ATEX E IECEx

HAZARDOUS AREA COMPONENTS AND EQUIPMENT

GIOVENZANA
INTERNATIONAL B.V.

ATEX and IECEx

ATEX and IECEx CATALOG
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GIOVENZANA INTERNATIONAL B.V.

GENERAL INDEX

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- **the "Quality Assurance Notification" (QAN) is required for ATEX**
- **the "Quality Assessment Report" (QAR) is required for IECEx.**

All our products are designed to be compliant with **ATEX 2014/34/EU**, the mandatory European directive according to the international standard **EN 60079 - IEC 60079**.

The **ATEX and IECEx product range** is constantly being expanded and evolved thanks to daily Research & Development and fed by customer requests to the Global Sales Network.

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1 - EQUIPMENT FOR HAZARDOUS LOCATIONS

1.1 - WHAT DO WE KNOW TODAY ABOUT EXPLOSION HAZARDS IN THE WORKPLACE?

In the workplace, **worker safety** is a right that drives us to use all state-of-the-art means, with the aim of exposing the worker to the minimum acceptable risk to his safety and health. The **risk assessment** of each task involves many different aspects, and the risk of exposure to potentially explosive atmospheres must be analysed.
What we know today about explosion hazards is supported by the application of the prevention and protection schemes that international technical standards have developed.

The potentially explosive atmosphere

Until about a decade ago, explosive atmospheres were more associated with the specific workplaces of the petrochemical industry. Awareness of workplaces whose processes require the use of flammable substances has increased over time, and the risk of explosion has become a factor to be assessed even in those places previously considered free of danger. This process has undoubtedly been aided both by the media coverage of explosion incidents and by the growing culture and technological evolution.

At present we can say that it has become natural to ask the question of whether or not it is necessary to consider the explosion hazard in industrial activities such as, for example, the timber industry, the agricultural industry, the food industry, in industries using heat treatment, in process activities using paints, solvents, in the printed paper industry, etc.

The future of energy will probably see a reduction in the use of oil derivatives in favour of more environmentally sustainable raw materials. This is the case, for example, with the widespread application of hydrogen gas as an alternative fuel, whose supply chain, from production to storage and distribution to the user device, requires consideration of the presence of a potentially explosive atmosphere.
What characterises all flammable and/or combustible substances used in work processes is that they are within containment systems.

Flammable process substance

Vapour

Gas

Combustible dust

VAPOURS
Originated mainly from fluids within containment systems, where they can be found at ambient pressure or under pressure. They can be emitted into the ambient atmosphere by evaporation from the free surface of the fluid or forced through orifices (e.g. nozzles).

GASES
Contained and transported under pressure. Depending on the type of production process, the gas may be released into the environment under normal atmospheric conditions and form an explosive atmosphere. The gas may also be released into the environment as a result of a failure of the containment system (e.g. failure of a seal, valve, etc.).

DUSTS
They can be formed by processing combustible solids (e.g. wood, vegetables, etc.) or materials that are not combustible in the solid state, such as metals, but which in dust form, in the presence of oxygen, become combustible. The characteristic of dust is that when it is dispersed in the air it forms clouds which are then deposited on the ground by gravity. There are therefore two practical situations:
- cloud formation > they form an explosive atmosphere;
- Formation of layers on surfaces > when lifted by the action of wind or air displacement, they form an explosive atmosphere in clouds.

Dust may be released from the containment system by process (e.g. pouring, transport, opening, etc.) or by failure.

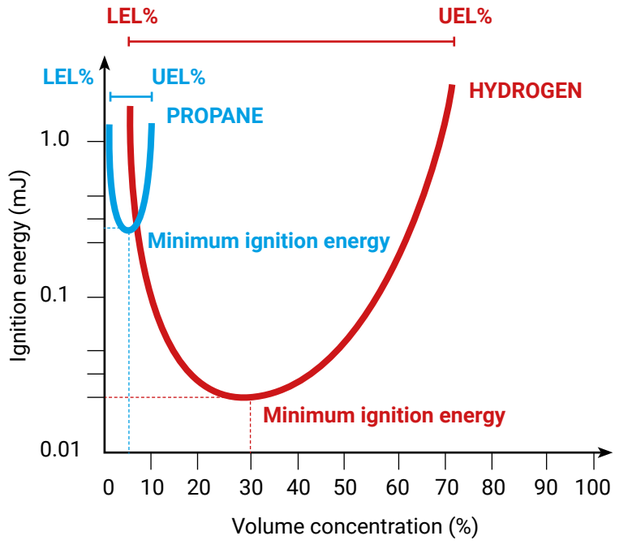
Release to atmosphere from containment system (emission)

Do flammable substances always create an explosive atmosphere?

The right recipe for creating an explosive atmosphere depends on two main ingredients:
- the percentage of flammable substance;
- the percentage of oxygen.

Explosive atmospheres in the workplace are said to exist when the substance is released into the environment under "normal" conditions of pressure and atmosphere, i.e. at atmospheric pressure and in the presence of a percentage of oxygen close to 20-21%.
The ingredient **"flammable substance"** will therefore be the variable that will give us the explosive atmosphere, in relation to the percentage that mixes with oxygen in air. This percentage varies from substance to substance and is a physical property of the substance itself.
For gases and vapours, for example, the release from the containment system must be such that the percentage of the substance in air is between two limits: the Lower Explosion Level (LEL) and the Upper Explosion Level (UEL).
If a sufficient amount of energy is supplied to the gas, mixed in percentages within these two limits, the resulting reaction is an explosion.

An explosive atmosphere can therefore be triggered when some physical event contributes an amount of energy greater than the "minimum ignition energy" required to initiate the explosion (typically a low value, in the order of mJ). The explosive limits and the minimum ignition energy are typical of any substance that can form an explosive atmosphere. For example, in the figure below it can be seen that two gases such as propane and hydrogen are different both in terms of their explosive range and the energy required to ignite them. Propane becomes explosive at lower percentages than hydrogen, but after 10.9% in air (UEL) it is no longer explosive; hydrogen has a much wider explosive range and explodes even at high mixing percentages (up to 77%). The limits of the LEL-UEL explosive concentration range can be represented by a curve which has a vertex at about the middle of the range. The energy required to ignite the gas at the concentration corresponding to the apex of the explosibility curve is the lowest ignition energy of that specific gas. The graph shows that propane requires more energy to ignite than hydrogen.



Dust also has a range of concentrations in a mixture with air, within which an explosive reaction occurs if triggered with sufficient energy. The limiting concentrations are defined, as for gases, as the **Lower Explosion Limit (LEL)** and the **Upper Explosion Limit (UEL)**.
Explosion limits for dust are expressed in terms of mass of dust per unit volume of air, usually in g/m^3.

Heat as a source of ignition

A further characteristic of explosive atmospheres, which derives from the substance generating it, is the ability to ignite when it reaches a certain temperature. The different properties of the substance generating the explosive atmosphere are reflected in its ignition behaviour due to temperature.

Gases and vapours are characterised by an ignition temperature value which is called the "auto-ignition temperature (AIT)" and which represents the lowest temperature, on a hot surface, at which a mixture of gas or vapour with air ignites. Each substance has its own self-ignition temperature, e.g. 560 °C for hydrogen and 450 °C for propane.
For dust, on the other hand, there is no unambiguous value for the ignition temperature because of the possibility of it being in a cloud mixed with air or deposited in a layer.

There are therefore two values, for each type of dust, of ignition temperature expressed in °C:

- **Minimum cloud ignition temperature T_{cl}**

This is the minimum temperature of a hot surface (spontaneous ignition) that ignites the dust cloud in the air.

- **Minimum dust layer ignition (or slow combustion) temperature T_l**

This is the minimum temperature of a hot surface at which ignition of a dust layer of specified thickness "l" deposited on it occurs. In the technical literature, layers with a thickness of 5 mm are generally used as a reference, so in the tables showing the properties of the powders most commonly found in industrial settings, the minimum ignition temperature of the layer is often indicated as T_{5mm}.

Here are some examples.

DUST	T_{cl} (°C)	T_l (°C)
Iron	580	450
Wood	500	310
Soy flour	430	420

In conclusion, it is clear that flammable substances, depending on the conditions under which they are released in the workplace, can generate an explosive atmosphere and that this will behave, in terms of ignition and explosiveness, in relation to the properties of the substance generating it. From these initial physical concepts, we can deduce that, for the purposes of prevention against the ignition of an explosion, a product will have different characteristics depending on the hazardous atmosphere in which it will operate.

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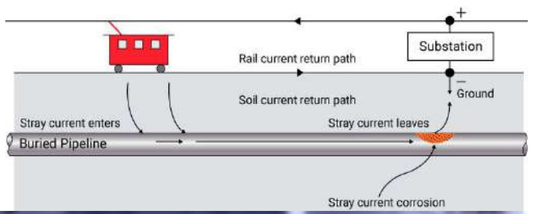
Ignition sources

In an electrical or non-electrical product, the events which may provide the initiating energy are referred to as "**potential ignition sources**" and are listed below, as given in ISO IEC 80079-36 and EN 1127-1.

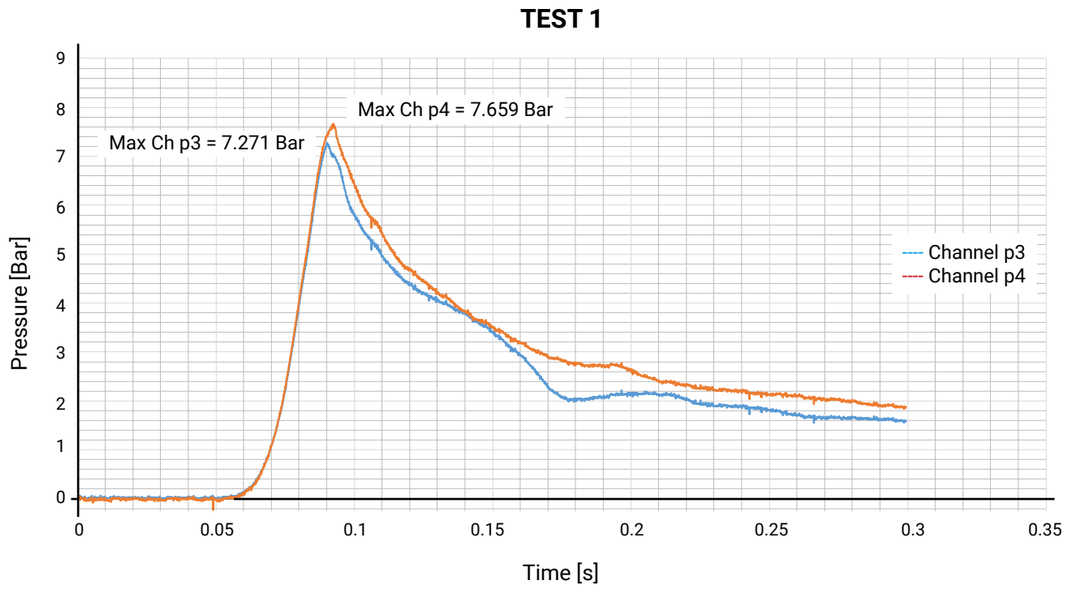
Potential ignition sources	
Hot surfaces	
Flames and hot gases	
Sparks of mechanical origin	
Electric sparks / electric arc	
Stray currents and protection against cathodic corrosion	
Static electricity	

Potential ignition sources	
Lightning	
Electromagnetic waves (radio frequency) from 10^4 Hz to 3×10^{12} Hz	
Electromagnetic waves from 3×10^{11} Hz to 3×10^{15} Hz	
Ionising radiation	
Ultrasonics	
Adiabatic compressions and shock waves	
Chemical reactions (exothermic)	

The effects of the explosion

When one thinks of the effects of an explosion, one thinks of a violent development with high levels of damage to property and people. The effects of an explosion can be measured in terms of the increase in pressure and the speed at which the pressure increases.
The phenomenon leads to high pressure increases in a very short time, typically in the order of a few milliseconds. This has fatal effects on humans, for whom the increase in pressure causes irreversible damage to internal organs, and effects on property are all the more severe the more they try to contain the explosion pressure.

The value of the explosion pressure and the rate of pressure increase are related to the ambient temperature, the type of gas/dust and the concentration of the substance. Below is an example of an explosion pressure measurement in a cylindrical container, at ambient temperature, with an 8% ethylene mixture in air.



Graph of explosion pressure measurement by kind permission of Intek Spa Laboratory.

In order to pursue the safety of operators, the technical standard and the rule of art require a prevention approach against the triggering event.
In this sense, the explosion pressure becomes a parameter for the construction of electrical equipment which must not propagate an internal explosion (e.g. definition of the thickness of the enclosure).

