

**EBARA**

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## INTRODUCTION

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The present is to illustrate all the respects and involvements about the 94/9/CE directive (better known as directive about ATEX products; ATEX is the acronym for Atmospheres Explosibles).

With the directive 94/9/CE it is possible to fix, and this is the first time, the mainly safety conditions for the machines **not electrical** which will be used in an area that **can be with high explosive atmosphere**.

The directive covers also those machines that can be used in explosive area due to the presence of dust (the risks are coming from the dust's presence), also covers the safety systems and those devices which can be used out of the explosive atmosphere, necessary for the machines running (working).

The directive considers an explosive atmosphere something that can be explosive due to the use or due to a changement of the surrounding environment.

Certainly it is a development of the actual national rules.

**An explosive atmosphere** according the 94/9/CE directive is a mixture of inflammable substances, at gas state, at vapour state, at fog state and dust one.

An atmosphere that can change to an explosive one due to the local conditions or working ones is a **potential explosive atmosphere**.

Starting from the 30<sup>th</sup> June 2003, with the introduction of these products in the EU territory, only if the products are respecting the 94/9/CE directive would be managed and used in our environment.

The 94/9/CE plans some duties from the producer which introduce the products on the market while the ATEX 99/92/CE directive gives the minimum safety conditions which the users must respect during the activity in the area where can be explosion risks.

The 1999/92/CE directive gives the minimum rules to protect the workers who can be in contact with the explosive atmosphere.

Both the 94/9/CE and 99/92/CE directives give the safety rules to be applied in the working areas where there is the possibility of explosion risk.

Also the 99/92/CE directive introduces a new duty, that is for the employer to classify the dangerous areas to proceed with the risks evaluation.

The European 99/92/CE directive has been recorded in Italy with the government decree of the 12<sup>th</sup> June 2003 nr.233 and published in the Gazzetta Ufficiale nr.197 on the 26/08/2003.

Several activities are under the 99/92/CE directive such as the food-processing industry (manufacturing and stockpile of flour, cereals, sugar), textiles and clothing industry, manufacturing wood industry, paper-mill industry, chemical, pharmaceuticals, petroleum/oil industry, bodywork, production and stockpile of paints or perfumes, bunker (fuel) companies which produce alcohol (an example can be distilleries).

Waste disposal places, dirty waters or stock warehouse are always under the above mentioned directive.

The places classification must consider not only the presence of combustible material or inflammable one (right proportions) under standard working conditions but also in case of accidental conditions (effects that can be foreseen) which can cause a possible explosive atmosphere presence.

Through the rule EN 60079-10 which covers the explosive atmosphere with gas, and through EN 50281-3 which covers the explosive atmosphere with combustible dusts, it is possible to classify the areas.

The areas classification permits to the user to identify the right machine as the producer to satisfy these conditions has classified the products according fixed categories.

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**GENERAL CONCEPTS**

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**MACHINE NOT INCLUDED IN THE 94/9/CE DIRECTIVE**

The following fixtures are excluded from the range of activities of the regulation 94/9/CE:

- The medical instruments designated for the medical field applications;
- The instruments and the protection systems, when the ranger of explosion is exclusively due to the existence of explosive materials or of variable chemical materials;
- The instruments meant for employments in the domestic environment and non-commercial, where an potentially explosive atmosphere can be caused only rarely and uniquely after an accidental gas leak;
- The device for individual protection, which is matter of the regulation 89/686/CEE. There are cases for which the individual protection devices equipped with proper potential primer sources are destined to be used in atmospheres which are potentially explosive. This type of devices for the individual protection has to observe the procedures established in regulation 94/9/CE in order to guarantee the safety level necessary against explosions;
- The nautical ships and the off-shore mobile units, together with the instruments used in-board of the just mentioned ships or units, because already provided by the law. However, the off-shore fix units, together with the in-board fixtures, and the units and the ships not considered nautical (for example, inferior to 500 tons, not destined to the off-shore navigation, but for the in-shore navigation of rivers, canals or lakes) are comprehended in the range of activities of the regulation 94/9/CE;
- The transport means, it is to say the vehicles and their trailers, destined uniquely to the transportation of persons via air or by the road networks, railways or navigable and the transportation means, as far as they are conceived for the transport of goods via air or by roads or by the public railways or by via navigable. The vehicles destined to be used in potentially explosive are not excluded;
- The devices projected and built for being used by the armed forces or for the tutorship of the laws and of the public order. The devices for a double use are not excluded.

