

RISK ATEX

W H I T E P A P E R



WHITE PAPER

SUMMARY

- ATEX RISK
- THE EXPLOSION POLYGON
- COMMUNITY DIRECTIVES
(2014/34/EU E-99/92/CE)
- ATEX ZONE CLASSIFICATION
- MARKING FOR ATEX CERTIFIED MACHINES
- DEPURECO ATEX RANGE



**RISK****EXPLOSION**

THE EXPLOSION IS A QUICK AND VIOLENT PHENOMENON THAT FOLLOWS A CHEMICAL REACTION THAT INVOLVES THE DECOMPOSITION OF AN UNSTABLE SUBSTANCE (EXPLDING), TRIGGERED BY MECHANICAL (BUMPS, FRICTIONS) OR THERMAL CAUSES (SPARKS, TEMPERATURE INCREASE), WITH THE PRODUCTION OF A BIG GASEOUS MASS AND HEAT, IN VERY SHORT TIMES.

In order to have an explosion several elements must coexist:

- A COMBUSTIVE AGENT: like the air we breathe, composed of nitrogen and oxygen
- A COMBUSTIBLE: gases, paintings, colorants, resins, sulfur, etc.
- A POINT OF FLAMMABILITY OR A SOURCE OF IGNITION.

If the concentration of dusts and gases is very high, the atmosphere becomes dangerous. For this reason, it is essential to identify the risk of an explosion of a certain environment and apply in advance a security and protection device.

According to the rate, the explosion may be:

- A DETONATION: an explosion that spreads at a supersonic speed (higher than the speed of sound)
- A DEFLAGRATION: an explosion that spreads at a subsonic speed (lower than the speed of sound)

THE FOLLOWING ACTIVITIES ARE POTENTIALLY SUBJECT TO THE RISK OF EXPLOSION:

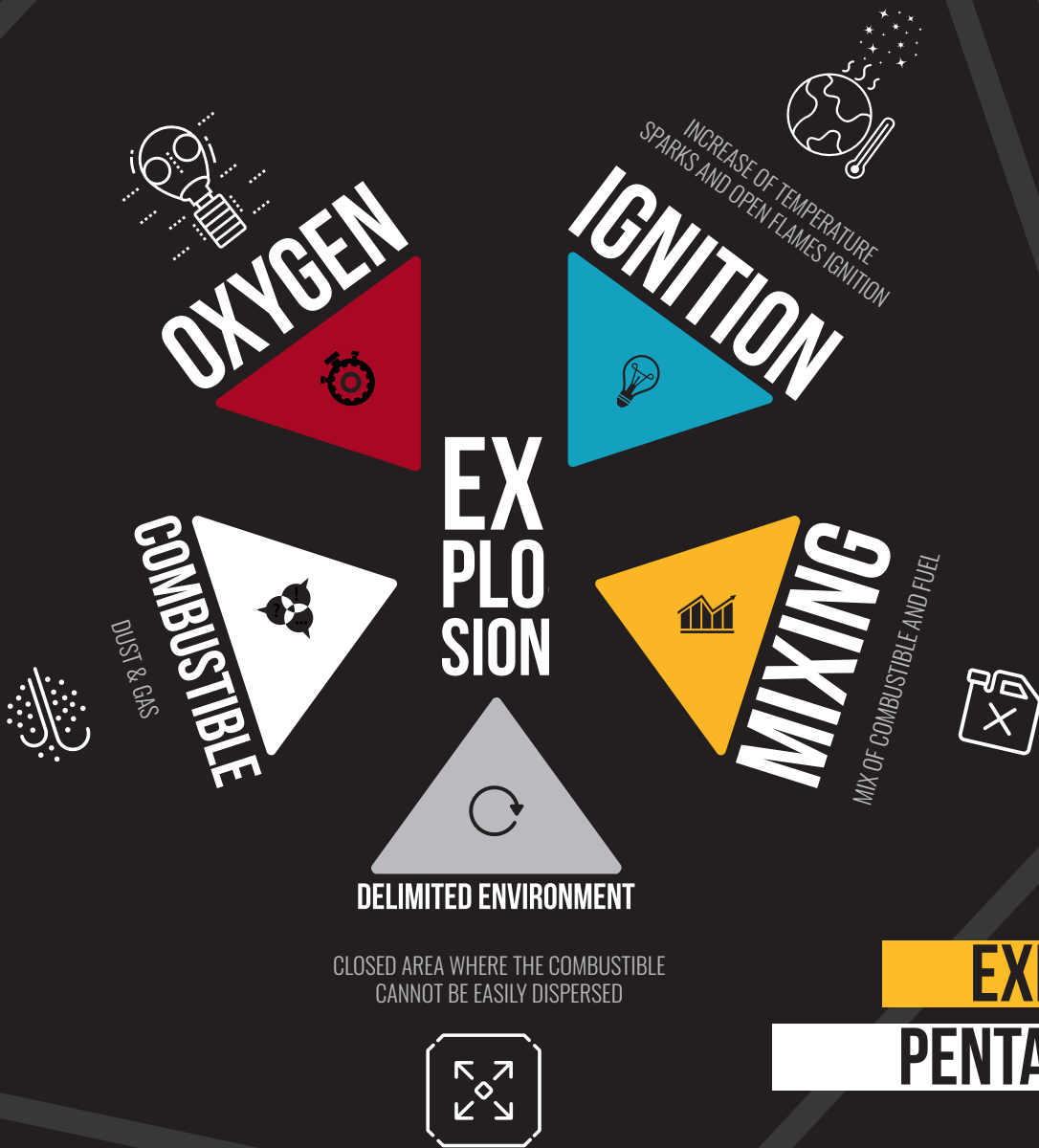
- 0.1** 0.1 FOOD: STORAGE AND PROCESSING OF CEREALS, FLOURS, SUGAR;
- 0.2** TEXTILE INDUSTRY: SPINNING;
- 0.3** JOINERY, WOODWORKING;
- 0.4** CHEMICAL AND OIL & GASES INDUSTRIES;
- 0.5** PHARMACEUTICAL INDUSTRY
- 0.6** METALLURGICAL INDUSTRY;
- 0.7** STORAGES OF GASEOUS, LIQUID, SOLID FUEL. NATURAL GAS AND GPL DEPOTS;
- 0.8** INSTALLATION FOR THE COMPRESSION AND DECOMPRESSION OF COMBUSTIBLE GASES;
- 0.9** PRODUCTION AND STORAGE OF PAINTINGS, GLAZES, COLORANTS;
- 0.10** BODY SHOPS;
- 0.11** DISTILLERY, SPIRITS PRODUCTION;
- 0.12** PERFUMES PRODUCTION