1.2 - THE TECHNICAL RESPONSE TO IGNITION PREVENTION

As a result of the first explosion accidents, initially recorded in coal mines where the explosive atmosphere occurs both in gas (methane) and dust (coal) form, at the beginning of the 20th century the international community developed the idea of standardising the technology of electrical equipment used in hazardous workplaces.
From the 1930s onwards, two approaches were developed, which were similar in substance, but differed in geography and method.

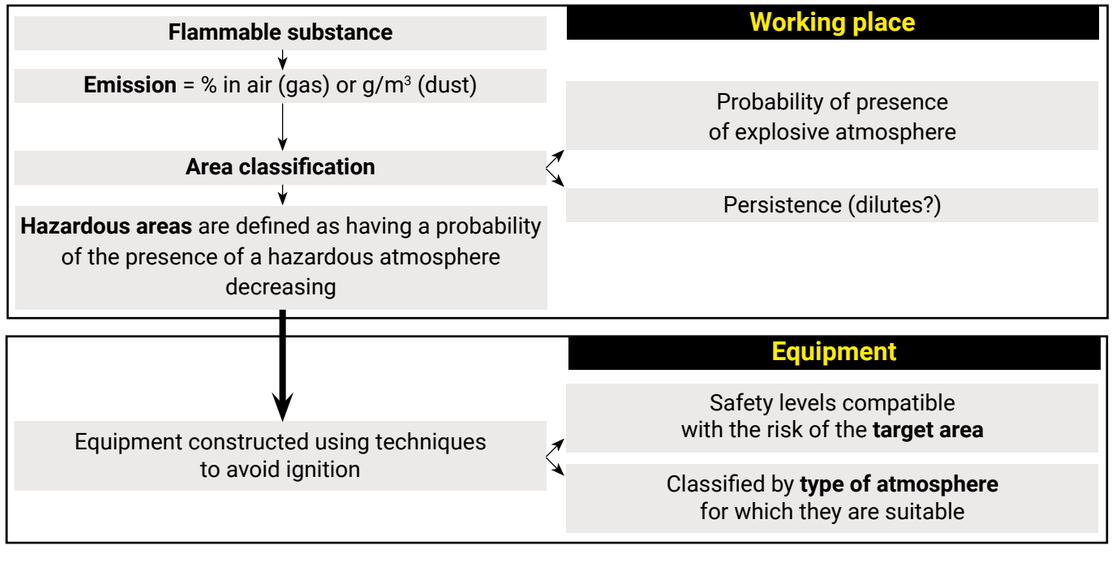
The first, linked to the experience and technology developed mainly in European and Anglo-Saxon countries, is that of the **international IEC** (International Electrotechnical Commission) and **European CENELEC** (European Committee for Electrotechnical Standardisation) standards.

The second originated in North America, especially in the United States, where insurance companies had to deal with risks (fire and explosion) in farms, food and the nascent oil industry (the first US oil company was founded in 1870). The common rules for electrical installations are written into the **NEC** (National Electric Code), within which there is a specific section for Hazardous Locations.

Both approaches are based on prevention of ignition, i.e. on the concepts that an electrical apparatus intended to be installed in a hazardous area must:
- be designed not to ignite the explosive atmosphere;
- be designed with a level of safety commensurate with the degree of hazardousness of the area in which it operates.

In order to achieve this, both methods start from the need to **divide places where flammable substances are present into areas with different levels of risk**. It is necessary to classify hazardous places into areas with a different probability of there being a hazardous atmosphere.

Starting from the method in which the areas are classified, the two methods take different paths according to their own background, they develop in this way:
- **IEC Zone System** (IEC Standards);
- **Hazardous Location Division System** (NEC).

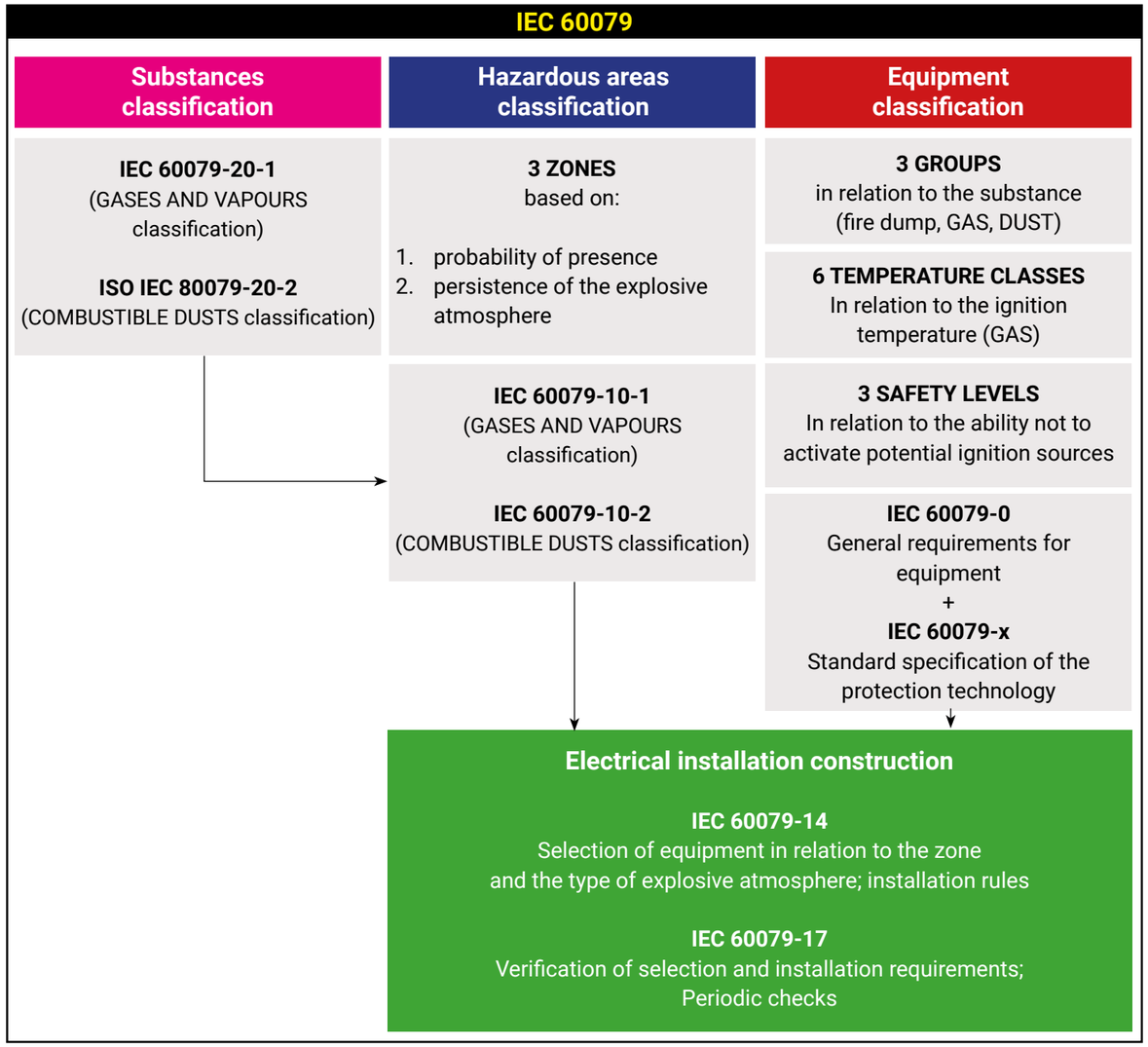


Schematic approach of IEC and HazLoc systems.

1.3 - IEC ZONE SYSTEM (EX CONSTRUCTION)

The IEC system requires the **subdivision of areas into hazardous ZONES** with different probability that explosive atmosphere is present and requires to determine their extent (volume of the zone).
The equipment permitted will be that compatible with the type of zone, which must be installed in such a way as not to impair the technique on which protection against ignition depends.
The manufacturer of equipment shall ensure that it is designed and constructed to prevent ignition in the zone for which he declares that the product is intended.

There are therefore three figures involved: the person in charge of the hazardous area, who classifies the area; the person in charge of the installations, who selects suitable equipment and installs it in the correct way; and the manufacturer of the equipment. For each of these responsibilities, the IEC system provides a technical standard that belongs, for electrical equipment, to a single set of standards: the **IEC 60079 series of standards**.



Scheme IEC Zone System - Standards IEC 60079.

SUBSTANCES CLASSIFICATION

It has been seen that the properties of substances affect the physics of the explosion and that each substance has its own characteristics, from explosion limits (LEL-UEL) to self-ignition temperature.

The IEC scheme classifies substances into:
- **Groups**;
- **Temperature classes** (only for gases).

Grouping of substances

Gases are grouped according to their ignition properties, namely:
- If they are mining gases, they are subdivided according to: **Grisou (Firedamp) gas**; or
- If they are **surface gases**, they are grouped in relation to:

- the maximum experimental safe gaps (MESG), in mm, which a joint of a defined length of an experimental vessel must have in order that the ignition of the atmosphere containing the gas under test produces an explosion contained in the vessel and does not spread to the surrounding atmosphere; and the surrounding atmosphere;
- in relation to the minimum ignition energy, by means of a parameter comparing it with the ignition energy of methane (minimum igniting current - MIC).

Dust, on the other hand, is grouped according to its **electrical conductivity**.

	GROUP	REPRESENTATIVE SUBSTANCE
Mines	**I**	GRISOU GAS
Surface	**IIA**	PROPANE
	IIB	ETHYLENE
	IIC	ACETYLENE AND HYDROGEN
	IIIA	COMBUSTIBLE FIBRES
	IIIB	NON-CONDUCTIVE DUST
	IIIC	CONDUCTIVE DUST

GROUP II	MIC	MESG (mm)
IIA	> 0.8	> 0.9
IIB	≤ 0.8 and ≥ 0.45	≤ 0.9 and > 0.5
IIC	≤ 0.45	≤ 0.5

Grouping of gases into temperature classes

Only gases are grouped into Temperature Classes, with reference to the **Auto-ignition Temperature**. In the classification of substances, the **"T-Class"** indicates the temperature at which an atmosphere, originating from the specific gas, explodes.

TEMPERATURE CLASS	SELF-IGNITION TEMPERATURE RANGE (AIT)
T1	AIT ≥ 450 °C
T2	300 °C < AIT ≤ 450 °C
T3	200 °C < AIT ≤ 300 °C
T4	135 °C < AIT ≤ 200 °C
T5	100 °C < AIT ≤ 135 °C
T6	85 °C < AIT ≤ 100 °C

For dusts, such a grouping is not practical, as they have been shown to have an ignition temperature that depends on whether they are dispersed in a cloud or deposited in a layer.

Examples of Substances according to IEC 60079 classification

SUBSTANCE	CLASSIFICATION
HYDROGEN	**IICT1**
ETHYLBENZENE	**IIAT2**
ETHYLENE	**IIBT2**
ISOBUTANE	**IIAT1**
METHANE	**IIAT1**
SUGAR	**IIIB Tcl 350 °C / T5mm 490 °C**
ALUMINIUM	**IIIC Tcl 700 °C / T5mm 320 °C**
WHEAT FLOUR	**IIIB Tcl 430 °C / T5mm 450 °C**

HAZARDOUS AREAS CLASSIFICATION

Areas other than mines are classified as follows.

GASES AND VAPOURS CLASSIFICATION (IEC 60079-10-1)	
ZONE 0	A place in which an explosive atmosphere consisting of a mixture of air and flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently (> 1000 hours/year).
ZONE 1	A place in which an explosive atmosphere consisting of a mixture of air and flammable substances in the form of gas, vapour or mist is likely to occur in normal operation (10 - 1000 hours/year).
ZONE 2	A place in which an explosive atmosphere consisting of a mixture of air and flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation and, if it does occur, will persist for a short period only (< 10 hours/year).

DUSTS CLASSIFICATION (IEC 60079-10-2)	
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 (> 1000 hours/year).
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 (10 - 1000 hours/year).
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 and, if it does occur, will persist for a short period only (< 10 hours/year).

A classified zone must always be indicated with at least the following parameters:

- **ZONE Type**;
- **Extent in metres**, in all directions (volume and shape);
- **Group of the substance**;
- **Class of T** (Gases);
- **Ignition temperatures** (Dusts).

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EQUIPMENT CLASSIFICATION

Equipment is classified according to:
- **Group of substances** for which it is designed;
- **Temperature class** (only for Gases);
- **Equipment protection level** (EPL).

Equipment groups

Equipment is classified into groups in the same way as substances.

GROUP	REPRESENTATIVE SUBSTANCE
I	GRISOU GAS
IIA	PROPANE
IIB	ETHYLENE
IIC	ACETYLENE AND HYDROGEN
IIIA	COMBUSTIBLE FIBRES
IIIB	NON-CONDUCTIVE DUST
IIIC	CONDUCTIVE DUST

Grouping of equipment by temperature classes

Only gas constructions are grouped into **Temperature classes**. In the classification of constructions, the "Class of T" indicates the maximum surface temperature (intended to be in contact with the explosive atmosphere) that the product reaches in its intended operation, under the ambient conditions declared by the manufacturer.