**PRODUCTS WHICH ARE INCLUDED IN THE 94/9/CE DIRECTIVE**

In order to fall into the range of applications of the regulation, a product must be:

- An instrument. The word 'instruments' comprehends the machines, the materials, the fixed or mobile devices, the command parts, the instrumentation and the recording and prevention systems;
- A protection system. The devices with the functions of stopping the explosions in the bud and of limiting the area hit, are considered protection systems;
- A component. Components are the parts essential for the safe working of the fixtures and of the protection systems, that, however, have not an autonomous function;
- Safety devices. The safety devices are comprehended in the range of applications of the regulation also if they are destined to be used out of the range of explosive atmospheres, but necessary or useful for the safe working of the instruments and protection systems, as far as the explosion risks are considered.

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**GENERAL CONCEPTS**

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**ELECTRICAL SET**

The 94/9/CE directive does not define the electrical sets.

The pump, considered without the electric motor, is classified according the valuation procedures of conformity and it is assembled to an electric motor (electrical set) which is already under evaluation separately.

If the set assembled does not involve other risks, it will be not necessary anyother valuation as far concern the electrical set.

This means that if pump and electric motor have ATEX certification, the final assembled product does not involve other risks (of course it is necessary to follow strictly the instructions).

If the pump and the electric motor are subjected to the evaluation procedures of conformity and then they are assembled , the final product has to be considered as electrical set and the conformity evaluation must be considered as it is.

**INSTALLATIONS**

The installations are not included in the 94/9/CE directive so that this directive does not involve the installation process (the installation will be subjected to the laws of the countries member of the european community).

An installer must be sure that each set (all the machines/sets) is respecting the directive and this has to be until it start to work.

In order that each set is still complying the law, it is necessary that the installer follows strictly all the instructions during the installation itself given by the producer.

## GROUPS CLASSIFICATION, CATEGORIES, GAS-DUST AND AREAS

The machines (sets) according the 94/9/CE are divided in two groups:

Definition:

- **GROUP I** (products to be used in the mines, so that they will be used in the mines and in the near surface plants where they can be under the risk of the firedamp burst and combustible dusts);
- **GROUP II** (sets to be used on the surface where is possible the development of explosive atmosphere).

### GROUP I

#### CATEGORY M1

The products which belong to this category must be working with the explosive atmosphere as they are suitable with protection system against the explosions:

- in case of protection system breakdown, at least a second one separate can replace granting the safety level;
- in case of two wastes separately, the safety level is granted.

This means that the sets or the safety systems of category M grant a safety level very high.

#### CATEGORY M2

For these sets it is necessary to stop the supply voltage in case of explosive atmosphere. The sets of category M2 grant a high safety level.

Summary table about performance products of category I

PROTECTION LEVEL	GROUP	WORKING CONDITIONS
VERY HIGH	M1	The sets are electrical powered and working even if there is an explosive atmosphere.
HIGH	M2	In case of explosive atmosphere the supply voltage is stopped

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**GROUPS CLASSIFICATION, CATEGORIES, GAS-DUST AND AREAS**

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**GROUP II**

The Group II is divided by three categories which are:

- CATEGORY 1** (sets or safety systems which grant a very high level protection)
- CATEGORY 2** (sets or safety systems which grant a high protection)
- CATEGORY 3** (sets or safety systems which grant a standard protection)

**CATEGORY 1**

The sets of the **CATEGORY 1** are foreseen to work in those environments where there is a **high degree of probability** which can generate for long period, or continuously, explosive atmosphere due to mixture of gas and air, fog or mixture of air and dusts.

The sets which belong to this category grant the minimum protection level in case of two separate wastes or in case of protection waste, a second one separate can grant the protection level requested.

**CATEGORY 2**

The sets of the **CATEGORY 2** are foreseen to work in those environments where there is **the possibility** of the explosive atmosphere presence due to the mixture of gas and air, vapour, fogs or mixture of air and dusts.

