

Providing electronic equipment for use in hazardous locations requires conformance to the requirements of Intrinsic Safety to prevent accidental ignition or detonation of the combustible gases or dust present in the hazardous location.

Intrinsic Safety requirements are divided by classification, division and group.

The classification of the hazardous areas describes the general form of the combustible with Class I indicating combustible gases or vapors, Class II describes combustible dust suspended in air, and Class III relates to ignitable fiber concentrations.

The Division designation refers to the probability of the electrical equipment being exposed to the combustible. Division I indicates the electronic equipment will routinely be exposed to the combustible in operations such as refueling, repair, venting, etc. Division II designates that the electronic equipment is exposed to the combustible in abnormal circumstances.

These hazardous locations are grouped alphabetically in decreasing severity according to the combustible airborne materials. For example, Group A describes an Acetylene rich atmosphere; Group D is propane mixed with air, while Group G is a grain dust suspension.

Intrinsic safety is regulated by several organizations and agencies depending on location and governmental jurisdiction. Some agency examples are Underwriters Laboratories (UL) in the US, Canadian Standards Association (CSA) in Canada, LCIE in France, and European Committee for Electrotechnical Standardization (CENELEC) in Western Europe.

Electronic equipment is divided into two groups and labeled simple and non-simple devices. Simple devices are such elements as LEDs, RTDs, and non-inductive resistors. In general, these devices do not need to be approved as intrinsically safe. Non-simple devices that store energy, such as relays, capacitors, transducers and transmitters must have intrinsic safety approval for operation in hazardous locations.

Devices such as transmitters, power supplies, batteries, capacitors, and inductors can create or store energy that is greater than the allowable intrinsic safety limits set forth by the governing body. The danger is generally not in their energy storage capacity but in the intentional or accidental release of the stored energy due to short circuits or open circuits. These electrical shorts and opens can be during normal circuit operation and faulted circuit conditions. To use these energy storage devices in a hazardous location the voltage, current, and device temperature must be limited to nonincendive values. These nonincendive values have been proven safe by controlled experimentation. Differing ignition values exist for each class, division, and group of combustibles in a hazardous location.

For approval of electronic equipment in Class I, Division I hazardous locations the testing also requires the equipment to be safe if two simultaneous faults are introduced. These faults can be shorted components or open circuit protection devices. Component spacing is also addressed with component or circuit traces spaced closer than 1.5 mm. These close traces are considered a 'free fault' and are not counted as one of the two induced faults. The energy discharge of the circuit must still be within the voltage, current, and temperature limit set forth by the governing body specification.

Of particular concern is the energy discharge capability of a power supply or battery. Both of these devices intentionally provide voltage and current, the sum of which can easily cause an ignition spark due to a short or open. These devices must be current limited and voltage limited to prevent spark energy discharge due to a shorted or open device in the circuit.

With all of the circuit protection and energy limiting devices installed in the circuit, it is also important to be sure that the circuit will still operate as intended under normal operating conditions.