TEMPERATURE CLASS	MAXIMUM SURFACE TEMPERATURE [°C]
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

Classification of equipment according to level of protection

IEC 60079 assigns an electrical construction a level of protection, defined as "**Equipment Protection Level (EPL)**", depending on whether it is constructed so as not to ignite an explosive atmosphere under various operating conditions of the equipment.

PROTECTION LEVELS (EPL) ACCORDING TO IEC 60079 CLASSIFICATION			
ATMOSPHERE	**EPL**	**PROTECTION LEVEL**	**OPERATING CONDITION** in which it is guaranteed not to ignite
MINE GASES GROUP I	**Ma**	VERY HIGH	normal operation, expected malfunctions or rare malfunctions, even if left live in the presence of a gas leak
	Mb	HIGH	normal operation or expected malfunctions during the time between a gas leak and the equipment being de-energised
SURFACE GASES GROUPS IIA, IIB, IIC	**Ga**	VERY HIGH	normal operation, expected malfunctions (first fault) or rare malfunctions (second fault, independent of the first)
	Gb	HIGH	normal operation, expected malfunctions (first fault)
	Gc	NORMAL	normal operation
COMBUSTIBLE DUSTS GROUPS IIIA, IIIB, IIIC	**Da**	VERY HIGH	normal operation, expected malfunctions (first fault) or rare malfunctions (second fault, independent of the first)
	Db	HIGH	fnormal operation, expected malfunctions (first fault)
	Dc	NORMAL	normal operation

Requirements for the construction of installations

IEC 60079-14 sets out the requirements for the selection of equipment and the requirements for the design and construction of electrical installations in explosion hazard areas.

The installation must be dimensioned and constructed to avoid temperatures that can ignite, sparks due to fault currents and accumulation of static electricity. General rules are laid down with requirements for protection against overcurrents, against indirect contacts and earth faults, requirements for conduits and earthing, and finally the specific requirements for correctly installing equipment depending on the protection technique (protection mode) with which it is constructed.

The first step is the correct choice of equipment in terms of correspondence of:
- Hazardous Zone;
- Equipment Group / Substance Group;
- Equipment Class T or Max Surface T / Gas Class T or Dust Ignition Temperature;
- Ambient temperature.

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Choice in relation to hazardous area

EPL		Ga	Gb	Gc	Da	Db	Dc
GASES AND VAPOURS	ZONE 0	✓	✗	✗	✗	✗	✗
	ZONE 1	✓	✓	✗	✗	✗	✗
	ZONE 2	✓	✓	✓	✗	✗	✗
DUSTS	ZONE 20	✗	✗	✗	✓	✗	✗
	ZONE 21	✗	✗	✗	✓	✓	✗
	ZONE 22	✗	✗	✗	✓	✓	✓

PROTECTION LEVELS	
SURFACE GASES GROUPS IIA, IIB, IIC	Ga
	Gb
	Gc
COMBUSTIBLE DUSTS GROUPS IIIA, IIIB, IIIC	Da
	Db
	Dc

Choice of equipment in relation to the group

AREAS		GAS GROUP EQUIPMENT IIA	IIB	IIC	DUST GROUP EQUIPMENT IIIA	IIIB	IIIC
	IIA	✓	✓	✓	✗	✗	✗
	IIB	✗	✓	✓	✗	✗	✗
	IIC	✗	✗	✓	✗	✗	✗
	IIIA	✗	✗	✗	✓	✓	✓
	IIIB	✗	✗	✗	✗	✓	✓
	IIIC	✗	✗	✗	✗	✗	✓

GROUPING
SURFACE GASES GROUPS IIA, IIB, IIC
COMBUSTIBLE DUSTS GROUPS IIIA, IIIB, IIIC

Equipment selection in relation to T class (Gas)

MAXIMUM SURFACE TEMPERATURE EQUIPMENT		T1	T2	T3	T4	T5	T6
AREAS	T1	✓	✓	✓	✓	✓	✓
	T2	✗	✓	✓	✓	✓	✓
	T3	✗	✗	✓	✓	✓	✓
	T4	✗	✗	✗	✓	✓	✓
	T5	✗	✗	✗	✗	✓	✓
	T6	✗	✗	✗	✗	✗	✓

TEMPERATURE CLASSES	MAX SURFACE TEMPERATURE
T1	450 °C
T2	300 °C
T3	200 °C
T4	135 °C
T5	100 °C
T6	85 °C

For dusts refer to the standard because there are rules for the selection of equipment involving both dust ignition temperatures (T_{cl} and T_l).

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Skills and responsibilities

Hazardous Areas classification	Equipment classification	Equipment selection and electrical installation construction
Employer **Production process expert**	**Manufacturer**	**Professionals with specific skills**
IEC 60079-10-1 (GASES AND VAPOURS classification) **IEC 60079-10-2** (COMBUSTIBLE DUSTS classification)	**IEC 60079-0** General requirements for equipment + **IEC 60079-x** Standard specification of protection technology	**IEC 60079-14** Annex A (Normative)

Plant manager

Operational/Technicians (selection and installation)

Designers (design and selection)

Specific skills are required, with a level of depth relative to the role:

- general understanding of electrical engineering;
- understanding of diagrams and drawings;
- knowledge of explosion protection principles;
- knowledge of basic principles of quality, including understanding of documentation; and knowledge of instrumentation management (calibration);
- Knowledge of protection techniques 60079 (types of protection);
- understanding of markings;
- Expertise in the types of protection used in the installation;
- Knowledge of the principles of equipment design that could influence the types of protection during installation. of protection during installation;
- Knowledge of the principles of testing, inspection and maintenance (IEC 60079-17).

Responsible figures according to IEC 60079.

Where to apply

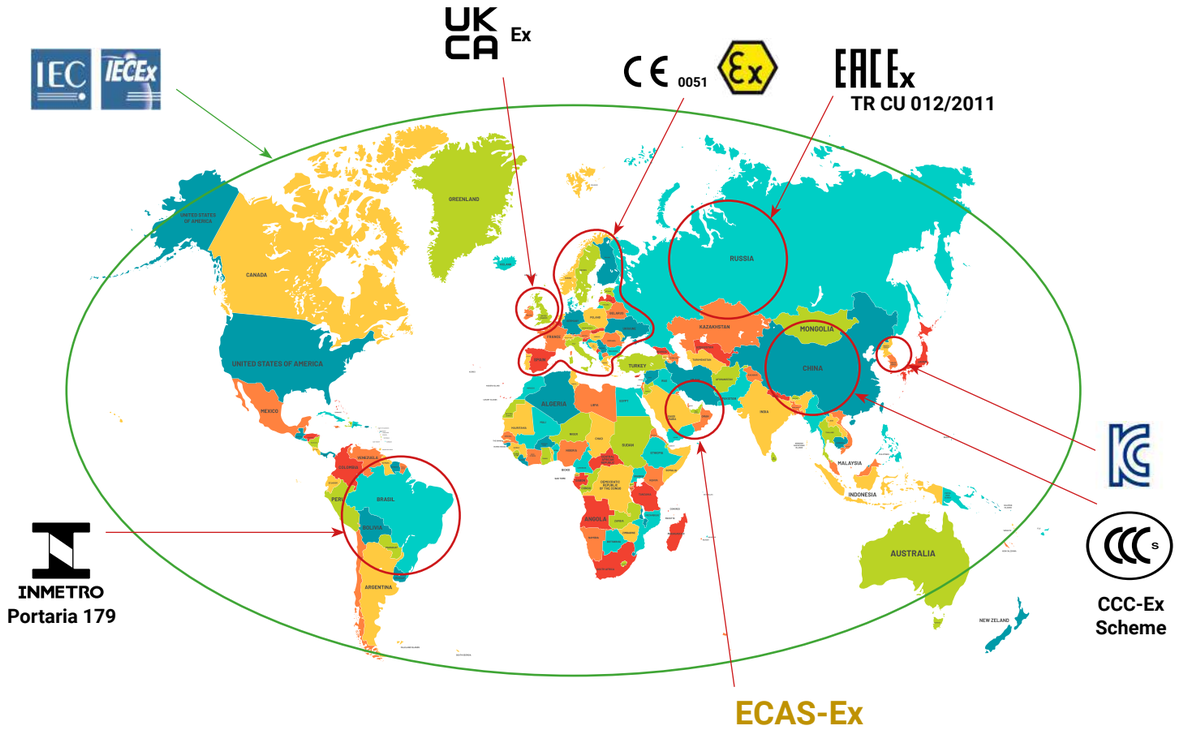
The IEC Zone System is applied by all IEC participating countries. Each country then transposes the IEC standards as local technical standards and legislative regulations: national in some cases or as EU regulations of a group of nations.

In the first case we can cite examples:

- **Brazil,** which transposes the IEC standards through the InMetro standardisation body that have presumption of conformity with the legislative obligation of the "Portaria 179" law that regulates places with danger of explosion;
- **China,** which adopts the IEC scheme within the CCC-Ex certification scheme and transposes the 60079 standards as GB national standards.

In the second case, where several countries form free trade unions, we can mention:

- **European Union,** where the system of IEC 60079 standards is "harmonised" into European EN 60079 standards by CENELEC. The European Union, in the context of the risk due to the presence of potentially explosive atmospheres, has adopted two harmonised health and safety directives, known as the ATEX directives: 2014/34/EU for products and ATEX 99/92/EC for workplaces. The European Commission gives EN 60079 standards "presumption of conformity" with the essential safety requirements of the two directives;
- **Eurasian Union (Custom Union - EA CU),** today comprises 5 states: Armenia, Belarus, Kazakhstan, Kyrgyzstan and Russia. These countries are gradually adopting the same Custom Union Technical Regulations (CU TR) that govern the requirements for the conformity of products placed on the market. The technical regulation adopting the IEC 60079 scheme is CU TR 012/2011.
- **United Kingdom (UKCA),** which when it was within the EU adopted the ATEX scheme and therefore the EN 60079 standards and after the Brexit has maintained the approach, but with legislative regulations applicable within the kingdom (as well as the EU Directives) and continues to adopt the IEC 60079 standards scheme which it transposes as BS 60079 (British Standards).



Some examples of local certification within IEC participating countries.

1.4 - HAZLOC DIVISION SYSTEM (NEC - NFPA70)

The **NEC (NFPA 70)** contains all the prescriptions for the construction of electrical installations and the requirements for equipment, conduits, etc.

Chapters 1 to 4 set out the requirements for ordinary locations. Chapter 5 modifies and/or extends the ordinary requirements for equipment for special locations. In particular, Articles 500 to 504 of Chapter 5 deal with explosive atmospheres classified into classes and divisions.

HAZARDOUS AREAS CLASSIFICATION

Division into 3 classes depending on the **type of explosive atmosphere**:

- **Class I** (combustible gases, vapours, mists);
- **Class II** (dusts);
- **Class III** (combustible fibres).

Each class is subdivided into two types of hazardous areas according to the **frequency or duration of the formation of an explosive atmosphere**:

- **Division 1**;
- **Division 2**.

			DIVISION 1	DIVISION 2
Gases, vapours, combustible mists	**CLASS I**	Areas where combustible gases, vapours or combustible mists are or may be present in sufficient quantity to produce explosive or ignitable mixtures	Explosive concentration during normal operations. Explosive concentration present frequently for maintenance/repair or by leakage. The breakdown of a piece of equipment or a process can release explosive concentrations and a simultaneous failure in electrical equipment, making it a source of ignition.	The substances are confined in containment systems and can only leave in the event of a breakdown. Explosive concentration prevented by ventilation system. The hazardous zone can be formed as a result of a ventilation system ventilation system. Explosive concentration due to areas bordering Division 1 without prevention by pressurisation or ventilation.
Combustible dusts	**CLASS II**	Areas with danger of explosion due to the presence of combustible dusts	Dust present in explosive concentration during normal operations. Breakdown or fault conditions in an apparatus or machine can release dust in an explosive concentration and have a simultaneous failure in electrical equipment such that it becomes an ignition source. Presence of metal dusts such as aluminium and magnesium (group e), in quantities that are dangerous.	Presence of combustible dust in the air, as a result of a fault and in such quantity that it has an explosive concentration. Layers of dust are present, but normally insufficient to interfere with the normal operation of the equipment, but which could be raised in a malfunctioning condition and give rise to explosive concentrations. Layers of dust in the vicinity or deposited on the equipment which can alter its dissipation capacities and ignite.
Combustible fibres	**CLASS III**	Hazardous environments due to the presence of readily ignitable fibres or where volatile combustible materials are used, but where these fibres are not likely to be present in sufficient quantity to create an explosive mixture	Environments in which easily ignitable fibres are handled, produced or used.	Environments in which easily ignitable fibres are stored or handled other than in the production process.

