TECHNICAL INFORMATION

Area Classification

Area classification is the division of a facility into three-dimensional hazardous areas and non-hazardous areas and the subdivision of the hazardous area into 'Zones'.

Hazardous areas may be sud-divided into three Zones as follows:- Flammable gases and vapour's	
Zone 0	An area in which an explosive atmosphere is constantly present, or present for long periods. (Rough Guide : More than 1,000 hours / year)
Zone 1	An area in which an explosive atmosphere is likely to occur in normal operation. (Rough Guide : 10 hours or more / year but less than 1,000 hours / year)
Zone 2	An area in which an explosive atmosphere is not likely to occur in normal operation and if it occurs, it will exist only for a short time.(Rough Guide : Less than 10 hours / year)

Combustible Dusts	
Zone 20	An area in which combustible dust, as a cloud, is present continuously or frequently,during normal operation, in sufficient quantity to be capable of producing an explosive concentration of combustible dust in a mixture with air.
Zone 21	An area, in which combustible dust, as a cloud, is occasionally present during normal operation, in sufficient quantity to be capable' of producing an explosive concentration of combustible dust in a mixture with air.
Zone 22	An area, in which combustible dust, as a cloud, may occur infrequently and persist for only a short period, or in which accumulations of layers of combustible dust may give rise to an explosive concentration of combustible dust in a mixture with air.

Apparatus selection according to the ignition temperature of gas or vapour

The equipment must be selected so that its maximum surface temperature will not reach the ignition temperature of any gas or vapour that may be present.

Temperature class of electrical apparatus	Maximum surface temperature of electrical apparatus	Ignition temperature of gas or vapour
T1	450° C	>450° C
T2	300° C	>300° C
T3	200° C	>200° C
T4	135° C	>135° C
T5	100° C	>100° C
T6	85° C	>85° C

If the marking of the electrical apparatus does not include an ambient temperature range, the apparatus is only for use within an ambient temperature range from -20° C to 40° C
For further information regarding data for flammable gases and vapour's, see PD IEC 60079-20.

Electrical Protection Concepts

Standard IEC / EN		Code		Protection concept	Zone	
Gas	Dust	Gas	Dust		Gas	Dust
60079-0		-	-	General requirements	-	-
60079-1		Ex d	-	Flameproof	1	-
-	60079-31		Ex ta Ex tb Ex tc	Enclosure	-	20 21 22
60079-2	61241-4	Ex pxb Ex pyb Ex pzc	Ep D	Pressurised	1 1 2	21/22
60079-5		Ex q		Powder filled	1	
60079-6	-	Ex o	-	Oil filled	1	-
60079-7		Ex e		Increased safety	1	
60079-11	61241-11	Ex ia Ex ib Ex ic	Ex ia Ex ib Ex ic	intrinsic safety	0 1 2	20 21 22
60079-15	-	Ex nA Ex nR Ex nC	-	Non-sparking Restricted breathing Enclosed break	2	-
60079-18		Ex ma Ex mb Ex mc	Ex ma Ex mb Ex mc	Encapsulation	0 1 2	20 21 22

Installation Standards and Codes

There are numerous different regulations, codes, guidelines and standards for the design, installation and Maintenance of electrical and non-electrical systems for use in potentially explosive atmospheres. The type of Operational facility, geographic location, operator practice, local and national legislation authority, having Jurisdiction etc. will determine many of the design and installation rules permitted.

