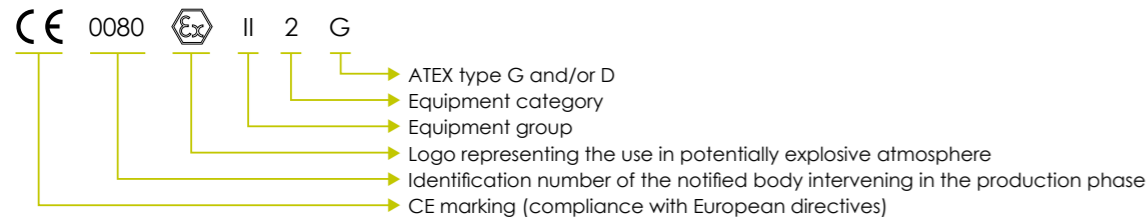


Electrical or non-electrical equipment marking
(requirement of directive 2014/34/EU)

Identification of the regulatory marking



Identification of the complementary normative marking



Example: Manual electrostatic spraying equipment

NANOGUN MV gun:
CE 0080 Ex II 2 G
0.24 mJ
INERIS14ATEX0014

GNM6080* module:
CE 0080 Ex II (2) G
[0.24 mJ]
INERIS14ATEX0014



Example: AIRMIX® piston paint pump

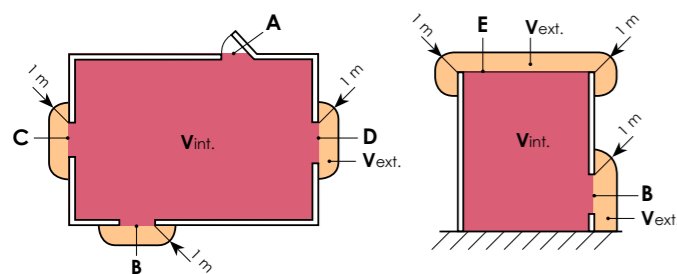
EOS 15-C25 pump:
CE Ex II 2 G IIA T3



*: ATEX marking showing the category between parentheses "(2)" and the specific marking between brackets "[0.24mJ]" indicate that this equipment is associated equipment. It must be located outside the explosive zone and is required for correct and safe operation of the equipment located in ATEX area (NANOGUN-MV).

Figures concerning the danger zones

Example of zones in an open top **liquid spraying** booth (EN 12215):

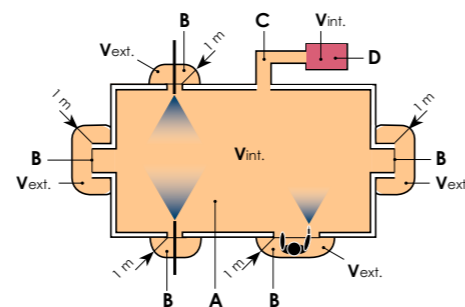


V_{int} interior volume of a spray booth which must include the recycling and extraction air pipes, classified as follows:
 ► **zone 1**, if the concentration of flammable substances is strictly between 25 % and 50 % of the LEL*
 ► **zone 2**, if the concentration of flammable substances is strictly less than 25 % of the LEL*

V_{ext} exterior volume formed by the space around the permanent openings, classified as follows:
 ► **zone 2**, in all cases

A: non permanent opening, no zone (e.g. doors)
B: permanent opening (e.g. opening for exit of painted parts)
C: permanent opening (e.g. opening for an operator)
D: permanent opening (e.g. opening for entrance of part to be painted)
E: permanent opening (e.g. filter)

Example of zones in a closed top **powder** booth with recycling system (EN 12981):



V_{int} interior volume:
 ► **zone 20**, potentially explosive space due to the mixture of flammable dusts/air.

V_{int} interior volume:
 ► **zone 22**, potentially explosive space due to the mixture of flammable dusts/air. Note that the regulation nevertheless considers that the applicators must belong to group II, category 2 (NF EN 50050).

V_{ext} exterior volume formed by the space around the permanent openings, classified as follows:
 ► **zone 22**

A: interior volume of a powder booth
B: permanent opening (e.g. opening for an operator, a reciprocator, entrance of part to be painted, etc.)
C: pipe: zone 22
D: closed recycling system: zone 20



**POTENTIALLY EXPLOSIVE ATMOSPHERES
EUROPEAN REGULATION**



The ATEX regulation aims at improving the health and safety of workers potentially at risk from explosive atmospheres.

2 DIRECTIVES GOVERN THE "POTENTIALLY EXPLOSIVE ATMOSPHERES":

MANUFACTURERS of equipment or assemblies designed to operate in ATEX areas.