Some examples of potentially explosive dusts are cereals, flour, starch, sugar, food for animals, light metals, coal, plastic and textile

If a sufficient concentration of these substances exists, mixed with air, a source of ignition can cause an explosion



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EXPLOSION

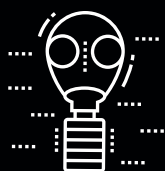
PENTAGON

WHAT IS IT EXACTLY?

Just like the fire triangle, that represents the flammability conditions (and of consequent explosion), for liquid and gaseous combustibles, it is common to refer to "the explosion pentagon" when it comes to dusts as well as gases, vapours and mists.

The five conditions represented in the pentagon of the explosions, and necessary to create the conditions for an explosions are:

- 0.1 **PRESENCE OF COMBUSTIBLE DUST;**
- 0.2 **PRESENCE OF A COMBUSTION AGENT IN THE ENVIRONMENT;**
- 0.3 **PRESENCE OF AN IGNITION SOURCE;**
- 0.4 **DELIMITED ENVIRONMENT**
- 0.5 **MIXING OF REAGENTS**



GOING INTO MORE DETAIL

THE EXPLOSIVITY OF A DUST

DEPENDS ON MANY FACTORS

CONCENTRATION OF THE COMBUSTION AGENT:

A concentration of oxygen above 21% increases the probability of explosion: staying under 10% is recommendable

NATURE OF THE COMBUSTIBLE:

Metallic dusts produce the most violent explosions

TURBOLENCE:

It develops a quicker combustion enabled by the mixing of the reagents

GRANULOMETRY:

The reduction of the particles dimensions increases the contact surface between combustible / combusive agent, requiring lower energies of ignition:

TEMPERATURE:

A reduction in humidity increases the speed of reaction:

HUMIDITY:

It decreases the explosive tendency

INERTS:

Non-reagent suspension gases or solids subtract heat to the reaction, to an equal extent of their specific heat; the inert effect is as bigger as higher the specific heat of the inert gas is; for metallic dusts, the most efficient inert gases are argon and helium;

