ATEX, NOMENCLATURE AND CODING

The intent of this technical note is approach to the user to the ATEX normative. For this we will begin defining, what is an explosive atmosphere, what are ATEX, as well as the directives that apply, uses and the implementation phases. Also we will make an explanation of the zones and the ATEX product marking. To finish with some examples of hazardous locations and examples of load cells and junction boxes we have available ATEX certified.

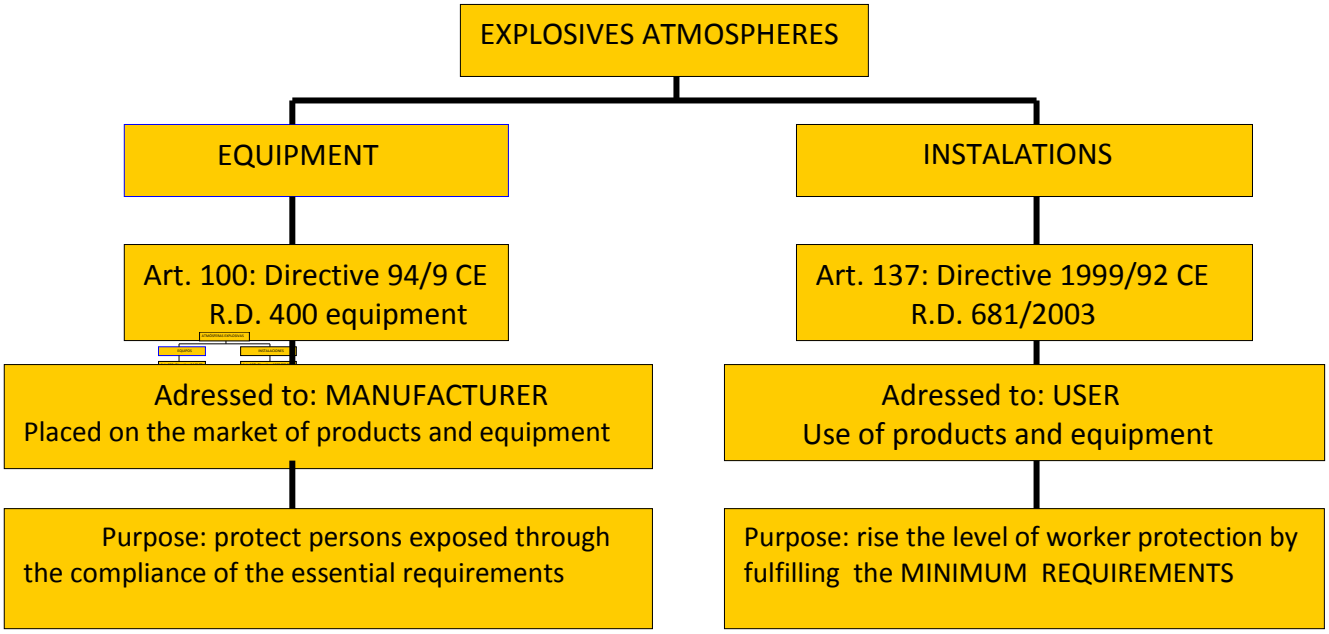
ATEX, ATmosphere EXplosive, Directive that companies must satisfy to the prevention and protection against explosions.

Defining explosive atmosphere

An explosive atmosphere is defined as a mixture of dangerous substances with air, under atmospheric conditions, in the form of gases, vapors, mist or dust in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

ATEX directives that apply and uses

Directive 94/9/CE: Equipment and protective systems intended for use in potentially explosive atmospheres.
It should be noted that directive 94/9/EC provides for the first time a series of essential safety and relative health requirements, on one hand, the non-electrical equipment for use in potentially explosive atmospheres and the devices for use in potentially explosive areas due to the presence of dust and protection systems, and secondly, to devices intended for use outside potentially explosive atmospheres but which are necessary or desirable for the safe operation of the equipment or protective systems in relation to risk of explosion. This represents an increase of the scope in comparison with the existing national legislation.
Directive 1999/92/CE: Health and safety protection of the workers.