Directive 2014/34/EU

Relating to equipment and protective systems intended for use in potentially explosive atmospheres.

WORKERS potentially at risk from explosive atmospheres.

Directive 1999/92/EC

Relating to the safety and health protection of workers potentially at risk from explosive atmospheres.

Classification of the hazardous areas

Directive 1999/92/EC

Zones are three-dimensional spaces defined and classified according to the frequency and duration of an ATEX occurrence. Classification by zone is carried out under the responsibility of the site manager.

ATEX presence duration	> 1000 h/year	10 < h/year <1000	1 < h/year <10	< 1 h/year
Explosive atmosphere	Present continuously or for long period	Likely to occur in normal operation	not likely to occur in normal operation	Unlikely
Gases and vapours (liquid paint)	ZONE 0	ZONE 1	ZONE 2	Safe area
Dusts (powder paint)	ZONE 20	ZONE 21	ZONE 22	Safe area

Which standard should be used to classify zones?

- ▶ **EN 60079-10-1** Explosive atmospheres, Part 10-1: classification of areas - Explosive gas atmospheres
- ▶ **EN 60079-10-2** Explosive atmospheres, Part 10-2: classification of areas - Explosive dust atmospheres
- NOTE:** Documents and guides have also been published by corporations, organisations, etc. (UIC, e.g.: INRS ED945, ED839, ED928, etc.)
- ▶ **EN 12215:** Spray booths for application of organic liquid coating materials.
- ▶ **EN 12981:** Spray booths for application of organic powder coating material.
- NOTE:** Refer to standard EN 60079-14 for the design, selection and construction of electrical installations

Equipment classification
(requirement of directive 2014/34/EU)

Equipment groups

GROUP I applies to equipment used in underground mines subject to firedamp.

GROUP II applies to equipment used in areas with an explosive gas atmosphere, other than mines subject to firedamp.

GROUP III applies to equipment used in areas with an explosive dust atmosphere, other than mines subject to firedamp.

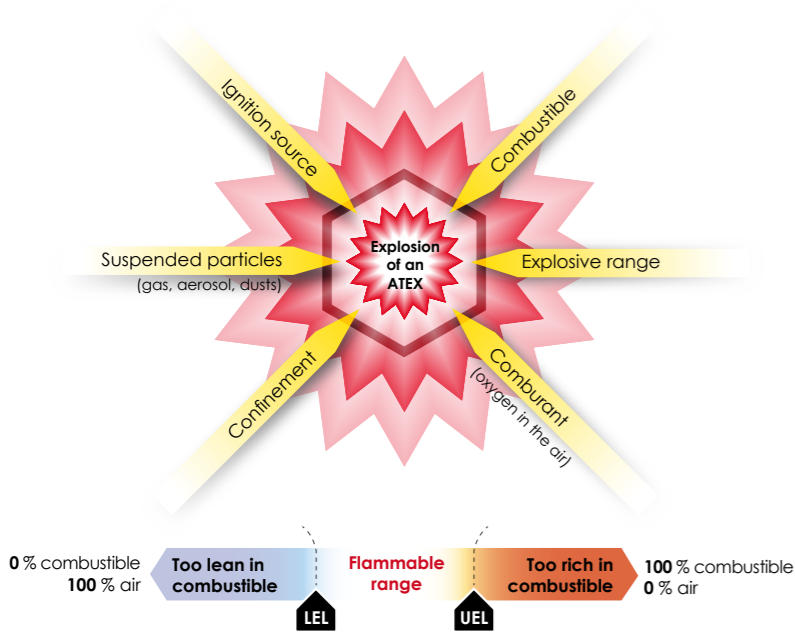
Subdivisions of GROUP II (from the lowest risk to the highest risk):
IIA: propane characteristic gas
IIB: ethylene characteristic gas
IIC: hydrogen characteristic gas

Subdivisions of GROUP III:
IIIA: combustible particles in suspension in air
IIIB: non-conducting dusts
IIIC: conducting dusts
 Refer to standard EN 60079-0.

Some definitions

Explosion hexagon

The following 6 conditions must be met simultaneously to create an explosion:



Examples of ignition sources

Arcs or sparks of sufficient energy	<ul style="list-style-type: none"> ▶ Sparks of electrical origin ▶ Sparks of mechanical origin
Excessive temperature	<ul style="list-style-type: none"> ▶ Hot surfaces
Other ignition sources	<ul style="list-style-type: none"> ▶ Electrostatic discharges ▶ Flames ▶ Lightning ▶ etc.