PRESSION:

A prestressed environment causes a more violent explosion;

PRESENCE OF FLAMMABLE GASES

When some flammable gases or vapors are added to the combusive agent-combustible system, "hybrid mixes" are generated; dust and gas together increases the violence of the explosion;

COMBUSTIBLE DUSTS

EXPLOSIVE DUSTS MAY COME FROM THE FOLLOWING COMBUSTIBLE MATERIALS:

ORGANIC NATURAL SUBSTANCES

(like cereals, sugar, coal);

ORGANIC SYNTHETIC SUBSTANCES

(like pesticides, plastic materials);

OXIDIZABLE METALLIC MATERIALS

(like aluminum, zinc, iron)

INFLUENCE OF THE DUST DISPERSION

The explosion of a dust deeply mixed up with a combusive agent, as it is in a suspension cloud, may exist if the concentration of the suspension is kept within certain limits.

- Too high density: heat is completely absorbed by the particles without the environment being influenced.
- Too low density: particles are too far; the local ignition does not develop a sufficient heat to cover this distance.

Determining the limits of inflammability (or explosivity) of the dusts may cause some problems because, whereas the gas is composed of molecular particles, in a sample of dust, there may be portions with a different granulometry that, because of the action of the gravity, may create Zones with different concentrations within the same cloud. This makes the determination of the limits of inflammability difficult to be established, above all in the maximum explosible concentration.

THE INTERVAL OF INFLAMMABILITY OF A DUST (CONCENTRATIONS ARE INDICATED WITH G/L OR MG/CM³) IS FAR MORE EXTENDED THAN A GAS AND IT IS APPROXIMATELY INCLUDED BETWEEN 10 MG/L AND 6 G/L.



ATEX ZONES

CLASSIFICATION

The classification of the dangerous Zones is established according to the norms:

EN 1127-1, EN 60079-10-1 (gas-Ex)

EN 60079-10-2 (Dusts-Ex),

With a division of the dangerous areas in three Zones, according to the frequency and the period of presence of the explosive substance.

WHAT IS ATEX?

“ATEX” IS THE ACRONYM

FOR “ATMOSPHERE EXPLOSIVE”

The European Union adopted two European directives in regard to health and safety, known as ATEX 2014/34/UE (also ATEX 114) and ATEX 99/92/CE (also ATEX 137 or ATEX153), concerning the risk of the existence of potentially explosive atmospheres.

2014/34/UE for the regulation of those devices to be used in Zones where a risk of explosion exists; the directive points at those manufacturers of tooling to be used in areas with a potentially explosive atmosphere and at an obligation to certify these products; directive 94/9/CE was cancelled and replaced effective from April 16th 2016.

99/92/CE for the workers' safety and health in explosive atmospheres; it is applied to those environments where a risk of explosion exists, where installations and certified tooling are used and it is consequently addressed to the users..

Directive ATEX 99/92/CE indicates the minimum demands in terms of health and safety of workplaces with potentially explosive atmospheres; in particular, these are divided into different Zones, according to the probability of presence of an explosive atmosphere and specifies criteria according to which products are chosen within those Zones.

ATEX ZONES CLASSIFICATION



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 <p>DUST</p>	<p>ZONE 20</p> <p>MARKING 1D</p>	<p>ZONE 21</p> <p>MARKING 2D</p>	<p>ZONE 22</p> <p>MARKING 3D</p>
	<p>ZONE 0</p> <p>MARKING 1G</p> <p>HIGH PROBABILITY</p>	<p>ZONE 1</p> <p>MARKING 2G</p> <p>MEDIUM PROBABILITY</p>	<p>ZONE 2</p> <p>MARKING 3G</p> <p>LOW PROBABILITY</p>

EXPLOSIVE ATMOSPHERE CAUSED BY COMBUSTIBLE DUSTS

ZONE 0: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is present continuously or for long periods or frequently

ZONE 20: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.

ZONE 1: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.

ZONE 21: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally.

ZONE 2: A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only

ZONE 22: A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.

