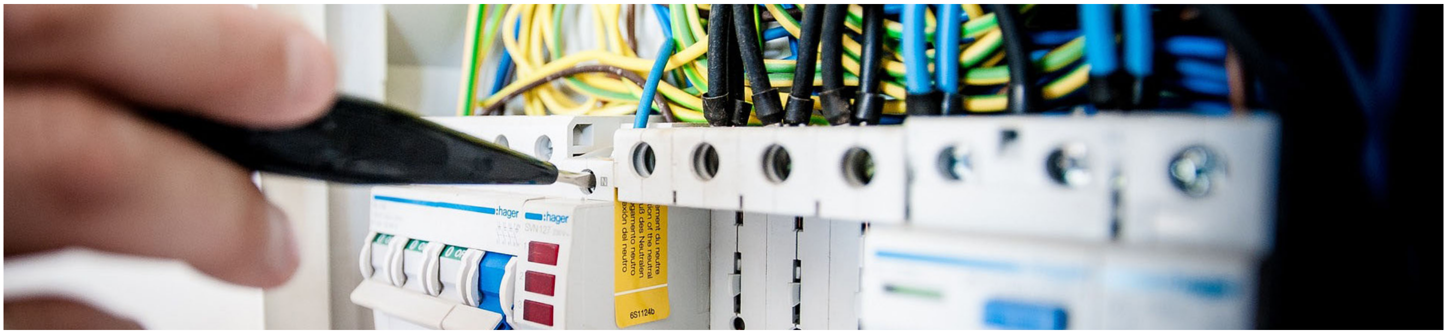


IS200
11-20 Channel Intrinsically Safe Barrier Enclosure

IS111-1B
Intrinsically Safe Barrier for use with Class 1, Division 1/Zone 0,1 Sensors

A barrier is a device, placed outside of the hazardous zone or in a less hazardous zone, that controls the amount of voltage, current, inductance, and power that the electronic device receives. These properties that the barrier controls along with capacitance are known as entity parameters. When taking into account these properties, the entire system from the barrier to the electronic device is to be controlled, including the capacitance of the cable running to the device.

For example, a device powered by 100 ft. of cable will have higher capacitance than a device with 10 ft. These parameters will be explained in further detail in subsequent sections. In the United States, there are different divisions that state the level of hazard present. Intrinsically safe protection methods are necessary in division 1 applications. Most of the rest of the world uses zones instead. In this case, intrinsic safety is used in zone 0 and 1. The topics of what zones and divisions are will be



Non-Arcing / Increased Safety

Sometimes the area that an electronic device may be in is only subjected to a hazardous environment intermittently or if an accident occurs causing a normally safe environment to become hazardous. When this is the case, a less strict approach to protection can be used. The protection methods of non-arcing and increased safety are similar in that the design of the electrical device(s) are examined to make sure it cannot produce a large enough ignition source to cause combustion.

However, because the risk is not as great, the threshold of what is considered large enough is increased. You do not need to use a barrier in this case because of this. However, some additional measures need to be taken. Cable requirements in America, defined in NFPA 70, formerly the National Electrical Code, are required in place of a barrier. Where intrinsic safety has been used in division 1 (North America) and zone 0,1 (international), the non-arcing protection method has been used to control division 2 and zone 2 respectively. In recent years however, the increased safety protection method has begun to replace non-arcing in these locations. Different standards are used to evaluate the electrical devices prior to certification, but the locations and principles are the same.

Explosion Proof

Sometimes there is simply no way to design a product that works for either of the protection methods above. For example, there may be a circuit that would not function without capacitance that exceeds the allowable values and could cause a spark large enough to cause ignition. One way to still use these products in the hazardous environments would be to enclose the entire device. This is the explosion proof protection method. Explosion proof does not mean there is no explosion. Rather, any explosion that does occur cannot escape the enclosure the device is in. This allows those installing the devices to have more flexibility on what they are installing. However, the enclosures are bulkier, difficult to install, and can be more expensive.

Classes

In North America, the type of hazard is broken down into classes. Class 1 is for gases, class 2 is for dust, and class 3 is for fibers/flyings. Dust and fibers are interesting cases because they can come from shavings of materials that would normally not be hazardous when in a solid form.

Divisions

As mentioned in the protection methods section, the North American protection scheme is broken down into divisions. Divisions represent how frequently the electronic device is within the hazardous location. Division 1 means that the electronic device is continuously exposed to the explosive material. If there was a pressure gauge within the storage tank of a gas station, it would be in division 1.

