

Guide to Hazardous Locations

Material for this section was provided by Pepperl + Fuchs.

Note: For complete information on hazardous locations, consult the National Electric Code Section 500.

■ Causes of Explosions

Three conditions must be present for an explosion to take place:

1. **Combustible Material (gas, vapors, dust, etc.)**
2. **Oxygen**
3. **Electrical or Thermal Energy (of sufficient value)**

If any one of these conditions is not present, the explosion cannot occur.

Intrinsic safety, generally considered the safest method of operating electrical instrumentation in hazardous areas, limits energy to a level below that which could ignite a potentially explosive gas/air mixture.

■ Protection Methods

The three most popular methods of protection in North America are:

1. Explosion proof
2. Pressurization
3. Intrinsic safety

1. Explosion Proof

When explosive gases or dusts enter an enclosure with electrical equipment inside, an explosion could occur. With the enclosure cover properly installed and tight tolerances maintained, the flame will be unable to propagate to the outside atmosphere.

Advantages

- Can be used with high power electrical devices such as contactors, transformers and motors.

Disadvantages

- Power must be disconnected before cover can be removed.
- All bolts must be installed and threaded covers must be tight.
- Size and weight are restrictive.
- Explosion proof conduit and appropriate seals must be installed.
- Not certified for use in all hazardous area groups.

2. Pressurization (Purged Enclosures)

This concept keeps the enclosure filled with a positive pressure of air or inert gas. Therefore, as long as the pressure inside is higher than the outside pressure, the explosive gases cannot enter the enclosure.

Advantages

- Can be used with high power electrical devices such as contactors and transformers.

Disadvantages

- The air/gas supply must be capable of compensating for leakage through the enclosure.
- Mechanical/Electrical interlocking must be utilized when opening and closing enclosure doors.
- Separate air/gas supply is necessary.

3. Intrinsic Safety

This method of protection limits the energy to the hazardous area. The energy limitation is provided by the use of safety barriers which are mounted in the safe area. Due to the energy limitation of the barrier, regardless of the fault in the hazardous area, sufficient energy cannot be released to ignite the explosive atmosphere.

Advantages

- Explosion proof enclosure and conduit are not necessary.
- Failure to replace enclosure covers or bolts will not degrade protection.
- Field instruments can be maintained and calibrated with power applied.
- Intrinsic safety is approved for all hazardous areas.

Disadvantages

- Since intrinsic safety operates with low power, only low power instruments may be utilized in the hazardous area.