

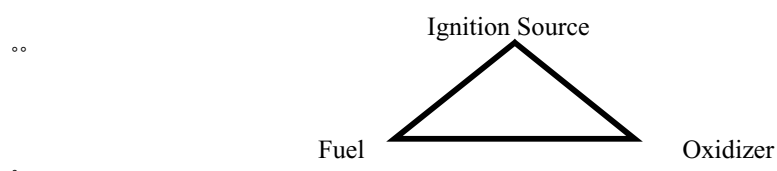
What is Potentially Explosive Atmosphere Certification, and why you may need it!

Most manufacturing and processing industries generate potentially explosive atmospheres using substances from solvents to flour! Previously there has been no mandatory obligation to use certified equipment (or indeed to classify an area as potentially explosive), European Directive 137 (The protection of workers from potentially explosive atmospheres) makes it mandatory under European law to assess for an explosion risk and classify the area accordingly. This Directive has recently been ratified and will be mandatory under European law from July 1st 2003.

Once an area is classified as potentially explosive, a risk analysis will normally dictate that only electrical and mechanical equipment that is suitably certified can be installed. Directive 137 will almost certainly increase the amount of Classified or Zoned areas, and hence increase the demand for certified equipment. The ATEX Directive (94/9/EC) forces manufacturers to gain certification of electrical and/or mechanical products that can be used in a potentially explosive atmosphere. Products without the appropriate certification will not legally be allowed to be placed on the European market after July 1st 2003.

What is an Explosion?

An explosion is any uncontrolled combustion wave. An explosion can be produced due to the combination of fuel (for example and explosive gas such as hydrogen), oxidizer (such as the oxygen in air) and a source of ignition energy (for example, a hot surface or an electrical spark). These three items are commonly referred as the fire triangle and represented below.



In addition to this, two additional facets are required: something to mix the fuel and the oxidizer (such as the turbulence created in a gas leak under pressure) and containment. It is however common industrial practice to use the term explosion for both confined and unconfined combustion.

Every material has a spontaneous ignition temperature, SIT (or AIT, autogenous ignition temperature) at which it will ignite spontaneously.

Definitions and Codes

A hazardous area is defined as an area in which explosive atmospheres, or may be expected to be, present in quantities such as to require special precaution for the construction and use of electrical equipment. An explosive atmosphere consists of a mixture of flammable substances with air in the form of GAS, VAPOUR OR MIST in such proportions that it can be exploded by excessive TEMPERATURES, ARCS OR SPARKS. The gases, vapours or mists will only explode when mixed with air between specific percentage mixtures, these are called:

- *LOWER EXPLOSIVE LIMIT (LEL)*
- *UPPER EXPLOSIVE LIMIT (UEL)*

These mixtures will also have different: auto-ignition temperatures (AIT); minimum ignition currents (MIC - intrinsic safety test apparatus); maximum experimental safe gaps (MESG - relates to flameproof enclosures flame path), depending upon the substances contained within the mixture.

EXAMPLES OF EXPLOSIVE MIXTURES & TEMPERATURE CODES

| Substance | LEL (%) | UEL (%) | MESG mm | MIC mA | AIT (°C) | TEMP. CODES Temperature Classification |
|-----------|---------|---------|---------|--------|----------|---|
| Methane | 5 | 15 | 1.14 | 195 | 595 | T1 |
| Propane | 2 | 9.5 | 0.97 | 146 | 470 | T1 |
| Ethylene | 2.7 | 34 | 0.65 | 108 | 425 | T2 |
| Acetylene | 3 | 17 | 0.25 | 60 | 305 | T2 |
| Hydrogen | 4 | 75.6 | 0.28 | 75 | 560 | T1 |

It is evident from the limited list shown in the table above that there are some natural groupings for the gases based on their MESG and MIC values. These groups are divided into two groups;

- Group I for mines susceptible to methane.
- Group II for explosive gases for locations other than mines; group II is further divided into three sub groups:
 - IIA, for atmospheres containing propane or gases of an equivalent hazard.
 - IIB, for atmospheres containing ethylene or gases of an equivalent hazard.
 - IIC, for atmospheres containing hydrogen or gases of an equivalent hazard.