The sets which belong to this category must grant the safety level requested even if there is a function waste.

For the above reasons the products (in our case the pump) have to be studied and produced to avoid the primer source even due to the anomaly situation.

If the surfaces can warm up, it is necessary to avoid, even in the waste conditions, to reach the max temperature fixed.

**CATEGORY 3**

The sets of the **CATEGORY 3** are foreseen to work in those environments where there is a **low possibility** of the atmosphere explosive presence, or that can be rarely or for short time, due to the gas, vapour, fogs or mixture of air and dusts.

The sets which belong to this category must grant a standard level protection, so that they have to be studied and produced that during their working (we don't consider the anomalies) they avoid the foreseeable prime sources limiting the fixed surface temperatures.

## GROUPS CLASSIFICATION, CATEGORIES, GAS-DUST AND AREAS

### GAS

- Low prime energy (20÷300 µJ);
- Ignition temperature relatively high (about > 250°C).

### DUSTS

- High prime energy (3÷500mJ);
- Ignition temperature relatively low (about < 200°C).

The gas explosion creates dusts vortex and trigs a chain reaction (subsequent explosions)

The max pressures are from 5 to 9 bar it depends on the dust type, granulometry, cloud dimension, mixture content.

### AREAS SETTLEMENT, RELATION WITH THE CATEGORIES

The areas in contact (exposed) with the GAS and DUST are divided each by three zones; the zone 0,1 and 2 are referred to the gas while the zone 20,21 and 22 are referred to the dust.

The numeration is different for the two types of atmospheres, the zone requirements are the same for the dusts and for the gas

Table about instruments for gas, vapour and fogs (GAS)

GROUP	CATEGORY	ZONE	PROTECTION LEVEL	OTHER APPLICATION ZONES
II Surface product (industry)	1	ZONE 0	Very high	1, 2
	2	ZONE 1	High	2
	3	ZONE 2	Standard	-

Table about instruments for dusts mixture and air (DUST)

GROUP	CATEGORY	ZONE0	Protection Level	Other application zones
II Surface product (industry)	1	ZONE 20	Very high	21, 22
	2	ZONE 21	High	22
	3	ZONE 22	Standard	-

#### ZONE 0/20 – CONSTANT DANGER

Area where an explosive atmosphere, composed by mix of gas and/or vapour or combustible dusts, is always present or for long period or frequently.

#### ZONE 1/21 – POTENTIAL DANGER

Area where is possible that, with standard activity, creates an explosive atmosphere composed by mix of gas and/or vapour or combustible dusts.

