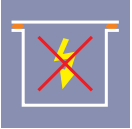


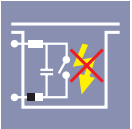
Encapsulation - Type of Protection “ma” for use in Zone 0 and “mb” for use in Zone 1 & Class I, Zone 2

Encapsulation is a type of protection in which the parts that can ignite an explosive atmosphere are enclosed in a resin. The resin must be sufficiently resistant to environmental influences so that the explosive atmosphere cannot be ignited by either sparking or heating, which may occur within the device. This is typically used with electronic devices.



Increased Safety - Type of Protection “e” or “eb” for use in Zone 1 & Class I, Zone 1

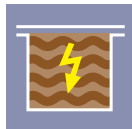
Type of protection applied to electrical equipment that does not produce arcs or sparks in normal service and under specified abnormal conditions, in which additional measures are applied so as to give increased safety against the possibility of excessively high temperatures and of the occurrence of arcs and sparks.



Intrinsic Safety - Types of Protection “i”, “ia”, “ib” and “ic”

North America now identifies four versions of this protection method. Types “i” (NEC 504) and “ia” (NEC 505) are identical since type “i” is based on the IEC 60 079-11 Standard. In Zone 0 the only acceptable type of equipment are types “i” and “ia”. Type “ib” is acceptable in Zone 1 and “ic” is acceptable in Zone 2

(For further details refer to R. STAHL INC’s Catalog for Hazardous Location Automation Products.)



Oil Immersion - Type of Protection “o” or “ob” for use in Zone 1 & Class I, Zone 1

Type of protection where electrical equipment is immersed in a protective liquid in such a way that an explosive atmosphere that may be above the liquid or outside the enclosure cannot be ignited.



Pressurization - Types of Protection “px” or “pxb” for use in Zone 1, “py” or “pyb” for use in Zone 1 and “pz” or “pzc” for use in Zone 2

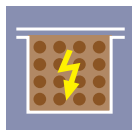
This type of protection prevents the surrounding atmosphere from entering an enclosure by maintaining a positive pressure within the unit. Clean air or inert gas is used to maintain a higher pressure than the surrounding atmosphere. In pressurization, the electrical equipment is interlocked with a system which cycles clean air within the unit to remove explosive gases before start up.



Purged and Pressurized -

For the Class and Division System the following table applies

Type	Explanation
X	Changes the area within the unit from Class I, Division 1 to unclassified
Y	Changes the area within the unit from Class I, Division 1 to Class I, Division 2
Z	Changes the area within the unit from Class I, Division 2 to unclassified



Powder Filling - Type of Protection “q” or “qb” for use in Zone 1 & Class I, Zone 1

Type of protection where electrical parts capable of igniting an explosive atmosphere are fixed in position and completely surrounded by filling material (glass or quartz powder) to prevent the ignition of an external explosive atmosphere.



Nonsparking Equipment - Type of Protection “nA” or “nAc” for Use in Zone 2 & Class I, Zone 2

Sparking Equipment - Type of Protection “nC” or “nCc” for Use in Zone 2 & Class I, Zone 2

Equipment in which the contacts are suitably protected other than by restricted breathing enclosure.

Hermetically Sealed for use in Class I, Division 2 or Class I, Zone 2

A common type of hermetically sealed equipment is a contact block or reed switch. In this method, the arcing components of the switch are encased in a glass tube. The connecting wires are fused to the glass sealing the unit to prevent any ingress of flammable gases.

Restricted Breathing Enclosure - Type of Protection “nR” or “nRc” for Use in Zone 2 & Class I, Zone 2

Combustible Dust Protection Methods

CLASS II EQUIPMENT

Dusttight equipment is designed to exclude dust from entering the enclosure, to prevent hot particles, arcs, sparks or heat generated inside of the enclosure from igniting an exterior accumulation or atmospheric suspension of dusts on or in the vicinity of the enclosure. Nonmetallic enclosures must also prevent the accumulation of static charges on the enclosure itself.

The primary function of the joints of these enclosures is to seal dust out and keep the hot particles etc. inside, therefore, typically the joints are gasketed.

Since this protection method keeps the combustible dusts outside, the enclosure is not expected or designed to contain an internal explosion. The design must be sufficient though to withstand mechanical abuse.

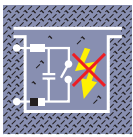
The ignition temperature of dusts is usually lower than that of gases and vapors, and therefore the control of external surface temperatures is more rigorous for Class II equipment than for Class I equipment. Dust layers on the equipment can act as insulation for the heat generated inside the equipment, which in turn can increase the surface temperature of the unit even under normal operating conditions.

The NEC defines "Dust-ignition proof" as the protection for Class II, Division 1 and 2 locations for which it is approved, and "Dusttight" as a type of enclosure that is constructed so that dusts will not enter the enclosing case under specific test conditions. In the NEC, some applications for Class II, Division 1 require Dust-ignition proof enclosures.

The NEC, in Article 506 introduced the Zone Classification System, Zones 20, 21 and Zone 22 for Combustible Dust or Ignitable Fibers and Flying, as an alternative to the Class and Division Classification System covered in Articles 500, 502 and 503.

The Zone Classification System is based on the modified IEC Area Classification System as defined in ANSI/ISA 61241-10.

Methods of Protection (Dust)

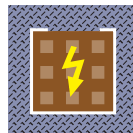


Intrinsic Safety - Type of Protection iaD for Zone 20, 21 and 22

Intrinsic Safety - Type of Protection ibD for Zone 21 and 22

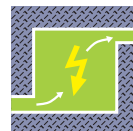
Associated Apparatus - Type of Protection [iaD] - Unclassified

Associated Apparatus - Type of Protection [ibD] - Unclassified

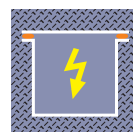


Encapsulation - Type of Protection maD for Zone 20, 21 and 22

Encapsulation - Type of Protection mbD for Zone 21 and 22



Pressurization - Type of Protection pD for Zone 21 and 22



Enclosure - Type of Protection tD for Zone 21 and 22