The natural grouping of the gases based upon the MESG and MIC values does not bear any relationship to the auto-ignition temperatures (AIT) of the various substances.

The auto-ignition temperature is the temperature, in °C, at which a gas will ignite spontaneously without another source of ignition. Because these temperatures do not correspond with the above groupings, a temperature code was established.

The full list of temperature codes are listed in the table below:

FULL TEMPERATURE CODES LIST

| Temperature Class | Maximum Temperature Limit (°C) |
|-------------------|--------------------------------|
| T1 | 450 |
| T2 | 300 |
| T3 | 200 |
| T4 | 135 |
| T5 | 100 |
| T6 | 85 |

Standard Ambient Temperature in service: $-20...^{\circ}\text{C}$ † $\text{Temp}_{\text{amb}}^{\dagger} + 40...^{\circ}\text{C}$

Hazardous areas are further divided in zones, these zones relate to the predicted occurrence of when an explosive atmosphere may be present in the area. These zones are defined as being:°

- **ZONE 0** - An area where an explosive atmosphere is continually present or present for long periods — for example inside liquid fuel storage tanks.
- **ZONE 1** - An area where an explosive atmosphere will be present in normal operation but not continually — for example re-fuelling areas.
- **ZONE 2** - An area where an explosive atmosphere is not likely to occur in normal operation and if it does occur it will exist only for a short time — for example solvent storage areas. The solvent is normal contained in sealed drums however, if a drum is damaged during the process of moving it then a potentially explosive atmosphere could exist for a short period.

Commonly recognised concepts of protection

There are eight commonly recognised concepts of protection within Europe. These are detailed in the European EN50 series of Standards; *electrical equipment for use in explosive atmospheres*.

FLAMEPROOF - EN50 018.

INTRINSICALLY SAFETY - EN50 020.