Implementation phases of the ATEX directive

From July the 1st of 2003 apply for all new commercialized equipment.
From July the 1st of 2006 apply for all existing equipment.

This requires that all equipment installed in hazardous areas, as load cells, junction boxes, etc.. in the weighing systems, must be certified ATEX, forcing even to renovate the entire equipment already installed that do not comply with existing directives.

Responsibilities

The businessman must classify in zones the areas where an explosive atmospheres can be formed, being based on their frequency of appearance and the duration of their presence, as well as, has the obligation to elaborate and to maintain updated a document of protection against explosions.

The classification of the zones is a preliminary phase of the project and the first step to begin to project surely, this phase requires the collaboration of experts in ATEX that will determine the danger of each zone. These can be other people to the installation, whereas the project is responsibility of the responsible engineer.

The correct classification of the susceptible places to explosions must like object subdivide the surroundings in zones of different probability from risk, as a being able to make an apt electrical system to each explosive zone with a gradual criterion: the greater is the risk in the zone, the more reliable must be the means of protection against the danger of explosion caused by the electrical components.

Zoning Definition

Zone 0, 1 y 2 areas with GASES, VAPORS or MISTS.

Zone 0: Area in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapor or mist is present continuously or for a long period of time, or frequently.

Zone 1: Area in which is likely to occur in normal operation, the occasional formation of an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapor or mist.

Zone 2: Area in which it is not likely to occur in normal operating conditions, the formation of an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapor or mist which, if it does occur, this explosive atmosphere will persist for short periods of time.

Zone 20, 21, y 22 areas with DUST.

Zone 20: Area in which an explosive atmosphere in a cloud of combustible dust in air is present continuously, or for a period of time, or frequently.

Zone 21: Area in which is likely to form occasionally in normal operation of an explosive atmosphere in a cloud of combustible dust in the air.

Zone 22: Area in which it is not likely to occur in normal operation conditions, the formation of an explosive atmosphere in a cloud of combustible dust in air or in which, if it does occur, that an explosive atmosphere will persist for a short period of time.

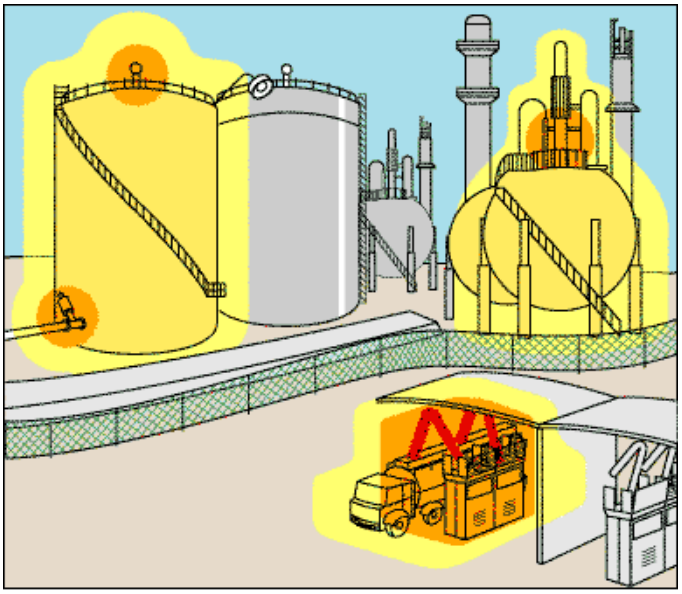


Image illustrating explosion risk areas, red to yellow, from highest to lowest risk, respectively.