For further information on the design, selection and installation of equipment for use in hazardous areas see:-

IEC 60079-14	Electrical installation in hazardous areas (other than mines)
IEC 61892-7	Mobile and fixed offshore units - Electrical installation, part 7: Hazardous areas
IEC 612141-1-2	(proposed change to IEC 61241-14) - Electrical apparatus in the presence of combustible dust.
Part 1-2 :	Electrical apparatus protected by enclosures and surface temperature
EN 60079-14	Electrical installations in hazardous areas (other than mines)
EN 50281-1-2	Electrical apparatus for use in the presence of combustible dust - part 1 - 2. Electrical apparatus protected by enclosures - selection, installation and maintenance

Inspection Standards and Codes

For information regarding the installation and maintenance of equipment for use in hazardous areas see:-
IEC 60079-17 - Inspection and maintenance of electrical installations in hazardous areas (other than mines)
IEC 61241-17 - Electrical apparatus for use in the presence of combustible dust atmosphere - part 17 : Inspection And maintenance

ATEX 94/9/EC Directive	
The Directive classifies equipment into eight categories dependingon the equipment's area of use:-	
Category M1 -	Equipment intended for mining use and is required to remain functional in the presence of an explosive atmosphere
Category M2 -	Equipment intended for mining use but is intended to be de-energised in the event of an explosive atmosphere
Category 1G -	Non-mining equipment for use in Zone 0
Category 2G -	Non-mining equipment for use in Zone 1
Category 3G -	Non-mining equipment for use in Zone 2
Category 1D -	Non-mining equipment for use in Zone 20
Category 2D -	Non-mining equipment for use in Zone 21
Category 2D -	Non-mining equipment for use in Zone 22

Equipment protection level	
EPL	Zone
G a	0
G b	1
G c	2
D a	20
D b	21
D c	22
M a	Energized
M b	De-energized

ATEX 137 Directive 99/92/EC

The Directive covers the use of equipment in potentially explosive atmospheres and its aim is to establish minimum requirements for improving the safety and health of workers.

Article 137 of Directive 89/391/EC was published in the official journal of the EC on 28th January 2000 as Directive 99/92/EC, it is the 15th individual Directive of the framework Directive 89/391/EEC.

The article defines the :

Obligations of the employees are the prevention and protection against explosions
Assessment obligations are the assessment of explosion risks.
General obligations are the safety and health of worker.

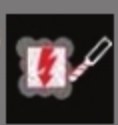
Requirements for explosion protection documents.

In places where potentially explosive atmospheres may occur in such quantities as to endanger the health and safety of workers, the point of entry must be marked with the sign shown below in accordance with Section II, Article 7 of the Directive.

CENELEC and IEC Degree of Ingress Protection, IP

IEC60529 & EN60592 standards is descriptive of a classifying system of degrees of protection provided by the enclosures of electrical equipment in accordance to the following table :

First Number

0		Non Protected	Protection of persons against access to hazardous parts inside the enclosure and against solid foreign objects
1		Protected against Objects of 50mm diameter and greater	An Object probe,sphere of 50mm diameter,shall not fully penetrate
2		Protected against Solid foreign objects of 12.5mm diameter and greater	An Object probe,sphere of 12.5mm diameter,shall not fully penetrate
3		Protected against Solid foreign objects of 2.5mm diameters and greater	An Object probe,sphere of 2.5mm diameter,shall not penetrate at all
4		Protected against Solid foreign objects of 1.0mm diameters and greater	An Object probe,sphere of 1.0mm diameter,shall not penetrate at all
5		Dust Protected	Ingress of dust is not totally prevented but dust shall not penetrate in a quantity to interfere with satisfactory Operation of apparatus or to impair safety
6		Dust - tight	No Ingress of dust

Example : IP 67

Second Number

0		Non Protected	Protection of the equipment inside the enclosure against harmful effects due to the ingress of water
1		Protected against Vertically falling water drops	Vertically falling drops shall have no harmful effects
2		Protected against Vertically falling water drops when enclosure tilted up to 15	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical
3		Protected against Spraying water	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects
4		Protected against Splashing Water	Water splashed against the enclosure from any direction shall no harmful effects
5		Protected against Water jets	Water Projected in jets against the enclosure from any direction shall have no harmful effects
6		Protected against Powerd Water jets	Water Projected in poweful jets against the enclosure from any direction shall have no harmful effects
7		Protected against the effects of temporary immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardised conditions of pressure and time
8		Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more server than for numeral 7