Division 2 is the area surrounding division 1. Devices in this location are only exposed to the combustible material in the event of an accident or fault condition. The outside area directly outside of that storage tank would be division 2. In normal operating conditions, the outside of the tank would have no hazards unless the tank ruptured.

Zones

Zones are the international version of divisions. The major difference is that zones are broken down into three locations instead of two. Zone 0 is the direct equivalent of division 1, meaning that the dangerous environment is always present. Zone 1 does not have an equivalent in North America and it represents an environment that is exposed to the hazards intermittently. For example, at a gas station the inside of the storage tank would be considered zone 0. The pump itself releases explosive gasoline every time someone fills up their car. The pump handle would be considered zone 1. Zone 2 is the same as division 2 and the area outside of the storage tank or sufficiently distant from the pump handle would fall in this category.

NOTE: For both zones and divisions, there is no set distance from the hazardous location where zone 0, 1 or division 1 ends and zone 2 or division 2 begins. It is up to those making the risk assessment to establish this in accordance with the local jurisdiction. The type of material, its state (solid, liquid, gas), any barriers between the locations, and other risk factors are to be considered and it may be different in each case.

Groups

Within each class, division, and zone, the location can be broken down again into the type of material. North America gives them alphabetical characters with A being the most hazardous down to G being the least. Internationally, special characters are used as seen in the chart below. If a product is rated for group A or IIC, it automatically qualifies for any of the less explosive groups. This is the same with B/IIB, all the way down.

Group	Environment	Location	Typical Substance
I	Gases, Vapors, and Mists	Coal Mining	Methane (firedamp)
IIA		Surface and Other Locations	Methane Propane, etc.
IIB			Ethylene
IIC			Hydrogen, Acetylene, etc.
IIIA	Combustible Dusts		Combustible Flyings
IIIB			Non-Conductive
IIIC			Conductive

Group	Hazard Class	Substance
A	Class I Flammable Gas	Acetylene
B		Hydrogen
C		Ethylene
D		Propane
E	Class 2 Combustible Dust	Combustible Dust
F		Combustible Carbonaceous Dust
G		Other Combustible Dusts

Entity Parameters

Electronic devices that have been rated for use in hazardous locations generally come with a set of entity parameters. These are a set of electrical specifications that are to be maintained in order to achieve a safe design. These say how much voltage, current, power, capacitance and inductance can be applied to the device. Anything above the parameters set would not be in compliance with the intended use and can cause an accident to occur. In the most hazardous locations, barriers are necessary to control these parameters. As stated in the intrinsically safe section, the entire circuit including the cable to the device is to be taken into consideration when ensuring the entity parameters are met.

CTC is the world leader in the design and manufacture of industrial accelerometers, piezo velocity transducers, 4-20 mA vibration sensors, and proximity probes as well as all related mounting hardware, cabling, and junction boxes. Our products enable efficient vibration monitoring for predictive maintenance in a wide variety of industries. Industries served include cement, mining, petrochemical, food & beverage, auto, steel, wind, paper & pulp, power generation, water & wastewater treatment, pharmaceutical, hospitals, bottling, and more. Our mission is to offer the widest variety of accelerometers and vibration hardware products, which are compatible with data collectors and online monitoring systems, as well as the tools for installation.

VIBRATION ANALYSIS HARDWARE

The CTC product line features vibration analysis hardware for heavy industry.

All CTC products are backed by our unconditional, lifetime warranty. If any CTC product should ever fail, we will repair or replace it at no charge.

PROXIMITY PROBE SYSTEMS

The PRO line offers the industry's most reliable proximity probe sets.

All PRO products are backed by a lifetime warranty on materials and workmanship. PRO will repair or replace any of our products as long as the product was not subjected to misuse, neglect, natural disasters, improper installation, or modification.

All stock products may be returned for a 25% restocking fee if returned in new and unused condition within 90 days of shipment. Built-to-order and private-label products qualify for a 50% refund if returned in new and unused condition within 90 days of shipment. Custom products are quoted and built specifically to the requirements of the customer, which may include completely custom product design or private-labeled versions of standard products for OEM customers. Custom products are non-cancelable, non-returnable, and non-refundable.

Image Credit: Gas Storage Tank (page 6) courtesy of kbrookes / Flickr