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EQUIPMENT CLASSIFICATION

Equipment groups

CLASS	GROUP	EQUIPMENT FOR
CLASS I	A	ACETILENE
	B	HYDROGEN
	C	ETHYLENE
	D	PROPANE
CLASS II	E	combustible metal dusts, including aluminium, magnesium and their commercial alloys, or other combustible dusts of particular size, abrasiveness and conductivity which present a similar risk in electrical applications
	F	carbon-based combustible dusts that are volatile to more than 8 % in total, or have been sensitised by other materials
	G	dusts not included in groups e, f, including flower, grain, wood, plastic and chemical dusts
CLASS III	-	combustible fibres

Compared to IEC, the hazard in the Gas Group is reversed: from A (Acetylene, most hazardous) to D (Propane). In addition, the IEC Group of IIC equipment, Hydrogen and Acetylene are, in the Division System, separated as reference substances for Group B and A respectively.
The classification for dusts also differs slightly: 3 groups of combustible dusts within Class II, while equipment for combustible fibres are classified as Class III and are not part of a Class II division, in the same way as the classification of substances.

Grouping of equipment into T classes

MAXIMUM SURFACE TEMPERATURE [°C]	NEC TEMPERATURE CLASS	IEC TEMPERATURE CLASS
450	**T1**	**T1**
300	**T2**	**T2**
280	**T2A**	**-**
260	**T2B**	**-**
230	**T2C**	**-**
215	**T2D**	**-**
200	**T3**	**T3**
180	**T3A**	**-**
165	**T3B**	**-**
160	**T3C**	**-**
135	**T4**	**T4**
120	**T4A**	**-**
100	**T5**	**T5**
85	**T6**	**T6**

Compared to IEC standards, intermediate temperature classes are introduced between T2 and T3, between T3 and T4, between T4 and T5.

NEC 505 and 506: the IEC System in North America

As North American countries (USA and Canada) are participants in IEC, the IEC Zone system has been implemented since the beginning of this century. **NEC 505 and 506 articles** therefore regulate equipment requirements for locations classified in Zones rather than Divisions.

GASES - ART. 505

HAZARDOUS AREAS CLASSIFICATION
(CLASS I remains)

CLASS I	ZONE 0
	ZONE 1
	ZONE 2

EQUIPMENT CLASSIFICATION IN GROUPS

GROUP IIA
GROUP IIB
GROUP IIC

Comparison with Art. 500

GROUP IIA	GROUP D
GROUP IIB	GROUP C
GROUP IIC	GROUPS B and A

EQUIPMENT CLASSIFICATION BY T CLASS

TEMPERATURE CLASS	MAX SURFACE TEMPERATURE
T1	450 °C
T2	300 °C
T3	200 °C
T4	135 °C
T5	100 °C
T6	85 °C

Marking
The IEC construction for the NEC takes the prefix "AEx".

Class I, Zone 0 AEx ia IIB T6

DUSTS - ART. 506

HAZARDOUS AREAS CLASSIFICATION
(CLASS II disappears)

ZONE 20
ZONE 21
ZONE 22

EQUIPMENT CLASSIFICATION IN GROUPS

GROUP IIIA
GROUP IIIB
GROUP IIIC

Comparison with Art. 500

GROUP IIIA	CLASS III
GROUP IIIB	CLASS II, GROUP F
GROUP IIIC	CLASS II, GROUP E

Marking
The IEC construction for the NEC takes the prefix "AEx".

Zone 21, AEx tb IIIB T165 °C

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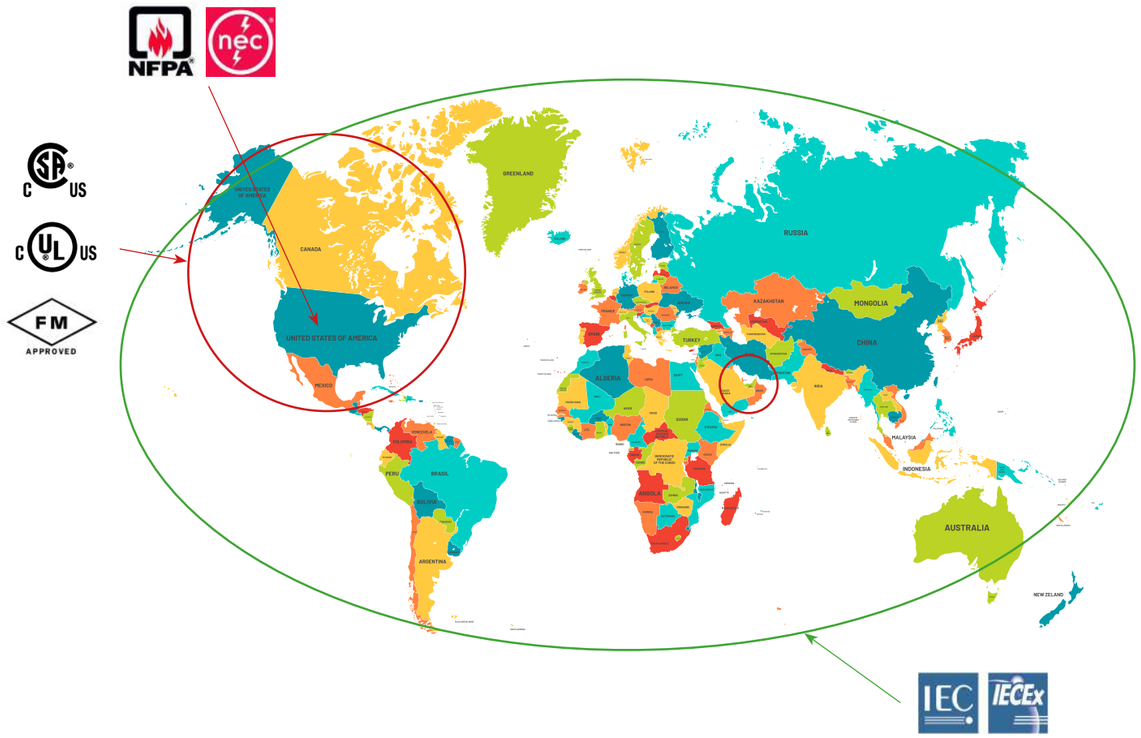
Which classification method is most commonly used in the HazLoc system?

The methods of Article 500 (Classes and Divisions) and the methods of Articles 505 and 506 (IEC Zones) are considered equivalent by the NEC, the choice falling to the habits of the classifier who chooses the initial classification criterion. For historical reasons, the method of classification in CLASSES and DIVISIONS is more widespread, but it depends on the initial contractual conditions.

The fundamental aspect to be considered is that equipment must be chosen according to the classification of the areas, respecting one or the other methodology. The NEC rules on piping and custody inputs will be common for Hazardous Locations.



NEC - North America.

1.5 - ONE CERTIFICATION SCHEME PER AREA

Does the product intended for installation in an explosive atmosphere have to be certified?
If so, is there a single certification?
An attempt is made below to answer these questions by describing the reference certification schemes in the explosion hazard area.

ATEX certification scheme (EUROPEAN UNION - EU)

The European Union regulates the free trade of goods and products between the countries of the Union by setting essential requirements to which these goods must conform. The acts of the European Union within which the essential requirements for the free movement of products are laid down are the European Directives. When a European Directive deals with safety issues, the essential requirements are elevated to "**essential safety requirements**".

In Europe we therefore have several Directives: from the food sector to toys, from electrical products to products intended for potentially explosive atmospheres, and so on. The New Approach EU Directives do not provide practical technical requirements within the safety requirements, however, they are not voluntary but 'mandatory'. In fact, an essential requirement is a legal requirement. In order to fulfil the requirements of a Directive, however, it is possible to use technical standards recognised by the European Commission, which gives them "presumption of conformity" with the requirements of the Directive. The list of recognised standards, called "**harmonised standards**" is published by the European Union, for each Directive issued.

For workplaces with explosive atmospheres, the EU has adopted two harmonised health and safety directives, known as the ATEX directives.

The **ATEX Directive 2014/34/EU** is the product directive: it sets out the **Essential Safety Requirements** and related procedures for the conformitỳ of products and protective systems intended for use in potentially explosive atmospheres.

The **ATEX Directive 99/92/EC** is the workplace directive: it defines **Minimum Health and Safety Requirements for workplaces** with potentially explosive atmospheres.

The two Directives adopt the IEC 60079 approach and the standard set is harmonised by the European Commission as EN 60079.

The use of EN 60079 gives presumption of conformity with the essential safety requirements of the two directives. It means that **the manufacturer MUST comply with the requirements of the directive, if he VOLUNTARILY uses EN 60079 THEN THE REQUIREMENTS ARE CONSIDERED FULFILLED**.

Hazardous areas classification	Equipment classification	Equipment selection and electrical installation construction
Employer **Production process expert**	**Manufacturer**	**IEC 60079-14** **IEC 60079-17**
IEC 60079-10-1 (GASES AND VAPOURS) **IEC 60079-10-2** (DUSTS) **EUROPEAN STANDARDS** **EN 60079-10-1** **EN 60079-10-2**	**IEC 60079-0** + **IEC 60079-x** (Standards of protection types) **HARMONIZED** **EN IEC 60079-0** **EN 60079-x**	**EN 60079-14** **EN 60079-17**
ATEX Directive **99/92/EC** Legislative Decree 81/08 TITLE XI	**ATEX Directive** **2014/34/EU** Legislative Decree 19 May 2016 no. 85	**D.M. 37/08** **D. Lgs. 81/07** **DPR 462/01** (periodic inspections of electrical installations in places with a risk of explosion)

Harmonisation of IEC 60079 standards into EN 60079 for ATEX Directives and reference to Italian laws.

By adopting the IEC scheme, the ATEX Directives adopt the 3-zone area classification with the same nomenclature and definition as the technical standard. Product Directive 2014/34/EU also adopts the equipment classification concept of IEC 60079-0, however with some differences in nomenclature.

Classification of equipment according to Directive 2014/34/EU

Two groups are defined:

- **Group I equipment**, products for use in mines susceptible to firedamp;
- **Group II equipment**, equipment intended for use on the surface.

The Directive then classifies the products into categories, according to the level of protection and the degree of hazard of the environment in which they will be placed, in the same way as the IEC system.

GROUP I EQUIPMENT

Mining products are divided into 2 categories:
- **Category M1**: equipment or protective systems which guarantee a very high level of protection;
- **Category M2**: equipment intended for use on the surface.

The Directive then classifies the products into categories, according to the level of protection and the degree of hazard of the environment in which they will be placed, in the same way as the IEC system.

GROUP II EQUIPMENT

For surface equipment (group II) there are 3 categories, depending on the level of protection (zone of use); the categories are identified by the number 1, 2, 3 followed by the letter G (Gas) or D (Dust).

- **Category 1:** equipment or protective systems which guarantee a very high level of protection;
- **Category 2:** equipment or protective systems which guarantee a high level of protection;
- **Category 3:** equipment or protective systems which guarantee a normal level of protection.

The "category" defined in the ATEX Directive is equivalent to the "protection level" of the IEC system. The following graphic explains the correlation between the IEC 60079 classification and the ATEX Directive.

Protection levels (EPL) according to IEC 60079 classification				ATEX Classification	
ATMOSPHERE	EPL	PROTECTION LEVEL	INSTALLATION AREA	GROUP	CATEGORY
MINE GASES GROUP I	Ma	VERY HIGH	-	I	Ma
	Mb	HIGH	-		Mb
SURFACE GASES GROUPS IIA, IIB, IIC	Ga	VERY HIGH	ZONE 0	II	1G
	Gb	HIGH	ZONE 1		2G
	Gc	NORMAL	ZONE 2		3G
COMBUSTIBLE DUSTS GROUPS IIIA, IIIB, IIIC	Da	VERY HIGH	ZONE 20		1D
	Db	HIGH	ZONE 21		2D
	Dc	NORMAL	ZONE 22		3D

NON-ELECTRIC products

The ATEX Directive 2014/34/EU also applies to NON-ELECTRICAL products, i.e. mechanical products and internal combustion engines. These products are not covered by the 60079 standards typical of electrical products, but by a specific set of IEC standards for mechanical products: ISO IEC 80079.
This series of standards adopts the approach of the IEC Zone System, with reference to the classification of equipment, with also specific protection modes for mechanical products.

The ISO IEC 80079 standards are harmonised for the ATEX Directive 2014/34/EU as:
- **EN ISO IEC 80079-36**: general requirements;
- **EN ISO IEC 80079-37**: protection types.

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ATEX product certification scheme: conformity assessment procedures

Compliance of a product with the requirements of Directive 2014/34/EU is supported by two legs:
- conformity of the design to the requirements of the Directive (type conformity);
- conformity of the product batch to the design (type conformity).