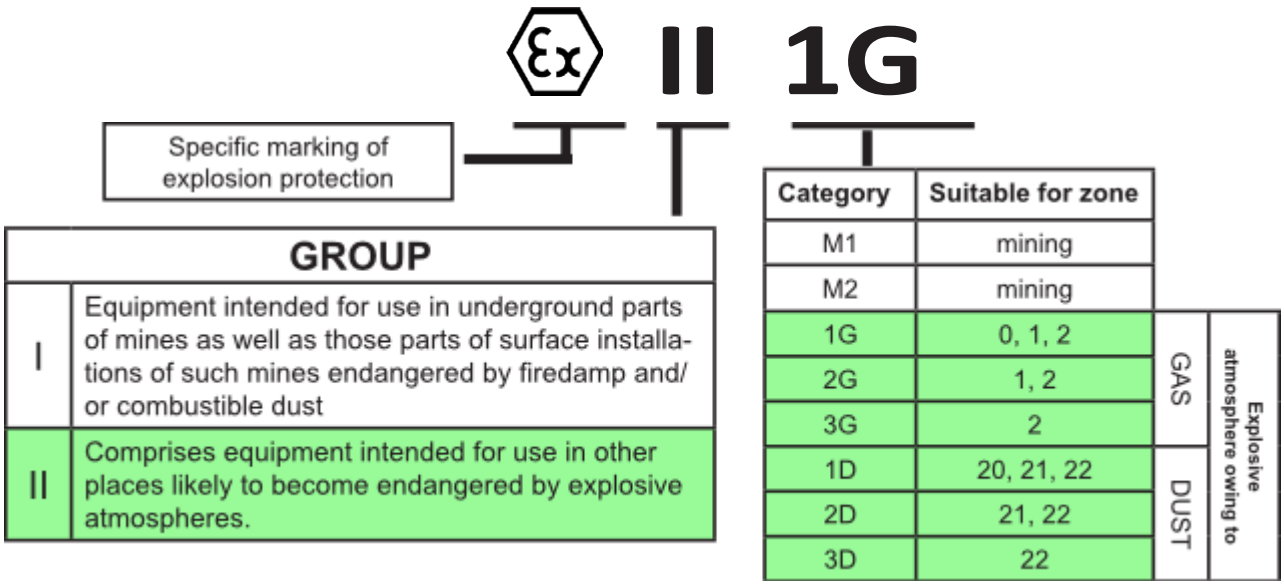
In the indicated zones it should use the following categories of equipment, provided they are suitable for gases, flammable vapors or mists or combustible dusts, as appropriate:

In zone 0 or zone 20, equipment of category 1.
In zone 1 or zone 21, equipment of category 1 or 2.
In zone 2 or zone 22, equipment of category 1,2 or 3.

ATEX Marking

The ATEX marking consists of a Specific Marking and an Additional Marking detailed below.

Specific Marking



GROUP	
I	Equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/ or combustible dust
II	Comprises equipment intended for use in other places likely to become endangered by explosive atmospheres.

Category	Suitable for zone		
M1	mining		
M2	mining		
1G	0, 1, 2	GAS	Explosive atmosphere owing to
2G	1, 2		
3G	2		
1D	20, 21, 22	DUST	
2D	21, 22		
3D	22		

1G Type of Category

Suitable Categories for Group I

M1 y M2 are only suitable for Group I, mining applications. With a **very high, for M1 or high, for M2** level of protection, the probability of an explosive atmosphere is assured.

M1 Category
For safety reasons, the products in this category must remain operational in the presence of an explosive atmosphere, and are characterized by integrating explosion protection means that:
In case of failure of one integrated measure, at least a second measure ensures a sufficient level of security.
Or in the event, of two faults occurring independently of each other, ensuring a sufficient level of security.

M2 Category
If there are signs of a potentially explosive atmosphere, shall be able to shut down the power supply of these products.
However, it is predictable to form an explosive atmosphere during operation of M2 Category equipment, because of the power shut down may not occur immediately. It is therefore

necessary to incorporate some means of protection to provide a high level of security. The means of protection relating to products in this category offer a sufficient level of safety during normal operation, even in more challenging operating conditions, particularly those that result from an intensive use of the device and a variable environment.

Suitable Categories for Group II

Category 1 comprises products designed to function within the operational parameters established by the manufacturer and ensuring a very high level of protection for its intended use in locations where it is **very likely** to occur steadily, often lasting or explosive atmospheres caused by mixtures of air and gases, vapors, mists or air / dust.
Equipment in this category are characterized by integrate means of protection against explosions such that:
In case of failure of one integrated media, at least one independent second means provides a sufficient level of security.
Or in the event of two faults occurring independently one from another, has to ensure an adequate level of security.
Are in this category:
1G Suitable for Zone 0, 1 and 2 (gas).
1D Suitable for Zones 20, 21, and 22 (dust).
Very high level of protection as there is a very **high probability** of explosive atmospheres.

