CE 0081 Ex EEx d IIC T6

CE Mark
Complies with
European Directive

Identification number of
the Notified Body
Responsible for Surveillance
(0081 is the Identification Number of LCIE)

EU Explosive
Atmosphere Symbol

Flameproof		
Code	Permitted Use	Standard
AEx d	Zone 1, 2	FM3618
EEx d	Zone 1, 2	EN50018
Ex d	Zone 1, 2	IEC 60079-1
Intrinsic Safety		
AEx ia	Zone 0, 1, 2	FM3610
AEx ib	Zone 1, 2	FM3610
EEx ia	Zone 0, 1, 2	EN 50 020/39
EEx ib	Zone 1, 2	EN 50 020/39
Ex ia	Zone 0, 1, 2	IEC 60079-11
Ex ib	Zone 1, 2	IEC 60079-11

Equipment Group
II: Non-Mining

Maximum Surface Temperature		
Temperature	NEC 505, IEC, CENELEC	NEC 500
450° C	T1	T1
300° C	T2	T2
280° C		T2A
260° C		T2B
230° C		T2C
215° C		T2D
200° C	T3	T3
180° C		T3A
165° C		T3B
160° C		T3C
135° C	T4	T4
120° C		T4A
100° C	T5	T5
85° C	T6	T6

Area Classification

Standard	Flammable Conditions Present Continuously	Flammable Conditions Present Intermittently	Flammable Conditions Present Abnormally
IEC/CENELEC	Zone 0 Zone 20 - Dust	Zone 1 Zone 21 - Dust	Zone 2 Zone 21 - Dust
NEC 505	Zone 0	Zone 1	Zone 2
NEC 500	Division 1	Division 1	Division 2

Gas Grouping		
Explosive Group	NEC 505, IEC, CENELEC	NEC 500
Acetylene	Group IIC	Class I/Group A
Hydrogen	Group IIB + H_2	Class I/Group B
Ethylene	Group IIB	Class I/Group C
Propane	Group IIA	Class I/Group D
Metal Dust	None	Class II/Group E
Coal Dust	None	Class II/Group F
Grain Dust	None	Class II/Group G
Fibers	None	Class III

History

Every year in the industry there are quite a number of casualties due to explosions caused by flammable gas and or dust. Especially after some major accidents from 1978 till 1984 (1984 Mexico city > 550 casualties, 1984 Bhopal > 2500 casualties) the authorities recognized the need for better regulations and specifications to limit these accidents.

Hazardous areas

Hazardous locations are areas where a flammable gas or dust mixture is present. However to cause an explosion there are three things needed:

- Flammable gas or dust
- Oxygen
- Ignition source

Hazardous location identification

Hazardous locations in a plant are determined by experts. They must identify where there is a possibility of hazardous atmosphere being present, the kind of atmosphere, and the time it can be present.
Hazardous locations are most commonly caused by leakage of flammable gases. This leakage can occur during normal operation or due to a fault. Also deterioration of equipment can cause a hazardous situation.
The area around a location classified as hazardous is extended in such a way that there is no chance of ignition of the gas mixture anymore. The size of this area is influenced by the type of gas , natural or artificial ventilation etc.

Classification of hazardous locations and protection methods.

North America.

The classification of hazardous areas and the protection methods suitable for these areas differ from continent to continent and sometimes even from country to country.
The US for a long time followed the recommendations of the national standard NFPA 70 article 500 of the National Electrical Code (NEC). Canada follows the recommendations of the Canadian Electrical Code C 22.1 part 1. These standards divide in a similar way the hazardous locations in two divisions:
Division 1: Danger can be present during normal functioning.
Division 2: Danger can only be present in case of abnormal functioning.
Materials intended for use in the above area's are divided into three classes:
Class I: Gases or vapors
Class II: Dusts
Class III: Fibers

The above classes are sub divided into the following Groups:
Groups A,B,C and D: Specifies gases and vapors
Group E: Metal dust
Group F: Carbon black, coal or coke dust
Groups G: Flour, starch or grain dust
The protection methods used by Thermo Electric are either Explosion proof or Intrinsic safe. Products are marked with the Division, Class and gas group they are suitable for.