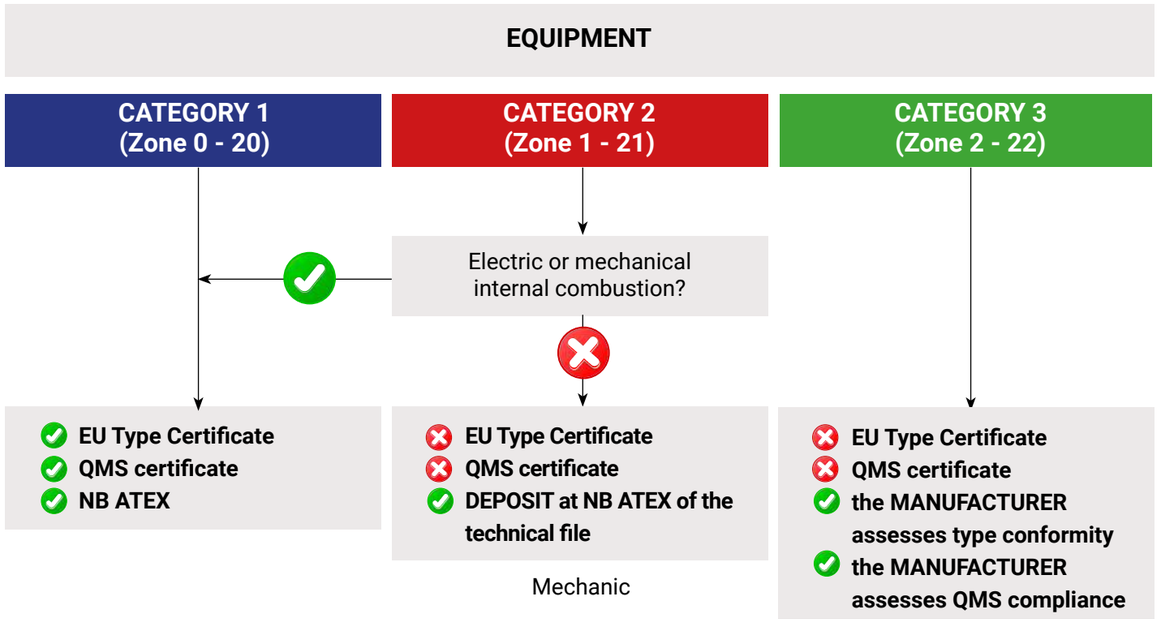
The Directive specifies, depending on the product category, whether the conformity assessment can be carried out independently, i.e. the manufacturer assesses and declares conformity (self-certification), or whether it must be carried out by a **Certification Body**.

All category 1 and category 2 electrical equipment must be compulsorily certified ("EU Type Examination") by an ATEX Notified Body (certification body, e.g. IMQ, FIDITAS, UL, TUV, etc.). In addition, the production and quality management system is subject to notification and surveillance by an ATEX Notified Body (Quality Assessment Notification - QAN); the body's identification number is affixed to the plate at the same time as the CE marking.

For all category 3 equipment, **self-certification is foreseen**, with internal manufacturing control, i.e. the manufacturer must still adopt all necessary procedures for both product and production conformity, but assesses them himself.

In both cases, the manufacturer must prepare technical documentation demonstrating the conformity of the equipment to the requirements of the Directive; the documentation must remain available for at least 10 years after the last placing on the market.

All products (categories 1, 2 and 3) must be accompanied by the EU declaration of conformity and the safety instructions for use, installation and maintenance.



ATEX Directive and Certificate.

IECEx certification scheme

The **IECEx certification scheme** is the IEC's specific scheme for products intended for use in explosive atmospheres. While the **ATEX certification scheme** is mandatory in the European Union, local laws and certification schemes apply outside the Union.

The IECEx certification scheme is based on IEC 60079 and ISO IEC 80079 standards, in which compliance with the technical standard is assessed. Compared to the ATEX scheme, there are no Directives or legal regulations with safety requirements, for which the application of the standard is a sufficient condition (presumption of conformity) but not necessary (voluntary).
In the IECEx scheme, application of the IEC 60079 standard is a necessary and sufficient condition for obtaining the certificate. The advantage of certifying a product under this scheme is due to the fact that the local certification schemes of the countries participating in IEC, adopt the 60079 and 80079 standards and therefore the IECEx certificate is a solid basis for obtaining a local certificate.

All electrical equipment with EPL Ga, Da, Gb, Db, Gc and Dc must be certified ("Certificate of Conformity - IECEx CoC") with IECEx Certification Bodies (ExCB).

The difference to the ATEX directive is that products for Zone 2 and Zone 22 are also certified by a third-party body: self-certification does not exist.

The IECEx scheme also requires that, in addition to the type (design) certificate, it certifies that production is able to manufacture the products in accordance with the type and that the quality management system is monitored by means of the "**Quality Assessment Report**".

The scheme is based on 3 procedures that lead to the issuing of the following 3 documents:

IECEx TR	Type test report	Type testing in accordance with IEC 60079 and/or ISO IEC 80079.
IECEx CoC	IECEx Certificate of Conformity	Conformity assessment of the design according to IEC 60079 and/or ISO IEC 80079 reference for the protection mode of the equipment. It is based on the IECEx TR and cannot be issued without an IECEx QAR listing the protection mode(s) of the product under consideration.
IECEx QAR	Quality Assesment Report	Quality Management System Assessment Report, which must ensure that all products are manufactured in accordance with the design. It is based on the ISO IEC 80079-34 standard for quality management systems for the production of Ex.

North American scheme - Hazardous Locations

In the North American system it is always required that a product intended to be installed in a Hazardous Location **complies with the requirements for ordinary locations**. Unlike European Union regulations, a product in North America cannot be declared compliant with Ordinary Location requirements by self-certification, but **verified by a certification body recognised by the system**.

Once the equipment complies with the requirements for ordinary locations, it is assessed against the specific NEC requirements for hazardous locations (NEC 500, NEC 505 or 506). A fortiori, this assessment is not allowed on a stand-alone basis, for any of the Classes/Divisions or Zones.
There are several accredited bodies that can issue certification according to the NEC (both for the USA and Canada): **UL (Underwriters Laboratories), CSA, FM (Factory Mutuals), INTERTEK, etc.**

Basically, the product is required to be **"Listed"** if it is a piece of equipment or **"Recognized"** if it is a component, by one of these bodies, in accordance with the requirements of the NEC for the specific location where it is intended: ordinary (i.e. not hazardous) or hazardous (hazardous locations).

The North American certification scheme, like the ATEX and IECEx schemes, also requires surveillance of the production system.

1.6 - IEC ZONE SYSTEM: PROTECTION TYPES FOR ELECTRICAL AND NON-ELECTRICAL PRODUCTS

Equipment conforming to the IEC 60079 series of names is referred to as "**Ex**" constructions.
The two letters are also used as a prefix in the product marking, followed by the letters indicating the "protection type(s)".

Similarly, the ISO IEC 80079 standards for mechanical constructions have developed their own modes of protection but, in part, rely on certain 60079 techniques typical of electrical products.

In both approaches, however, depending on the method by which ignition and explosive atmosphere are prevented from meeting, basic techniques are identified:

PROTECTION	Protection by enclosure in which explosive atmosphere and ignition may come into contact. The enclosure is constructed in such a way as to withstand the stresses of an internal explosion and not propagate the flame to the outside.
PREVENTION	Constructions with absence of initiation by physical impediment or by avoiding the occurrence of initiation through design (insulation, materials, etc.). Low-energy constructions: limitation of the energy below the minimum ignition energy of the explosive atmosphere.

The following protection types are implemented on the basic techniques (the main ones are listed here).

IEC 60079			
Letter indicating protection type	**IEC standard**	**Definition**	**Explosive Atmosphere**
d	**60079-1**	Explosion-proof enclosures	Gases
p	**60079-2**	Internal overpressure	Gases and Dusts
e	**60079-7**	Increased safety	Gases
i	**60079-11**	Intrinsic safety	Gases and Dusts
n	**60079-15**	Protection mode "n" (*)	Gases
m	**60079-18**	Protection by encapsulation	Gases and Dusts
t	**60079-31**	Protection by "t" enclosures	Dusts

(*) The protection type "n" has changed over time in relation to the evolution of the standards. In edition 5 of IEC 600579-15, the types "nA", "nC" and "nL" were transferred to the standards dealing with the same protection technique respectively.

nA	non-sparking for zone 2	From IEC 60079-15	to IEC 60079-7	**ec**
nC Enclosed Break	Explosion Containment for zone 2	From IEC 60079-15	to IEC 60079-1	**dc**
nL	Energy Limitation for zone 2	From IEC 60079-15	to IEC 60079-11	**ic**

ISO IEC 80079			
Letter indicating protection type	**Standard**	**Definition**	**Explosive Atmosphere**
d	**IEC 60079-1**	Explosion-proof enclosures	Gases
p	**IEC 60079-2**	Internal overpressure	Gases and Dusts
c	**ISO IEC 80079-37**	Construction safety	Gases and Dusts
b	**ISO IEC 80079-37**	Control of ignition source	Gases and Dusts
k	**ISO IEC 80079-37**	Immersion in liquid	Gases and Dusts
t	**IEC 60079-31**	Protection by "t" enclosures	Dusts

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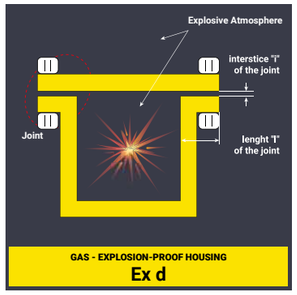
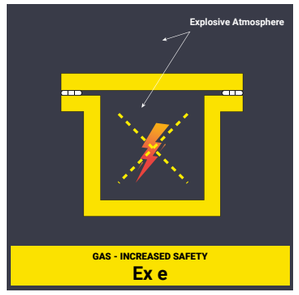
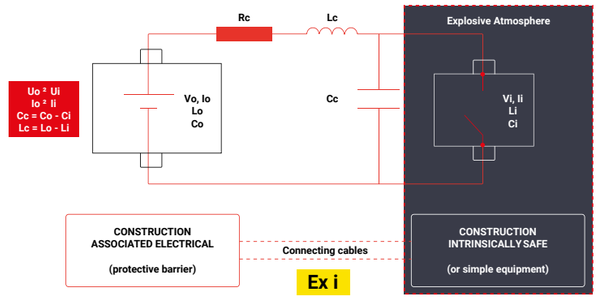
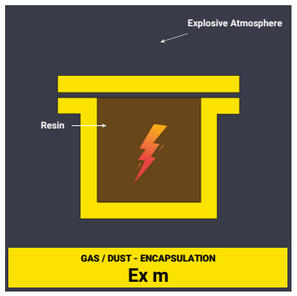
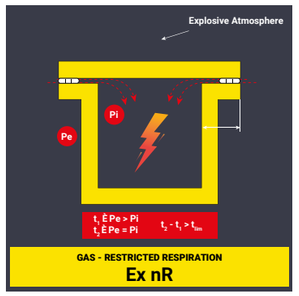
SUMMARY TABLE OF PROTECTION TYPES

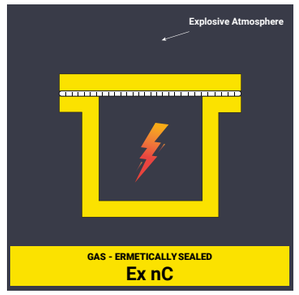


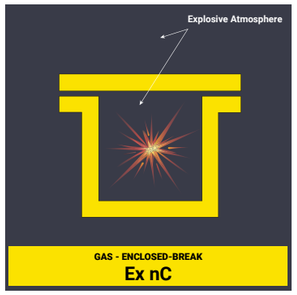


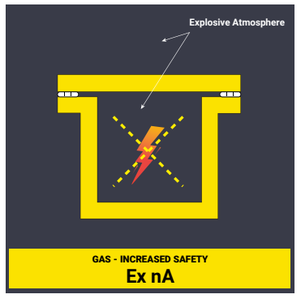


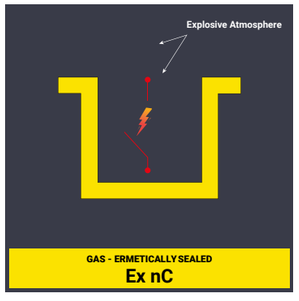


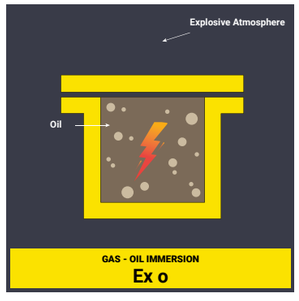


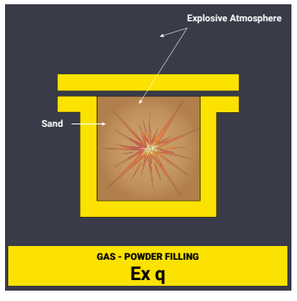


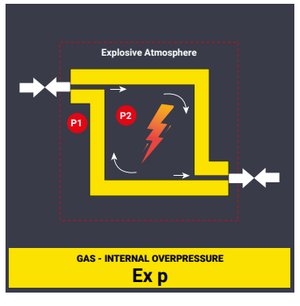


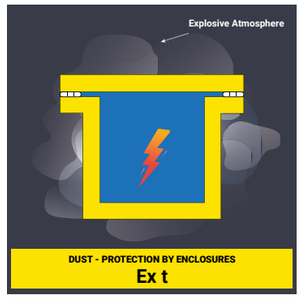






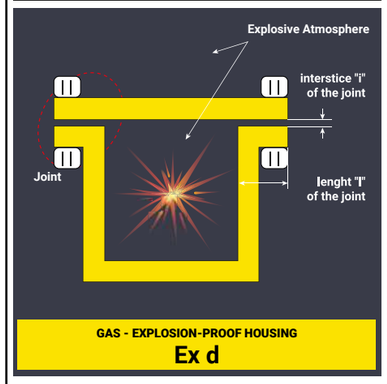






By way of example, the characteristics of some of the protection modes mentioned are described on the following pages.