Category 2 comprises products designed to function within the operational parameters established by the manufacturer and ensuring a high level of protection for its intended use in locations where it is **likely** the formation of explosive atmospheres caused by mixtures of air and gases, vapors, mists or air / dust.
The explosion protection relating to equipment in this category ensure a sufficient level of security, even in case of malfunctions occur or working in hazardous conditions normally to be taken into account.
Are in this category:
2G Suitable for Zone 1 and 2 (gas).
2D Suitable for Zone 21 and 22 (dust).
High level of protection as there is a **probability** of explosive atmospheres.

Category 3 comprises products designed to function within the operational parameters established by the manufacturer and ensuring a normal level of protection for its intended use in locations where it is **unlikely** the formation of explosive atmospheres caused by mixtures of air and gases, vapors, mists or air / dust, and where, according to all probability, their formation is rare and its presence is of short duration.
The design of the products in this category must ensure a sufficient level of safety during normal operation.
Are in this category:
3G Suitable for Zone 2 (gas).
3D Suitable for Zone 22 (dust).
Improved level of protection as the **probability** of an explosive atmosphere is **unlikely**.

Additional marking

Ex ia IIC T1..T6

Protection mode (for electrical equipment)			EPL	Typical Zones	IEC/EN Standards	Basic concept of protecion
Types of protection for gas explosive atmospheres	o	oil immersion	Gb	1, 2	60079-6	Keep the flammable gas out
	px py pz	pressurized enclosures	Gb Gb Gc	1, 2 1, 2 2	60079-2	Keep the flammable gas out
	q	powder filling	Gb	1, 2	60079-5	Contain the explosion, quench the flame
	d	flameproof enclosure	Gb	1, 2	60079-1	Contain the explosion, quench the flame
	e	increased safety	Gb	1, 2	60079-7	No arcs, sparks and hot surfaces
	ia ib ic	intrinsic safety ia intrinsic safety ib intrinsic safety ic	Ga Gb Gc	0, 1, 2 1, 2 2	60079-11	Limit the energy of sparks and surface temperatures
	ma mb mc	encapsulation	Ga Gb Gc	0, 1, 2 1, 2 2	60079-18	Keep the flammable gas out
	nA nC nL nR nP	non incendiary	Gc	2	60079-15	nA (No arcs, sparks and hot surfaces) nC (Contain the explosion, quench the flame) nL (Limit the energy of sparks and surface temperatures) nR, nP (Keep the flammable gas out)
Types of protection for dust explosive atmospheres	ta tb tc	protection by enclosures	Da Db Dc	20, 21, 22 21, 22 22	60079-31	Dust standard protection, rugged tight enclosure
	ia ib ic	intrinsic safety ia intrinsic safety ib intrinsic safety ic	Da Db Dc	20, 21, 22 21, 22 22	60079-11	Similar to ta, tb, tc but with some relaxations if circuit inside is intrinsically safe
	p	pressurized enclosures	Db	21, 22	60079-2	Pressurization of enclosure
	ma mb mc	encapsulation	Da Db Dc	20, 21, 22 21, 22 22	60079-18	Encapsulation of incendive parts

Explosion groups	
Group I	Firedamp mines
	Typical gas: Methane
Group II	Gas explosive atmospheres
Subdivisions (1)	Typical gas
IIA	Propane
IIB	Ethylene
IIC	Hydrogen
Group III	Dust explosive atmospheres
Subdivisions (2)	Typical dust
IIIA	Combustive flyings
IIIB	Non-conductive dust
IIIC	Conductive dust

(1) According to EN 60079-12 and EN 60079-20
(2) According to IEC 60079-0:2007 (ed.5)

Temperature class	Maximum surface temperature* (°C)
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

* Higher temperature obtained during service in the hardest operative conditions from a part or from the surface of the device, of the protection system or of the component, which can produce the starting of the surrounding explosive atmosphere
For dust the temperature class is indicated in °C.