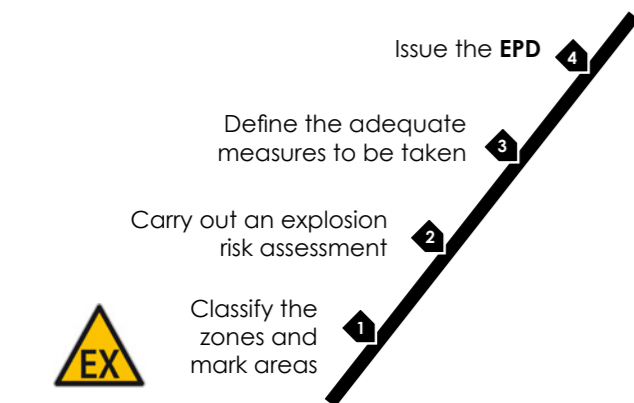
Refer to standard EN 1127-1 for identification of potential ignition sources.

Explosive range

Range of concentrations of the flammable substances in air within which the mixture is likely to explode in the presence of an ignition source. The flammable range extends from the **LEL** (lower explosive limit) to the **UEL** (upper explosive limit).

Directive 1999/92/EC

Obligations of the employers



EPD: Explosion Protection document

What actions must be taken?

- ▶ Write instructions describing the explosion risks and the protection measures
- ▶ Provide training for the workers
- ▶ Supervise the workers during their work in hazardous areas
- ▶ Guarantee safe maintenance operations
- ▶ Organize appropriate inspections
- ▶ Report any areas presenting a risk of explosion

What must the "EPD" include?

- ▶ Description of the work places
- ▶ Description of the substances used
- ▶ Description of the work process
- ▶ Presentation of the risk assessment
- ▶ Safe use measures taken

Equipment categories for GROUP II

The table can be used to determine the **equipment** category depending on the atmosphere in which the equipment may be **used**. Depending on the level of protection against explosions, the equipment is classified in **3 categories**.

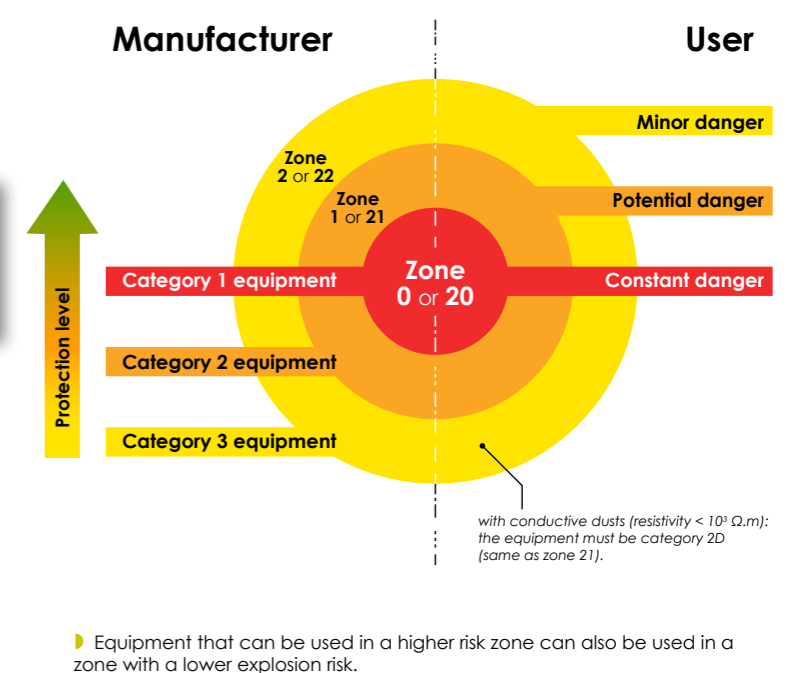
Category 1	Category 2	Category 3
▶ EQUIPMENT ensuring a VERY HIGH LEVEL of protection	▶ EQUIPMENT ensuring a HIGH LEVEL of protection	▶ EQUIPMENT ensuring a NORMAL LEVEL of protection

Equipment protection level (EPL)

Category	EPL
1G	Ga
2G	Gb
3G	Gc
1D	Da
2D	Db
3D	Dc

A protection level (EPL) is assigned to the equipment. Unless otherwise specified, the following table shows the traditional relation between the category and the protection level. Refer to standards EN 60079-0 and EN 60079-14

Correspondence with the types of ATEX zone



▶ Equipment that can be used in a higher risk zone can also be used in a zone with a lower explosion risk.