IEC 60079-1



■ **GAS**

□ **DUST**

Level	Ga*	Gb	Gc
	Da	Db	Dc

GAS	ZONE 0	ZONE 1	ZONE 2
Level	da	db	dc

***Ga** only for very small volumes compatible with the analysis chambers of portable gas detectors.

PROTECTION

Explosion-proof enclosures

- Equipment and components inside the housing can be standard (both sparkling and non-sparkling);
- Gas may enter the enclosure if the explosive atmosphere is ignited:
  - the housing withstands the pressure resulting from the explosion, without damage;
  - the housing joints are (length "L" and maximum gap "i"), are standardised according to the gas group, so as to cool the flame passing through them and not propagate the explosion outside.

APPLICATIONS

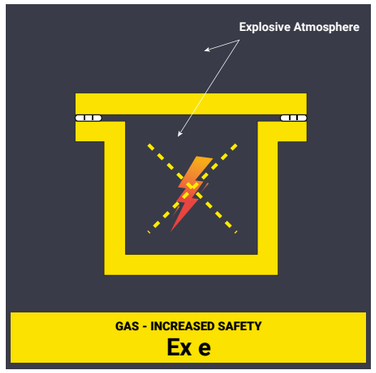
- Glittering equipment: switches, electrical actuators, switchboards, lighting equipment power supplies, etc.
- Non-sparking equipment: motors, fluorescent lamps, junction boxes, etc.

INSTALLATION

- If they only have a component certificate, i.e. marked with the suffix "U", they must not be installed in a hazardous location. They may only be installed if they are Ex-certified as complete equipment.
- Number and type of cable entries (threaded holes) defined by the manufacturer and in the certificate. Additional holes drilled in the field are not permitted if not provided for and in any case machined by the manufacturer.
- Keep distance from obstacles (e.g. walls) of the standard according to the gas group.
- Flame-proof joints must not be painted.
- Grease to protect the joint against corrosion is permissible, but subject to specific requirements.
- Special requirements on flange joint taping (not permitted for Group IIC.
- Choice of inlets in housing:

Unused holes	Exd plug, same group, thread co-ordinated with bore, temperature co-ordinated with construction.
Direct entry into enclosure with cable gland	Ex d marked, same group, threading coordinated with the hole, temperatures coordinated with the construction. The cable gland must be suitable for the type of cable: unarmoured, armoured or shielded. The standard sets out the requirements for the choice between: - sealed cable gland (barrier cable gland); - cable gland with sealing ring (compression) or grommet seal.
Direct entry into enclosure with conduit	An Ex d clamping fitting, equal to the gas group of the equipment, must be provided and installed as close as possible to the housing: - between housing and locking fitting: certified components. certified components. - after the locking fitting: non-certified components (e.g. pipe).

IEC 60079-7



■ GAS
□ DUST

Level	Ga	Gb	Gc
	Da	Db	Dc

GAS	ZONE 0	ZONE 1	ZONE 2
Level	-	eb	ec

PROTECTION

Increased safety equipment

- Protection by enclosure and internal non-sparking components with the same "Ex e" type of protection and the same level of protection (Gb or Gc).
- Gas may enter the interior of the enclosure, but the explosive atmosphere cannot be ignited (no ignition).
- Protection from non-sparking components or constructions, in which the insulation distances and insulating materials are "increased" in order to avoid sparking even in the event of a fault;
- **Housing:** metallic or non-metallic material. Protection requirement against penetration by foreign bodies, minimum IP54. The aim is to prevent solid or liquid foreign bodies, which may be conductive, from nullifying the benefit of the increased insulation distances. The IP54 degree of protection is verified in accordance with IEC 60079-0, which requires the same sample to be tested for heat resistance, cold resistance, hot impact, cold impact and finally the IP degree of protection test.
- **Internal components:** surface and air insulation distances as a function of the nominal voltage (max. 11 kV), increased compared to the standard product; mechanical fixings, vibration tests, choice of materials with increased electrical characteristics; dielectric strength.
- Thermal characteristics (heating) defined during testing and therefore limited by the configuration established by the manufacturer and the electrical parameters on the nameplate.

APPL.

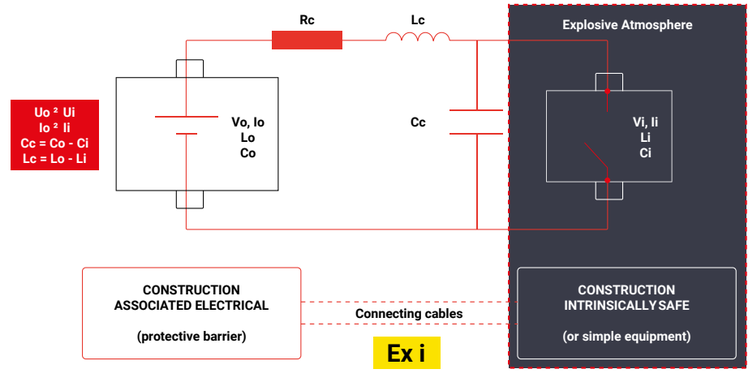
- Terminal blocks and equipment terminals; coils; rotating electrical machines; lighting equipment; transformers; junction and junction boxes for general purposes; resistance heating devices (other than heating cables).

INSTALLATION

- Configuration and mounting of internal components carried out by the manufacturer: The user is not permitted to mount components inside empty enclosures (replacing the manufacturer) or to mount additional components inside the enclosure.
- **For junction boxes:** the length of the conductors inside the enclosure should be as short as possible and never more than the length of the diagonal of the enclosure. If internal conductors are bundled together, do not exceed the maximum of 6 conductors per bundle inside the enclosure. Tighten unused terminals.
- The manufacturer's documentation contains information on the maximum number of terminals, conductor size, maximum current, maximum number of conductors per connection point (depending on the certificate), preparation of cable terminations (terminal type, stripping length, etc.), terminal tightening torque, tightening torque of housing screws. These requirements must be met.
- Number and type of cable entries (threaded or flat holes) defined by the manufacturer and in the certificate. Additional holes made in the field are not permitted unless provided for and in any case machined by the manufacturer.
- Choice of inlets in housing:

Unused holes	Exe plug, same group, threads coordinated with the bore, temperatures coordinated with the construction.
Direct entry into enclosure with cable gland	Ex-marked and, same group, threading coordinated with the hole, temperature coordinated with the construction. The cable gland must be suitable for the type of cable: unarmoured, armoured or shielded. The degree of protection in accordance with the construction certificate with minimum IP54.

IEC 60079-11



■ GAS
■ DUST

Level	Ga	Gb	Gc
	Da	Db	Dc

GAS DUST	ZONE 0 ZONE 20	ZONE 1 ZONE 21	ZONE 2 ZONE 22
Livello	ia	ib	ic

PROTECTION

Intrinsically safe equipment (I.S.)

- Protection provided by all components of the circuit: associated construction (certified power supply unit called "barrier" and normally installed in a safe area), cables (type, section, length), intrinsically safe equipment (in classified area).
- The energy is limited (a few watts, with permissible short-circuit currents of up to a few amperes) by the associated construction.
- The associated construction is certified not to exceed the output parameters Uo, Io, Po, Lo, Co under any condition (defined by the EPL).
- Cables and field construction defined by construction and certificate parameters, respectively: Lc/Cc; input quantities Ui, Ii, Li, Ci.
- **Protection**
  coordination between output and cable/input parameters:
  $U_o \leq U_i$
  $I \leq I_i$
  $P_o \leq P_i$
  $C_i + C_c \leq C_o$
  $L_i + L_c \leq L_o$

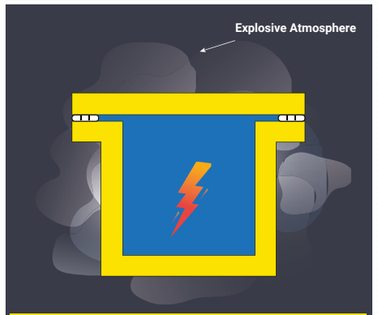
APPL.

- Control and measurement instrumentation.

INSTALLATION

- Each I.S. circuit must be coordinated in such a way as to prevent sparks or released energy from having values that could ignite an explosive atmosphere, whether gas (Group II) or dust (Group III): a coordination document is required for each I.S. circuit (also required by IEC 60079-25).
- Each I.S. circuit must be identified in the document with at least: the components (barrier, cables, any junction boxes and field equipment), the I.S. certificates of the components, the electrical and concentrated parameters of all the components, calculations and results of coordination between the components of the I.S. circuit, diagram of the connection between the components.
- There are no special conditions for the enclosures (IP20 minimum), unless the installation or the certificate of intrinsically safe construction requires a specific IP rating (e.g. dust).
- I.S. circuits MUST always be uniquely identified. If a colour is used then it must be light blue.
- Requirements for conductors: voltages to earth, installation, earthing of conductor shields, insulation of unused conductors, etc.
- Requirements on protective earthing of associated constructions, minimum cross-sections of earthing conductors and maximum resistance of the earthing circuit.

IEC 60079-31



☐ GAS

■ DUSTS

Level	☐ Ga	☐ Gb	☐ Gc
	■ Da	■ Db	■ Dc

DUST	ZONE 20	ZONE 21	ZONE 22
Level	ta	tb	tc

PROTEZIONE

Dust-proof enclosures

- Enclosures containing standard electrical equipment/components in which the ingress of an explosive atmosphere is prevented;
- Protection level Da, Db or Dc, depending on the requirements to which the enclosure meets;
- For all levels of protection, specific characteristics are required on couplings, cable entries, operating rods, etc., and with respect to all parts of the enclosure interfacing with the outside, in order to maintain protection against the ingress of dust;
- For protection level Da, additional requirements are set to limit the maximum surface temperature;
- The protection levels are achieved by protection against the ingress of dust, verified by requirements relating to the IP degree of protection, determined after subjecting the enclosure to the following tests: ageing (hot/cold), impact resistance (hot/cold), dropping (if portable), a pressure test.
- The minimum degree of protection is prescribed in relation to the dust group and EPL, as follows:
  - IP6X for all "ta" constructions (EPL Da);
  - IP6X for all group IIIC constructions;
  - IP6X for all constructions "tb" group IIIB;
  - IP6X for all constructions "tb" group IIIA;
  - IP5X for all constructions "tc" groups IIIA and IIIB.

APPL.

- Sparking and non-sparking equipment, electrical machines intended for installation in the presence of dust.

INSTALLAZIONE

- Configuration and mounting of internal components carried out by the manufacturer: The user is not permitted to mount components inside empty enclosures (replacing the manufacturer) or to mount additional components inside the enclosure.
- Tighten unused terminals.
- The manufacturer's documentation contains information on conductor size, maximum current, maximum number of conductors per connection point (depending on the certificate), preparation of cable terminations (terminal type, stripping length, etc.), terminal tightening torque, tightening torque of housing screws. These requirements must be met.
- Number and type of cable entries (threaded or flat holes) defined by the manufacturer and in the certificate. Additional holes made in the field are not permitted unless provided for and in any case machined by the manufacturer.
- Choice of inlets in housing:

Unused holes	Ex t plug, same group, thread co-ordinated with bore, temperature co-ordinated with construction
Direct entry into enclosure with cable gland	Ex t-marked, same group, threading coordinated with the hole, temperatures coordinated with the construction. The cable gland must be suitable for the type of cable: unarmoured, armoured or shielded. The degree of protection in accordance with the construction certificate with minimum IP6X or IP5X depending on the IP rating of the construction.