PRESSURISATION - EN50 016

INCREASED SAFETY - EN50 019

OIL IMMERSION - EN50 015

POWDER/SAND FILLING - EN50 017

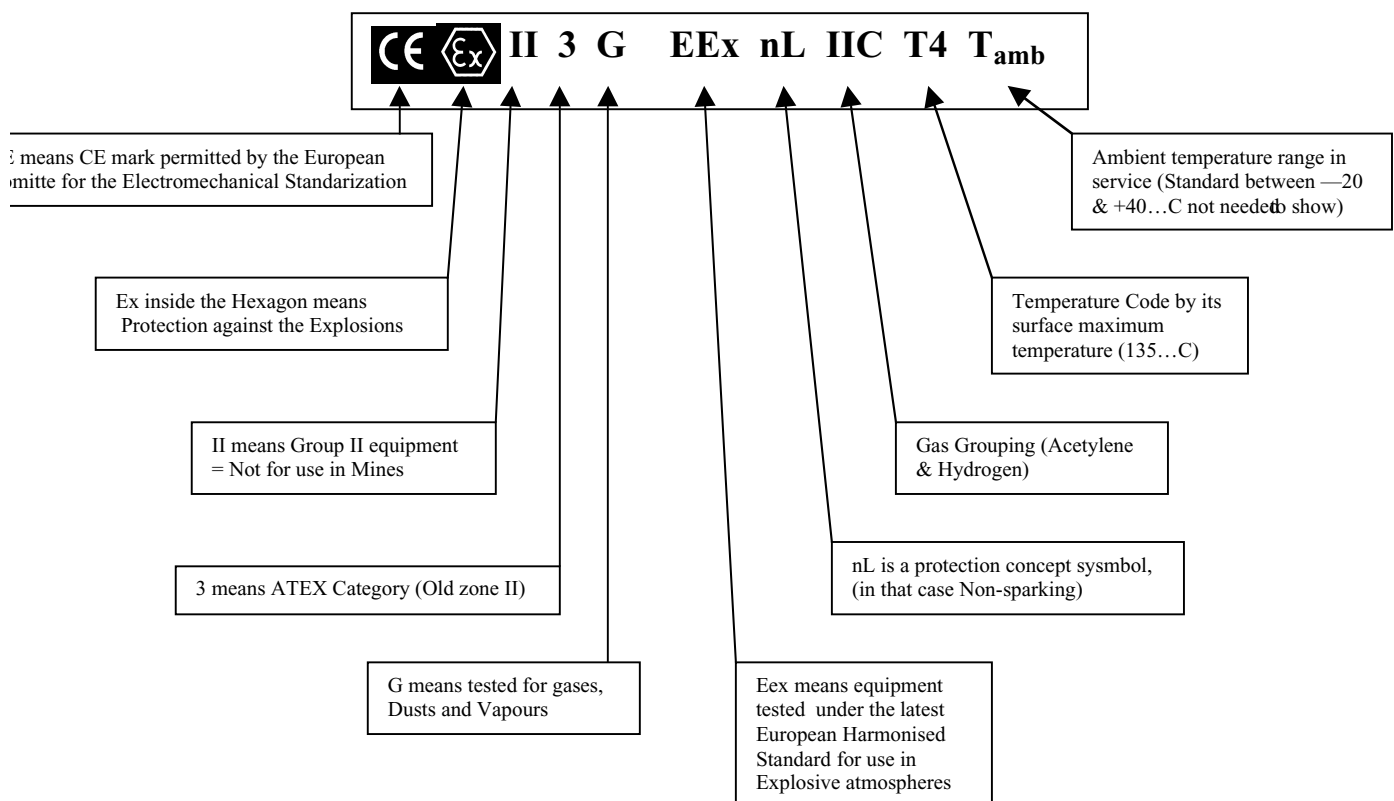
ENCAPSULATION - EN50 028

TYPE N PROTECTION (Non-sparking) - EN50 021

A type of protection applied to an electrical apparatus such that, in normal operation, it is not capable of igniting a surrounding explosive atmosphere, and a fault capable of causing ignition is not likely to occur.

This design concept is reflected in the equipment marking by the symbol Ex N. Equipment designed to this concept is suitable for use in *Zone 2* classified hazardous areas.

ATEX® CERTIFICATION CODING EXAMPLE



ATEX DIRECTIVE

The ATEX Directive 94/9/EC is a directive adopted by the European Union (EU) to facilitate free trade in the EU by aligning the technical and legal requirements in the Member States for products intended for use in potentially explosive atmospheres. It came into effect (on a voluntary basis) on the 1st of March 1996. It will be mandatory from 1st July 2003.

The ATEX Directive (94/9/EC) replaces the old *Explosive Atmospheres and Gassy Mines Directive (76/117/EEC)* and is intended to bring products covered by the old directive into line with the other, so called, *New Approach* CE marking Directives. The Directive covers equipment and protective systems, which may be used in areas endangered by potentially explosive atmospheres created by the presence of flammable gases, vapours, mists or dusts. The Directive covers both electrical and mechanical equipment.

Product Categories

Products are required to be categorised by the level of protection that they offer against the risk of them becoming a potential source of ignition of an explosive atmosphere. °

The equipment conformity categories are:°

Equipment Group I (mining): °

- **M1** — High integrity of protection for mining equipment. Two fault conditions
- **M2** — Reliability concept of protection for mining equipment

Equipment Group II (non-mining):

- **CAT 1 (Zone 0)** — Still safe with two faults
- **CAT 2 (Zone 1)** — Increased safety under abnormal operating conditions
- **CAT 3 (Zone 2)** — Equipment which is appropriate in normal operating conditions

The USE Directive

Coupled with the ATEX Directive is a new Directive for The Protection of Workers at Risk from Potentially Explosive Atmospheres (1999/92/EC)- commonly known as the Use directive. This Directive will also be mandatory under EU law in 2003. It requires that Site s documented evidence of risk analysis; area classification and site inspections to be carried out where potentially explosive atmospheres (gas or dust) may develop. This use Directive ensures that only ATEX certified electrical, mechanical and safety related systems are installed in potentially explosive atmospheres.