MARKING



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DEPURECO INDUSTRIAL VACUUMS
 Corso Europa 609 10088 VOLPIANO
 Tel. 011/98.59.117 Fax 011/98.59.326
 MADE IN ITALY

CE marking for compliance with directives: 94/9/CE (ATEX) 98/37/CE (machines)

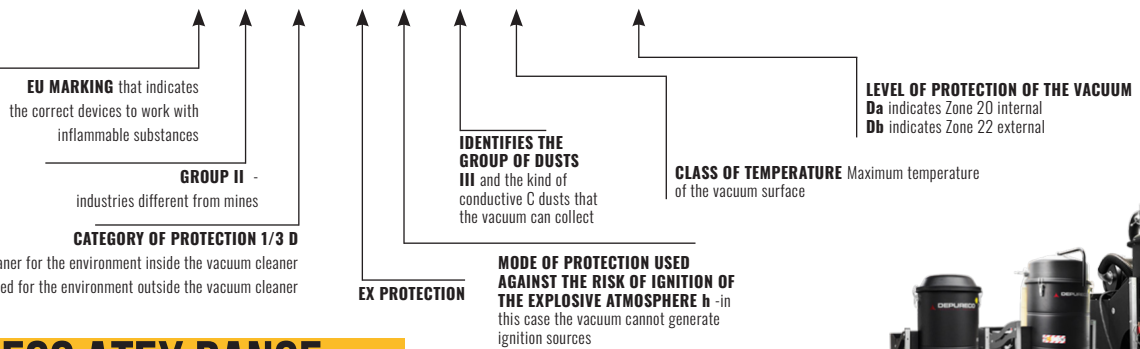
Identification of the institution that controlled the production

Model		Serial No.		
Max Voltage	50/60 Hz 400 V 3~ac	Max Power	--,-- kW	
II 1/3D Ex h IIIC T140°C Da/Dc	Kg		--	
	Year		--	
T. amb: -20°C +40°C	Tech file: FP20EX	TÜV CY 21 ATEX 0206460 X		
ATTENZIONE: NON APRIRE IN PRESENZA DI TENSIONE WARNING : DO NOT OPEN WHEN ENERGIZED			Dust Class	-

ATEX MARKING

Number of the certification issued by the Notified Organisation

II 1/3D Ex h IIIC T140°C Da/Dc



DEPURECO ATEX RANGE CERTIFICATIONS



3D ZONE 22

LOW RISK DUSTS

Certified Zone 22 – ATEX marking **II 3D Ex htc IIIB T140°C Dc**

Industrial vacuums to be used in places with a low risk of explosions due to the presence of potentially explosive dust. 3D side channel blower certified by the manufacturer. Antistatic M class filters, grounding and collection bin in AISI 304 steel as a standard.

3GD ZONE 2 - ZONE 22

LOW RISK DUSTS - GAS

Certified Zone 2 and 22 – ATEX marking **II 3G/D Ex htc IIIB T140°C Gc/Dc**

Industrial vacuums to be used in places with a low risk of explosions due to the presence of potentially explosive dust and/or gas. 3GD side channel blower certified by the manufacturer. Antistatic M class filters, grounding and collection bin in AISI 304 steel as a standard.

1 / 3D ZONE 20 INTERNAL ET ZONE 22 EXTERNAL

LOW RISK DUSTS

Certified Zone 22 – ATEX marking **II 1/3 D Ex htc IIIC T140°C Da/Dc**

Industrial vacuums to be used in places with a high risk of explosions due to the presence of potentially inflammable dusts. Antistatic M class filters, HEPA H14 filter, grounding and collection bin in AISI 304 steel as a standard. Components and motors certified by the manufacturer. Internal chamber of the vacuums certified for Zone 20.

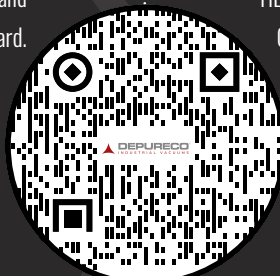
1 / 2D ZONE 20 INTERNA E ZONE 21 ESTERNA

HIGH RISK DUSTS

Certified Zone 20 internal and Zone 21 external – ATEX marking **II 1/2 D Ex htb IIIC T140°C Da/Db**

Industrial vacuums to be used in places with a high risk of explosions due to the presence of potentially inflammable dusts. Antistatic M class filters, HEPA H14 filter, grounding and collection bin in AISI 304 steel as a standard. Components and motors certified by the manufacturer. Internal chamber of the vacuums certified for Zone 20.

All units are composed of an ATEX certified side channel blower, pressure relief valve, big antistatic M class filter and a stainless steel AISI304 collection bin.



EACH MODEL WAS TESTED WITH THE EXTERNAL ORGANISATION TUV NORD