1.7 - EXAMPLES OF TYPE TESTING (INTEK LABORATORY)

The INTEK laboratory

INTEK is an independent test and measurement laboratory founded in 1994. It is qualified to perform electrical/electronic, environmental and physical tests. The laboratory also performs the tests necessary for presumption of conformity with the European Low Voltage, Electromagnetic Compatibility, RED and ATEX Directives.

It specialises in metrology and uncertainty measurements and is constantly seeking to improve its test methods.

It does not stop at simply carrying out tests, but also preventive analysis, customisation of test plans, training: **everything is needed as added value!**

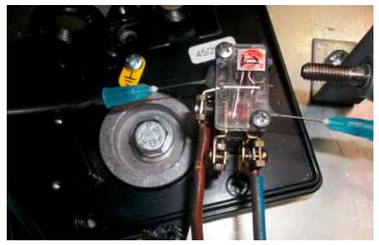
ATEX

PHYSICAL AND ENVIRONMENTAL TEST

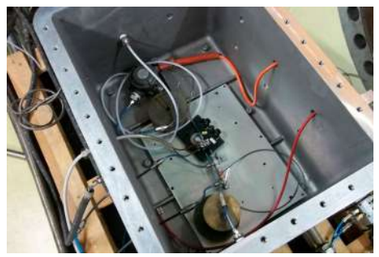
LOW VOLTAGE TEST

www.intek.it

ATEX



The ATEX department is able to provide regulatory advice and perform laboratory tests according with the harmonised standards for **Directive 2014/34/EU** of the **EN 60079** and **EN 80079** series.
It also performs tests according to the **IEC 60079** series of standards for the IECEx scheme.



The chamber has an internal volume of approximately 4 m^3 and can accomodate **equipment with dimensions up to 1000 x 1000 x 2000 mm** with the possibility of supplying the equipment under test with a **voltage up to 800 V in three-phase and a maximum current of 100 A**.

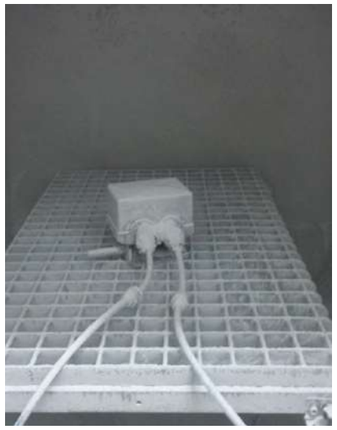
The gas control and mixing system has been designed to realize normative mixtures with oxygen and hydrogen, acetylene, ethylene, propane or methane. The correctness of the mixtures is compared by means of sample mixtures using a gas chromatograph.

GIOVENZANA INTERNATIONAL B.V.

PHYSICAL AND ENVIRONMENTAL TEST

Impact test (hot)

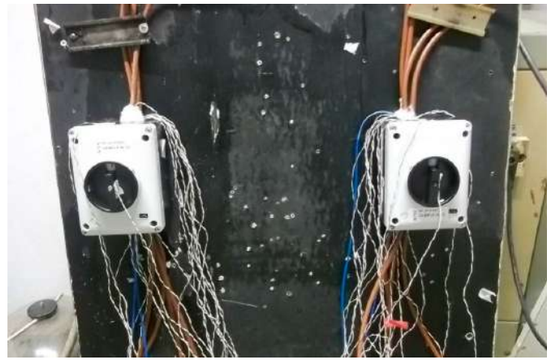
Impact test (cold)



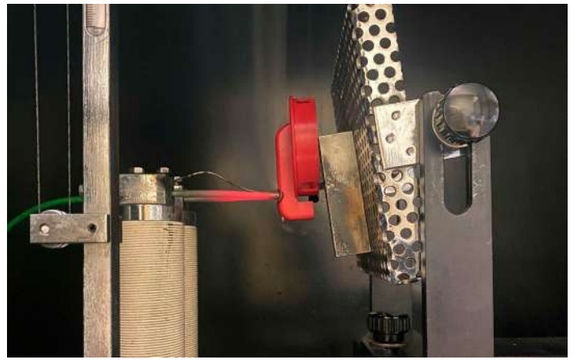
IP Dust Test

IP Test X4 (water)

IP Test X5 (water)

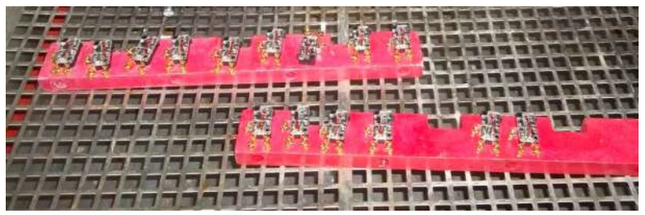


Thermal Test



Glow Wire Test

Thermal Endurance
to heat and to cold
Test



LOW VOLTAGE TEST

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1.8 - IEC ZONE SYSTEM: THE ATEX AND IECEx MARKINGS

Marking of conformity to IEC 60079 (ELECTRICAL) - IECEx marking

Construction 60079	Protection types	Gas group	T Class	EPL
Ex	db eb	IIC	T5	Gb
- 25 °C ≤ T_{amb} ≤ + 100 °C T_{amb} if different from -20°C/+40°C				

Construction 60079	Protection types	Dust Group	Max T_{sup}	EPL
Ex	tb	IIIC	T 95 °C	Db
- 25 °C ≤ T_{amb} ≤ + 100 °C T_{amb} if different from -20°C/+40°C				

Marking of conformity to ISO IEC 80079 (MECHANICAL) - IECEx marking

Construction 80079	Protection types	Gas group	T Class	EPL
Ex	h	IIC	T5	Gb
- 25 °C ≤ T_{amb} ≤ + 100 °C T_{amb} if different from -20°C/+40°C				

Mandatory marking of conformity with the ATEX directive

Equipment marking

	NOTIFIED BODY NUMBER responsible for production quality assurance		GROUP I: firedamp mines GROUP II: places with the presence of explosive atmosphere, other than mines	CAT.	GAS	DUST
CE	0051	Ex	II	2	G	D

Component marking

Directive 2014/34/EU does not require CE marking for components, it is only allowed for equipment.

COMPONENTE ELETTRICO		GRUPPO	CATEGORIA
0948	Ex	II	2G

Marking for category 3

Directive 2014/34/EU does not require the number of the ATEX Notified Body that carries out the notification of the production system. Applying the body number after the CE marking is not allowed.

ELECTRIC EQUIPMENT		GROUP	CATEGORY
CE	Ex	II	3G

ATEX marking and compliance with harmonised standards EN 60079 (ELECTRICAL)

CE 0051 Ex II 2G

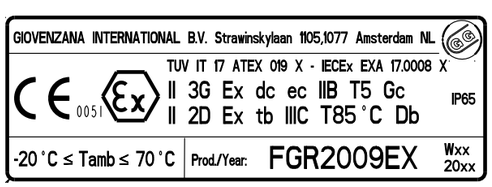
Ex db eb IIC T5 Gb

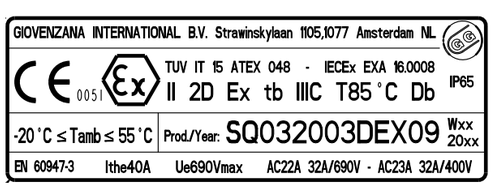
ATEX marking and compliance with harmonised standards EN ISO 80079 (MECHANICAL)

CE 0051 Ex II 2G

Ex h IIC T5 Gb

Some examples:





GIOVENZANA INTERNATIONAL B.V.

SUMMARY OF ATEX MARKING

Classification and marking of equipment for use in hazardous areas

Flammable substances	Presence of explosive atmosphere	Hazardous areas classification	Required marking: Group	Required marking: Category	Protection level (EPL)
Gases and vapours	Always, temporarily or often present	ZONE 0	II	1G	Ga
	Occasionally present	ZONE 1	II	2G	Gb
	Very seldom or only present for a short period	ZONE 2	II	3G	Gc
Dusts	Always, temporarily or often present	ZONE 20	II	1D	Da
	Occasionally present	ZONE 21	II	2D	Db
	Does not occur or only seldom for a short period	ZONE 22	II	3D	Dc

Notification Body which issues QAN

Country (example)	Code	Institute Notified Body (NB)
Italy	0051	IMQ

Example:

CE 0051

NB 12 ATEX 1007 X

II 2G Ex db IIC T6 Gb

II 2D Ex tb IIIC T80°C Db

Subdivision gases and vapours

Subgroups	Gas classification					
IIA	Ammonia - Methane Ethane - Propane	Ethyl alcohol Cyclohexane - Butane	Petrol - Diesel Fuel oil - Hexane	Acetaldehyde		
IIB	City gas Methylacrylate	Ethylene oxide Ethylene	Hydrogen sulphur	Ethyl ether		
IIC	Hydrogen	Acetylene				Carbon sulphide

Temperature classes

- T1 < 450°C
- T2 < 300°C
- T3 < 200°C
- T4 < 135°C
- T5 < 100°C
- T6 < 85°C

Use of the product according to the temperature class (T1 - T6).
The temperature class indicates the maximum temperature of the exposed surface of the product. For dust explosion it is the maximum surface temperature shown directly (e.g. T80°C).

Limitations of use

Limitations	Code
No restrictions	-
Special conditions noted in the certificate	X
This product is a component certified for use in a complete system	U

Directive:
ATEX 2014/34/EU

Code	Dusts classification
IIIA	flammable fibres
IIIB	non-conductive dusts
IIIC	conductive dusts

Example:

CE 0051

NB 12 ATEX 1007 X

II 2G Ex db IIC T6 Gb

II 2D Ex tb IIIC T80°C Db

Input protection EN 60529

IP	Protection from solids/dusts	Protection from water
0	no protection	no protection
1	protection from solid objects > 50 mm	protection against vertical drops of drops of water
2	protezione da oggetti solidi > 12.5 mm	protection from direct spray above 15° from the vertical
3	protection against solid objects > 12.5 mm	protection from direct spray above 60° from the vertical
4	protection from solid objects > 1 mm	protection against splashing from all directions
5	protection from dust - restricted entry	protection against low pressure jets from all directions
6	total protection from dust	protection against strong water jets
7	-	protection against temporary immersion
8	-	protection against long periods of immersion

[5] ta (zones 20, 21, 22) - tb (zones 21, 22) - tc (zones 22)
[6] Areas of maximum application

Protection

Protection principle	Protection type	Code	Symbol	To use in zone	EN 60079-31
Prevents transmission of the explosion outside	flame-proof explosion	Ex d		1 - 2	EN 60079-1
Prevents high temperatures and sparks	increased safety	Ex e		1 - 2	EN 60079-7
Low current / Supply voltage	intrinsec safety	Ex i [1]		0 - 1 - 2 - 20 - 21 - 22	EN 60079-11
Positive pressure device	pressurisation	Ex p		1 - 2 - 21 - 22	EN 60079-2
Segregation of ignition source from explosive atmosphere	encapsulation	Ex m [3]		0 - 1 - 2 - 20 - 21 - 22	EN 60079-18
Parts immersed in oil to isolate from explosive atmospheres	oil immersion	Ex o		1 - 2	EN 60079-6
Prevents transmission of the explosion outside	powder filling	Ex q		1 - 2	EN 60079-5
As above but for use in zone 2	"n" protection	Ex n		2	EN 60079-15
Explosion-proof powder	"t" protection	Ex t[5]	IP66	20 - 21 - 22	EN 60079-31

[1] ia (zone 0, 1, 2, 20, 21, 22) - ib (zone 1, 2, 21, 22) - ic (zone 2, 22)
[3] ma (zone 0 , 1, 2, 20, 21, 22) - mb (zone 1, 2, 21, 22) - mc (zone 2, 22)

GIOVENZANA INTERNATIONAL B.V.

1.9 - NORTH AMERICA (HAZLOC): PROTECTION TYPES AND MARKINGS

As in the IEC zone system, the level of protection of electrical equipment in the **HazLoc system** is achieved by means of "protection types". Due to the different classification of areas and equipment, the protection modes suitable for the IEC system are not always suitable for the NEC.

In North America, the NEC sets the requirements for installations and equipment allowed in classified areas.

Equipment requirements are defined by **ANSI** (American National Standards Institute) standards, and equipment must be assessed for compliance with these standards by an **NRTL** (National Recognised Testing Laboratory). An NRTL is a private company or organisation recognised by **OSHA** (Occupational Safety and Health Administration) and authorised to issue certifications and carry out tests for certain types of products and according to certain standards. For example, NRTLs are bodies such as:
- UL (Underwriters Laboratories);
- Intertek (ETL);
- CSA (Canadian Standard Association);
- FM (Factory Mutuals Approvals);

Each NRTL publishes its own standards for verifying the conformity of equipment to requirements, and ANSI recognises the standard and approves it.