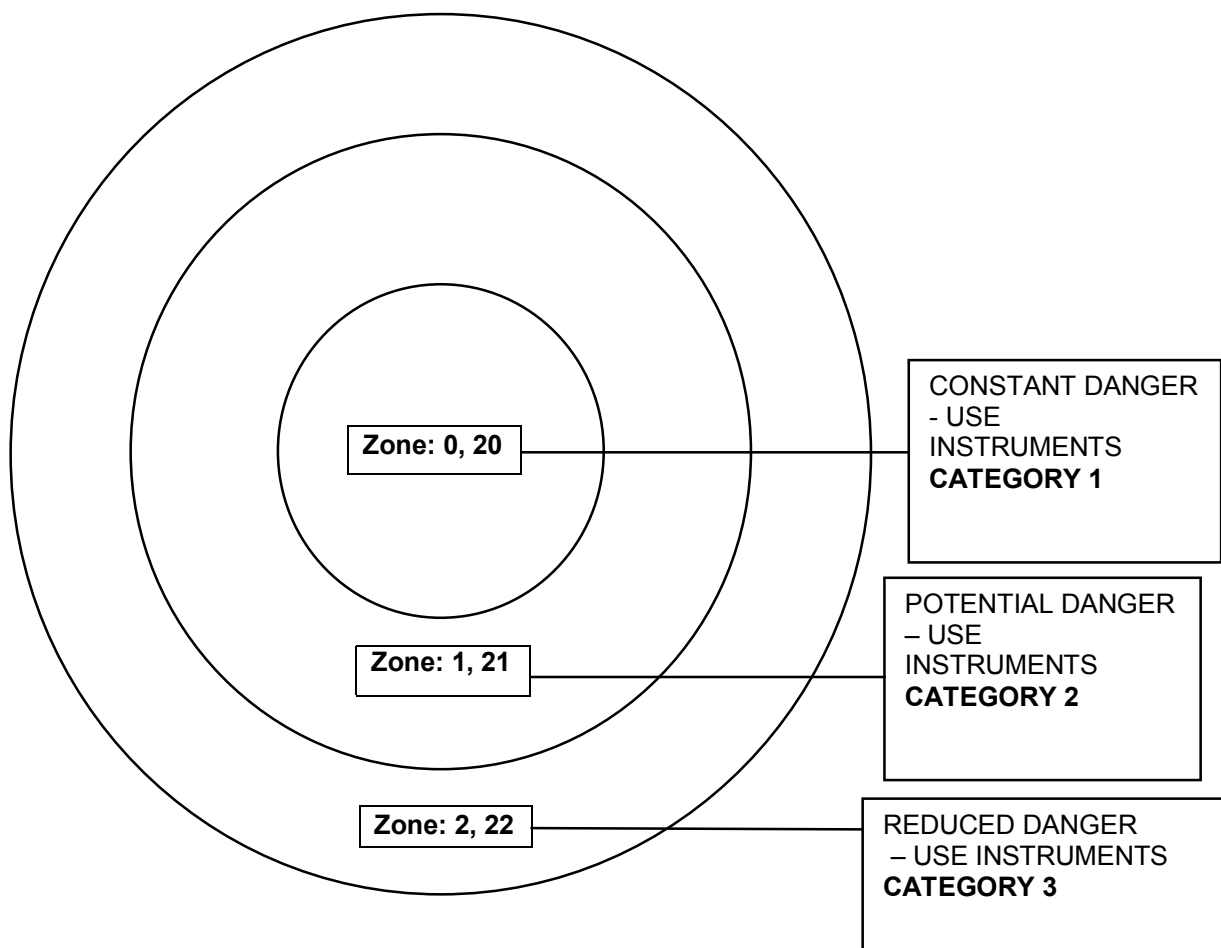
#### ZONE 2/22 – REDUCED DANGER

Area where is improbable that, with standard activity, creates an explosive atmosphere composed by mix of gas and vapour, and that event can happen for a short period.



**GROUPS CLASSIFICATION, CATEGORIES, GAS-DUST AND AREAS**

**RELATION BETWEEN AREAS AND CATEGORIES**



## GROUPS CLASSIFICATION, CATEGORIES, GAS-DUST AND AREAS

### USER DUTIES

The user must establish what follows:

- ❑ To define the areas where it can create the explosive atmosphere (in case of doubts please ask to the appropriate office). To define the explosion risks the user has to consider the time duration of the explosive atmosphere presence, the possibilities that the burst source are present and become active.  
The system features, the material used and the foreseeable effects.
- ❑ To choose the suitable product for the above mentioned areas.
- ❑ To check the installation conditions, its functions and standard material maintenance.

### MAKER DUTIES

The maker must project and produce according the mainly safety rules expressed in the ATEX directive.

The product must be marked in conformity and must have an instruction manual.

The maker must supply a CE declaration according what established by the organization for category 2 or by the maker for the category 3.

### TEMPERATURE CLASSES

The temperature class defines the max temperature that it can join the internal or external machine surface (es.pump) considering that the environment temperature cannot exceed the 40°C.

The gas prime temperature (mixture of gas or vapour) must be higher than the pump class one.

The following table indicates the values of the 6 standard temperature classes.

Temperature class	Surface max temperature of the pump [°C]	Burnst temperature of mix gas or vapour [°C]
T1	450	>450
T2	300	>300
T3	200	>200
T4	135	>135
T5	100	>100
T6	85	>85

### GASES CLASSIFICATION

**GROUP I** – mine gas

**GROUP II** – gas which involves the surface industries, these gases are divided by three groups A, B e C.

The pumps marked to be used with the presence of gas group C can be used also for gas A or B.