Relatively new for the US is the classification according the NEC 505. This classification follows more the old Cenelec classification and is in line with the IEC classification.

Hazardous areas are classified in zones based on the time a hazardous situation exists. IEC 79-10 and NEC 505 specifies three zones:
Zone 0: An area in which an explosive gas mixture is continuously present or for a longer period of time.
Zone 1:An area in which an explosive gas mixture could occur under normal operational conditions (Operating within design parameters).
Zone 2: An area in which an explosive gas mixture is not likely to occur under normal operational condition and if it does it will only be for a short period of time.

Any other plant location is to be classified " NON HAZARDOUS ".

Materials intended for use in the above area's are divided into two groups:
Group I: Materials intended for use in underground mines. Danger is represented by methane gas and coal dust.
Group II: Materials intended for use in all other situations. (Surface industries) Danger is represented by gases and vapors.
Group II itself is divided into three sub groups A, B, and C, depending on the types of gas present in the hazardous areas.

The most common protection methods used by Thermo Electric are :

Eexd
With this protection method the electrical parts that can cause an explosion are placed in an enclosure that can withstand the force of the explosion, while the explosion remains confined inside the enclosure.

Eexi
The Eexi (Intrinsic safety) method is based on the principle of limitation of the energy stored in the electrical circuits. An Eexi circuit is virtually incapable of generating arcs or sparks that are able to cause an explosion in both normal operation and under fault conditions.
Before a circuit enters a hazardous area a Zener barrier is placed to control the energy within that circuit.

The marking consist of one of the above protection methods, the gas group it is suitable for and the temperature class. This temperature class specifies the maximum surface temperature the product can generate. The maximum surface temperature must be lower than the minimum ignition temperature of the surrounding gasses. (Marking example Exd or Aexd IIC T4 etc.)

Europe.

As of July 1 2003 there is a new directive in place. Directive 94/9/EC. This directive is also called the ATEX (Atmospheres Explosives) directive. From July 1 2003 Only equipment complying with the new directive can be put on the market or put into service in the countries that are a member of the European Economic Area (EEA).

The new directive 94/9/EC applies to all potentially explosive atmospheres due to flammable gases, vapors, mists, or dusts. Exceptions are medical, domestic, and non commercial area's, ships and public transport.

The equipment is divided into groups and categories:
Group I : Equipment for use in underground parts of mines , and to those parts of surface installations of such mines endangered by firedamp and or combustible dusts.
Group II : Equipment intended for use in other places liable to be endangered by explosive atmospheres

The groups are sub divided into a number of different categories. Group I is sub divided into category M1 and M2:
Category M1 : Equipment of this category is required to remain functional with an explosive atmosphere present.
Category M2 : Equipment of this category is intended to be de-energized in the event of an explosive atmosphere.

Group II is sub divided into categories 1, 2, and 3:
Category 1: Equipment of this category is intended for use in a area where an explosive atmosphere is continuously present, present for long periods or frequently present and must ensure a very high level of protection.(Zone 0 and Zone 20)
Category 2: Equipment of this category is intended for use in a area where an explosive atmosphere is likely to occur and must ensure a very high level of protection. (Zone 1 and Zone 21)
Category 3: Equipment of this category is intended for use in a area where an explosive atmosphere is unlikely to occur and must ensure a normal level of protection. (Zone 2 and Zone 22)

Here also most common protection methods used by Thermo Electric are Eexd and Eexi.

The following marking is required:

Name and address of manufacturer.
Type and/or serial number.
Year of fabrication.
CE marking.
Identification number of the notified body.
Epsilon X mark and the equipment group and category.
For equipment of group II the letter G and/or D.
Certificate number of the notified body.
The marking required by the applicable standard. (Eexd IIC T4 etc.)