Covered by UTILCELL
Check application

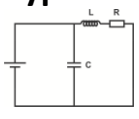
-Ex ia IIC T1..T6-

Ex Indicates that the equipment conforms to one or more standards

-Ex ia IIC T1..T6-

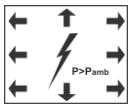
ia Is the protection mode

Types of protection modes



i: Intrinsic Safety: Limit the energy of sparks and surface temperatures.
ia: For zones 0, 1, 2, 20, 21 y 22.
ib: For zones 1, 2, 21 y 22.
ic: For zones 2 y 22.


o: Oil immersion , for zones 1 and 2, gas explosives atmospheres. Keep the flammable gas out.



p_ (px, py o pz): Pressurized enclosures. For zones 1 and 2 (gas) except py that is only apply for zone 2. Keep the flammable gas out.

p: Pressurized enclosures. For zones 21 and 22 (dust). Pressurization of the enclosure.


q: Powder filling. For zones 1 and 2 (gas). Contain the explosion, quench the flame.


d: Flameproof enclosure. For zones 1 and 2 (gas). Contain the explosion, quench the flame.


e: Increased safety. For zones 1 and 2 (gas). No arcs, sparks and hot surfaces.


m_ (ma, mb, mc): Encapsulation, for gas explosive atmospheres, keeps the flammable gas out, and for dust explosive atmospheres, encapsulates of incentive parts.

ma: For zones 0, 1, 2(gas), 20, 21 y 22(dust).

mb: For zones 1, 2(gas), 21 y 22(dust)

mc: For zones 2 (gas) y 22 (dust).

n_ (nA, nC, nL, nR, nP): Non incendiary, all that certifications are applied for zone 2(gas).

nA: No arcs, sparks and hot surfaces.

nC: Contain the explosion, quench the flame.

nL: Limit the energy of sparks and surface temperatures.

nR o nP: Keep the flammable gas out.

t_ (ta, tb, tc): Protection by enclosures. Dust standard protection, rugged tight enclosure.

ta: For zones 20, 21 y 22 (dust).

tb: For zones 21 y 22.

tc: For zone 22.

-Ex ia IIC T1..T6-

IIC Explosion groups of material, according to EN60079-0

Group I: Firedamp mines. Belongs to Methane gas group.

Group II: Gas explosive atmospheres

IIA: Propane is the typical gas in this subdivision.
IIB: Ethylene is the typical gas in this subdivision.
IIC: Hydrogen is the typical gas in this subdivision.

Group III: Dust explosive atmospheres

IIIA: Combustive flying are the typical dusts in this subdivision.
IIIB: Non-conductive dust is the typical dust in this subdivision.
IIIC: Conductive dust is the typical dust in this subdivision.

-Ex ia IIC T1..T6-

T1..T6 Temperature Class

Is the higher temperature obtained during service in the hardest operative conditions from a part or form the surface of the device, of the protection system or of the component, which can produce the starting of the surrounding explosive atmosphere.

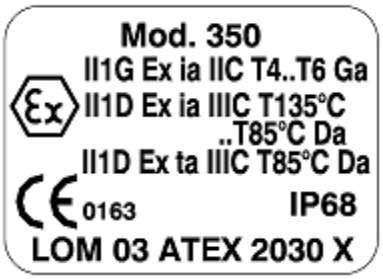
For gas the temperature class is indicated from T1 to T6.

T1: For a maximum surface temperature of **450°C.**
T2: For a maximum surface temperature of **300°C.**
T3: For a maximum surface temperature of **200°C.**
T4: For a maximum surface temperature of **135°C.**
T5: For a maximum surface temperature of **100°C.**
T6: For a maximum surface temperature of **85°C.**

For dust the temperature class is indicated as shown:

The T letter followed by the maximum surface temperature, for example T85°C.

ATEX product labeling



All ATEX certified product must lead an identifying label, reporting to the user the type of certification or certifications you have, the CE marking with the number of the notified body responsible for auditing the production, the tightness or IP-Grade, the name of the certifying body with certificate number, and finally an X appears, if the equipment has special operational conditions.