The classification of the gases and of the vapours is made according the rule EN50014 which introduces the concept MESG (maximum experimental safe gap) to establish which group it belongs.

**GROUPS CLASSIFICATION, CATEGORIES, GAS-DUST AND AREAS**

**COMMON GASES CLASSIFICATION**

<b>GAS</b>		<b>GROUPS</b>
<b>HYDROCARBONS</b>	ALKANES	II A
	ALKENES	II A
	AROMATICITY HYDROCARBONS	II A
	BENZENOIDS	II A
	MIXED HYDROCARBONS	II A
<b>COMPOUNDS CONTAINING OXYGEN</b>	OXIDES	II A
	ALCOHOLS AND PHENOLS	II A
	ALDEHYDES	II A
	KETONES	II A
	ESTERS	II A
<b>COMPOUNDS CONTAINING HALOGENS</b>	COMPOUNDS WITHOUT OXYGEN	II A
	COMPOUNDS WITH OXYGEN	II A
<b>COMPOUNDS CONTAINING SULFUR</b>	EXAMPLE ETHANETHIOL	II A
<b>COMPOUNDS CONTAINING NITROGEN</b>	EXAMPLE AMMONIA	II A
<b>AMINES</b>	EXAMPLE METHYLAMINE	II A
<b>HYDROCARBONS</b>	PROPINE	II B
	ETHYLENE	II B
	CYCLOPROPANE	II B
	BUTADIENE	II B
<b>COMPOUNDS CONTAINING NITROGEN</b>	ACRYLONITRILE	II B
	ISOPROPYL NITRATE	II B
	HYDROGEN CYANIDE	II B
<b>COMPOUNDS CONTAINING OXYGEN</b>	DIMETHYL ETHER	II B
	ETHIL METHYLETHER	II B
	DIETHYL ETHER	II B
	DIBUTYL ETHER	II B
	ETHYLEN OXIDE	II B
	EPOXYPROPANE	II B
<b>MIXTURES</b>	COKE OVEN GAS	II B
<b>COMPOUNDS CONTAINING HALOGENS</b>	TETRAFLUOROETHYLENE	II B
<b>SUBDIVISION C</b>	HYDROGEN	II C
<b>SUBDIVISION C</b>	ACETYLENE	II C
<b>SUBDIVISION C</b>	CARBON DISULFIDE	II C

**MARKING**

**ADDITIONAL LABEL DATA**

The law 94/9/CE asks an additional marking (or a new one which indicate the old data and the new ones) together with the product serial ones. The products must have also the specific marking against explosion. (which is symbol EX inside an hexagon).

This symbol must be followed by the group symbol and category one, for the products of group II, by the letter G (related to the explosive atmospheres due to the presence of gas, vapour and smoke); by the symbol EEx which confirms that the products is complying with more rules of this standards.

All the products must indicate name and address of the producer, type, serial number and production year.

We must also indicate the symbol for each protection used (fr, d, g, c, b, p, k).

Fr: limited flow covering (prEN 13463-2);

d: not inflammable covering (prEN 13463-3);

g: inherent safety (prEN 13463-4);

c: constructive safety (EN 13463-5);

b: check burnst ignition (prEN 13463-6);

p: pressurized instruments (prEN 13463-7);

k: immersion in liquid (EN 13463-8);

It is necessary then to indicate the gas class (IIA,IIB and IIC), and to indicate the temperature class or the maximum surface temperature.

The label will indicate the directive conformity.

**EXAMPLE LABEL DATA**



**DESCRIPTION ADDITIONAL LABEL**

1. pump type;
2. serial number (this number identify the place production, the production date and progressive number);
3. pump code;
4. additional label

## MARKING

## DESCRIPTION OF THE SUPPLEMENTARY USED



Community marking regarding protection against explosion (in accordance with DIN 40012 Appendix A).

**II 2 G** pump for surface systems (group II) with the presence of gases (G), steam or cloud of category 2, suitable for area 1 and for additional emissions into area 2.

**EEx** symbol which refers to pumps designed and produced in accordance with European standards.

**c k b** these letters specify the type of protection;

In particular

- C** production safety.
- k** protection by immersion into liquid (the ignition sources are emerged into a protective liquid in order to render them inefficient or remove them from the explosive atmosphere).
- b** protection by ignition source control.