Examples of hazardous locations

Once defined the specific marking, the additional marking and the ATEX product labeling, we are going to enumerate some examples of installations that can be dangerous locations, for this reason is necessary being ATEX certified.

-Chemical Industry: Usage of liquids and inflammable gases.
-Garbage dumps and civil engineering: Inflammable gas formation.
-Companies producing energy: Coal dust generated in transportation, milling and drying.
-Residual water treatment companies: Inflammable gas formation.
-Industry of wood treatments: Wood dust formation.
- Gas supply companies.
-Painting and enameling companies: Painting mists, solvents and powdery pigments.
-Manufacture of light materials pieces and factories of metallic carpentry: Explosive metallic dusts (Aluminum, Magnesium, etc.).
-Agriculture and livestock facilities: Forage dehydrators, almond husking machines.
-Fertilizers.
-Food industry: Transportation, flour processing and storage, starch, sugar, cacao, milk and egg powder, spices and their derivate.
-Pharmaceutical industry: Usage of liquids and inflammable gases.
-Refineries.
-Textile industry: Storage and treatment of cotton, linen and fibers.
-Facilities using inflammable chemical agents.
-Agricultural industries: Forage, cereals, starch and hay silos. Dryers.
-Forest industries: Wood sawmills. Paper and cellulose manufacturing.
-Recycling industries.

Load cells, junction boxes and weighing indicators ATEX certified

The following table shows our load cells, junction boxes and weighing indicators ATEX certified.

MODEL	***TYPE OF CERTIFICATION***				
	Intrinsic Safety GAS	**Intrinsic Safety DUST**	**Protection by enclosures DUST**	**Non incendiary**	**Protection by enclosures**
	Suitable for Zone 0, 1 and 2	Suitable for Zone 20, 21 and 22	Suitable for Zone 20, 21 and 22	Suitable for Zone 2	Suitable for Zone 22
LOAD CELLS					
 ***190i***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 GD Ex nA II T6	II 3 GD Ex tD A22 IP68 T85°C
 ***300/340***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 G Ex nA IIC T6 Gc	II 3 D Ex tc IIIC T85°C Dc
 ***350***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 G Ex nA IIC T6 Gc	II 3 D Ex tc IIIC T85°C Dc
 ***420***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 G Ex nA IIC T6 Gc	II 3 D Ex tc IIIC T85°C Dc
 ***460***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 G Ex nA IIC T6 Gc	II 3 D Ex tc IIIC T85°C Dc
 ***650***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 G Ex nA IIC T6 Gc	II 3 D Ex tc IIIC T85°C Dc
 ***740***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 GD Ex nA II T6	II 3 GD Ex tD A22 IP68 T85°C
 ***750***	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 1 D Ex ta IIIC T85°C Da	II 3 G Ex nA IIC T6 Gc	II 3 D Ex tc IIIC T85°C Dc
 ***JUNCTION BOXES***					
	Zone 0, 1 and 2	Zone 20, 21 and 22	Zone 21 and 22	Zone 2	Zone 22
89093(4 LOAD CELLS)	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 2 D Ex tb IIIC T85°C Db	II 3 G Ex nA IIC T6 Gc	
89092(8 LOAD CELLS)	II 1 G Ex ia IIC T4..T6 Ga	II 1 D Ex ia IIIC T135°C..T85°C Da	II 2 D Ex tb IIIC T85°C Db	II 3 G Ex nA IIC T6 Gc	

MODEL	***TYPE OF CERTIFICATION***	
	Non incendiary GAS	**Protection by enclosures DUST**
	Suitable for Zone 2	Suitable for Zone 21 and 22
INDICATORS		
 ***SMART***	II 3 G Ex nR IIC T6 Gc -20°C ≤ Ta ≤ +60°C	II 2 D Ex tb IIIC T85°C IP65 Db -20°C ≤ Ta ≤ +60°C

Utilcell wishes this technical note can be of your help as an approach to the ATEX normative, only as a guideline and not serve as a contractual specification. We reserve the right to change the content of this technical note at any time without notice.

Remaining at your disposal for any further information.