**II C** substance group. The pumps marked for use in the presence of group C gases can also be used with group A or B gases. Gas and vapour classification is in accordance with the MESH values (maximum experimental safe gap) in conformity with EN 50014

**T2 to T4 resp.** pumps temperatures classifications (the maximum temperature of internal and external surface of the pump must be lower than the ignition temperature of the atmosphere in which the gases, vapours or clouds are present)

**X....X** registration number of the technical document storage area.

## APPLICATIONS

### EVM PUMPS

#### USER INSTRUCTIONS FOR PRODUCT

These instructions refer to the installation of EVM pumps (supplied without motor).  
 The EVM product is in conformity with the directive 94/9/CE (ATEX).  
 Combined unit (motor+pump) is in according with the ATEX Directive just when the pump and the relative motor are approved ATEX; otherwise the unit can not be used in areas where it is present the danger of explosion.

#### GROUP CLASSIFICATION, CATEGORY AND ZONE

Description of the supplementary label data.



II 2 G EEx c k b IIC T2 to T4 resp.

8000315792

The EVM pumps belongs to **GROUP II, Category 2, Gas** atmosphere, “c” for production protection, “k” for protection by immersion into liquids, “b” for protection by ignition source control.  
 The EVM pumps in category **2G** are suitable for areas 1 and 2.  
 The protection system indicated by the letters c k b is indispensable in all cases where a category 2 product is request.  
**T2 to T4**: pump temperatures classification.  
 When a category 3 pump is sufficient, a device for controlling the fluid level isn't necessary.  
**8000315792** is registration number of the technical document storage area.  
 The technical leaflet is deposited in TÜV Nord CERT Hanover.  
 Explosion-proof pumps should be used in areas where the surrounding temperatures is from **-20 to 40 °C** and the atmospheric pressure is from **0.8 to 1.1 bar**.  
 The maximum viscosity (permitted) of the fluid is **30 mm<sup>2</sup>/s**

#### TEMPERATURE OF THE FLUID

Maximum temperature of the fluid in accordance with the temperature classification.

Maximum temperature of the fluid (°C)	Temperature classification
120	T1
120	T2
120	T3
80	T4

## APPLICATIONS

### 3PF-3LPF-3SF-3LSF PUMPS

#### USER INSTRUCTIONS FOR PRODUCT

These instructions refer to the installation of 3PF-3LPF-3SF-3LSF pumps.  
 The 3PF/3LPF product is in conformity with the directive 94/9/CE (ATEX), while there is 3SF/3LSF ATEX version.  
 Combined unit (motor+pump) is in according with the ATEX Directive just when the pump and the relative motor are approved ATEX; otherwise the unit can not be used in areas where it is present the danger of explosion.

#### GROUP CLASSIFICATION, CATEGORY AND ZONE

Description of the supplementary label data.



II 2 G EEx c k b IIC T2 to T4 resp.

8000319205

The pumps belongs to **GROUP II, Category 2, Gas** atmosphere, “c” for production protection, “k” for protection by immersion into liquids, “b” for protection by ignition source control.

The pumps in category **2G** are suitable for areas 1 and 2.

The protection system indicated by the letters c k b is indispensable in all cases where a category 2 product is request.

**T2 to T4:** pump temperatures classification.

When a category 3 pump is sufficient, a device for controlling the fluid level isn't necessary.

**8000319205** is registration number of the technical document storage area.

The technical leaflet is deposited in TÜV Nord CERT Hanover.

Explosion-proof pumps should be used in areas where the surrounding temperatures is from **-20 to 40 °C** and the atmospheric pressure is from **0.8 to 1.1 bar**.

The maximum viscosity (permitted) of the fluid is **30 mm<sup>2</sup>/s**

#### TEMPERATURE OF THE FLUID

Maximum temperature of the fluid in accordance with the temperature classification.

Maximum temperature of the fluid (°C)	Temperature classification
90 / 110*	T1
90 / 110*	T2
90 / 110*	T3
80	T4

\*Version for high temperatures