For explosive atmospheres, for example, an NRTL may publish a standard to verify the requirements of a product suitable for CLASS I DIVISION 1, let's assume UL publishes UL1203. At this point ANSI approves the standard for NEC requirements for products eligible for that classification. The standard will become ANSI/UL1203 and the UL NRTL will use it to certify the product for use in a hazardous area classified CLASS 1 DIVISION 1.

Thus in North America, for each mode of protection, there may be different standards depending on the body issuing the certification.
With regard to the IEC Zone Classification Scheme, transposed in NEC 505 and 506, the reference remains the IEC 60079 standards but transposed as standards of a specific NRTL. For example, IEC 60079-0 is transposed as UL 60079-0 or CSA 22.2 No. 60079-0.

As an example, the following table shows the protection modes allowed in areas classified with the North American system for the presence of Gas: CLASS I.

CLASS I			
AREAS	**PROTECTION TECHNOLOGY**	**REFERENCE STANDARDS**	
		USA	**CANADA**
DIVISION I	Explosion proof Intrinsic Safety (2 fault) / IS Systems Purged/Pressurized (Type X or Y) **Class I Zone 0 intrinsic safety "ia"**	UL 1203 - FM3615 UL 913 - FM3610 NFPA 496 - ANSI/UL 12.01.04 - FM3620 **UL 60079-11**	CSA 22.2 no. 30 CSA 22.2 no. 157 NFPA 496 **CSA 22.2 No. 60079-11**
DIVISION 2	Hermetically sealed Nonincendive Non-sparking Purged/Pressurized (Type Z) **Techniques for Class I, Zone 0, 1, 2**	ANSI/UL 12.12.01 ANSI/UL 12.12.01 – FM3611 ANSI/UL 12.12.01 NFPA 496– ANSI/UL 12.01.04 **UL 60079-x**	CSA 22.2 No. 213 NFPA 496 **CSA 22.2 No. 60079-x**

Example of marking for gases

PROTECTION TECHNIQUE (optional except for I.S.)	PERMITTED CLASS	PERMITTED DIVISION (optional if DIV. 1, DIV.2 ALWAYS TO BE REPORTED)	PERMITTED GROUPS	MAXIMUM TEMPERATURE OF THE EQUIPMENT (optional T5 and T6)	AMBIENT TEMPERATURE (Other than -25 °C + 40 °C)
Explosionproof	**Class I,**	**Division 1,**	**Groups B, C, D**	**T5**	**-40 °C ≤ T_{amb} ≤ +60 °C**

Example of marking for combustible dusts

PROTECTION TECHNIQUE	PERMITTED CLASS	PERMITTED DIVISION (optional if DIV. 1, DIV.2 ALWAYS TO BE REPORTED)	PERMITTED GROUPS	MAXIMUM TEMPERATURE OF THE EQUIPMENT (optional T5 and T6)	AMBIENT TEMPERATURE (Other than -25 °C + 40 °C)
Dust-ignitionproof	**Class II,**	**Division 1,**	**Groups E, F, G**	**T5**	**-40 °C ≤ T_{amb} ≤ +60 °C**

Class I Zone 1 classification example

AMBIENT TEMPERATURE (Other than -25 °C + 40 °C)
Class I Zone 1 AEx de IIB+H2 T5 -40 °C ≤ T_{amb} ≤ +60 °C

GIOVENZANA INTERNATIONAL B.V.

1.10 - ATEX DIRECTIVE APPLIED TO INDUSTRIAL PRODUCTION

The ATEX directive applies to many areas of industrial production. Companies involved with the ATEX directive have a duty to ensure that they purchase certified components and equipment.
For each type of company, hazardous areas and materials that could create a potential risk have been identified.

Sector	Description	Dust	Gas
A	Food and agriculture	•	•
B	Fixtures, fittings and metal industries	•	
C	Aviation, aerospace, naval, automotive, railways	•	
D	Chemistry	•	•
E	Combustibles, fuel, energy, metallurgy	•	•
F	Research, universities and laboratories	•	•
G	Furniture, carpenters, leather processing, tanneries, textile	•	
H	Plastics and rubber	•	
I	Paper mills	•	

A - Food and agriculture

DUST GAS

Typical processes in the food industry involve the handling of materials stored in silos, resulting in the release of dust and the presence of hazardous ATEX areas. Explosive dust can form during the transport and storage of grain.
The drying, grinding and refining of agricultural and food materials is dangerous. In food industries, controlled environments are often used for sterilisation of alcoholic substances.

Companies

- Biscuits
- Pasta
- Semolina and sugar
- Plant and equipment food processors
- Coffee roasting
- Cereal and cocoa grinding companies
- Bakeries
- Distilleries and mills

Materials

- Cocoa
- Coffee
- Cereals (mixed powder)
- Wheat flour
- Soy flour
- Gelatine
- Wheat
- Milk powder
- Lactose
- Rye
- Whey
- Sugar
- Granulate
- Sugar Alcohol

B - Fixtures, fittings and metal industries

DUST

Potentially explosive atmospheres due to the presence of fine metal dusts caused by machine operations in product slots and vending machines can be dangerous. Explosive metal dusts can form in the production of stamped metal parts during surface treatment. This is especially true in the case of light metals and alloy mixtures. These metal dusts can result in an explosion hazard, conductive dusts being the most dangerous.

Companies

- Metal frames
- Metal accessories
- Profiling order
- Metal surface treatment

Materials

- Active substances
- Various chemicals
- Pharmaceutical products
- Biohazardous materials

C - Aviation, aerospace, naval, automotive, railways

DUST

Aspects of micro-dust in the machining of hi-tech components. Machining the fuselage of an aircraft. Dusts from vibration testing of electronic components. Processing of propellants in the aerospace industry. Suction of fuel from the tank. Aircraft maintenance procedures. Explosive material residues in engines Wooden boat construction, resin handling and presence of explosive fumes. Machinery operations and hydrocarbon recycling rooms.

Companies

- Aircraft construction
- Trains
- Automobile maintenance
- Precision engineering
- Electronics industry
- Aerospace
- Spray booths
- Resin treatment

Materials

- Hydrocarbons
- Propellants
- Metal powder
- Fuels
- Solvents
- Magnesium
- Zirconium
- Aluminium

D - Chemistry

DUST **GAS**

Presence of solvents and fumes during the production cycle. Production of hydrogen in chemical reactions. Transformation of materials into solid, liquid and gaseous fuels with consequent risk of creating explosive atmospheres. Use of explosive powders or liquids for the synthesis of products. Various solvents: acetate, acetylene, acetone, alcohol, ethylene, etc.

Companies

- Paints
- Colors
- Soda
- Alcohol
- Chemicals
- Solvents
- Oils

Materials

- Process chemicals products

E - Combustibles, fuel, energy, metallurgy

DUST **GAS**

Accidental spillage and extraordinary spillage operations. Hydrocarbons processed in refineries are all flammable and, depending on their flash point, can generate an explosive atmosphere even at room temperature. The environment in which oil-processing equipment is located is normally considered a hazardous area. Coke is generally used for metallurgy and power generation, it is a highly flammable organic material, and there are many combustible dust wastes.

Companies

- Petrol refining plants
- Plants which treat gases such as fuel oil and natural gas
- Metallurgy
- Electric power production

Materials

- Hydrocarbons
- LPG
- Refinery gas
- Fuels
- Metal dust
- Acids
- Fossil carbon
- Wood

F - Research, universities and laboratories

DUST **GAS**

Typical processes in the food industry involve the handling of materials stored in silos, resulting in the release of dust and the presence of hazardous ATEX areas. Explosive dust can form during the transport and storage of grain. The drying, grinding and refining of agricultural and food materials is dangerous. In food industries, controlled environments are often used for sterilisation of alcoholic substances.

Companies

- Oxygen cylinders
- Lab products
- Test or analysis benches

Materials

- Various solvents
- Ethanol
- Alcohol
- Gas cylinders
- Oxygen
- Lab products
- Electronic micropowder
- Resins
- Gallium arsenide
- Production photocells
- Dust from electric circuits
- Arsine

G - Furniture, carpenters, leather processing, tanneries, textile

DUST

Woodworking operations produce wood dust that can form explosive mixtures of dust and air. Layers of micro-dust accumulate on the walls and build up in crevices and machine rooms. Dust from sanding can also pose an explosion risk.

Companies

- Kitchens production
- Wooden furniture production
- Timber processing
- Plywood
- Chipboard
- Production of fixtures and doors
- Footwear
- Leather
- Textile plants

Materials

- Wood
- Wood flour (50% stones)
- Sawdust
- Cork
- Cellulose (93% softwood, 7% hardwood)
- Fine dust skin
- Fibers

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H - Plastic and rubber

DUST

Explosive dust can form during transport and storage of plastic or rubber granulate, in grinders, in storage systems, and dust separation. Some rubbers are made with flammable liquid solutions.

Companies

- Plastics and rubber processing

Materials

- Polymer of vinyl chloride
- Plastic micro powder

I - Paper mills

DUST

Accumulations of potentially explosive dust are created in paper processing operations, during the production cycle, particularly during loading, cutting and general processing.

Companies

- Paper production

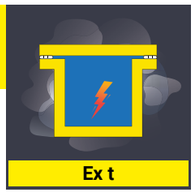
Materials

- Paper
- Cellulose
- Metal micro powder

GIOVENZANA INTERNATIONAL B.V.

REGOLUS Ex SWITCH DISCONNECTORS » SQ, SE SERIES

Low voltage three or four poles disconnector, protected by metallic enclosure and with rotating actuation, for hazardous areas.



DUST

II 2D Ex tb IIIC T85°C Db
Zone 21-22 (Dust)

FEATURES

- Switches with rotary actuation
- Current range in AC21-22-23/690V: 25 - 32 - 40 - 63 - 80 - 100 A
- Maximum voltage: 690V
- 3 - 4 poles
- Aluminium enclosure
- Painted in RAL 7035 (grey) or PANTONE 102C (yellow)
- Stainless steel screws
- Padlockable switch
- Impact resistant: 7 Joules
- Degree of protection: IP65
- Ambient temperature: -20 °C ... +55 °C

STANDARDS OF REFERENCE
SCHEME IEC
IEC 60079-0, IEC 60079-31, IEC 60947-3

CERTIFICATIONS
ATEX, IECEx

ELECTRICAL SCHEMES

1 / 0	1L1 3L2 5L3 / 2T1 4T2 6T3	1-L1 3-L2 5-L3 N / 2-T14 -T26 -T3 N
	3 POLES	4 POLES

DIRECTIVE
ATEX 2014/34/EU

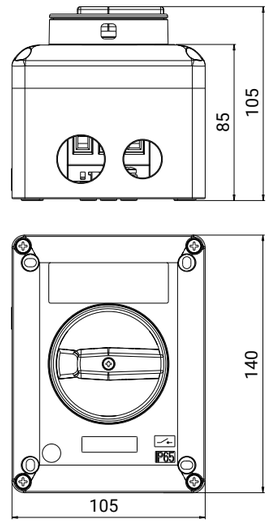
TYPE OF PROTECTION
Protection by enclosures - Ex “tb”

SQ SERIES (can be supplied with additional pole and/or auxiliary contact on request)							
CODE	POLES	ENCLOSURE	Ith [A]	Ithe [A]	AC 21A/690V [A]	AC 22A/690V [A]	AC 23A/690V [A]
SQ025003DEX09	3	EX09 - Grey	32	32	32	25	25
SQ025003DEX10	3	EX10 - Yellow	32	32	32	25	25
SQ032003DEX09	3	EX09 - Grey	40	40	40	32	32
SQ032003DEX10	3	EX10 - Yellow	40	40	40	32	32
SQ040003DEXB9	3	EX09 - Grey	63	63	63	63	50
SQ040003DEXB0	3	EX10 - Yellow	63	63	63	63	50
SQ063003DEXB9	3	EX09 - Grey	80	80	80	80	75
SQ063003DEXB0	3	EX10 - Yellow	80	80	80	80	75

SE SERIES							
CODE	POLES	ENCLOSURE	Ith [A]	Ithe [A]	AC 21A/690V [A]	AC 22A/690V [A]	AC 23A/690V [A]
SE630003BEXB9	3	EXB9 - Grey	63	63	63	63	50
SE630004BEXB9	4	EXB9 - Grey	63	63	63	63	50
SE630003BEXB0	3	EXB0 - Yellow	63	63	63	63	50
SE630004BEXB0	4	EXB0 - Yellow	63	63	63	63	50
SE800003BEXB9	3	EXB9 - Grey	86	80	80	80	60
SE800004BEXB9	4	EXB9 - Grey	86	80	80	80	60
SE800003BEXB0	3	EXB0 - Yellow	86	80	80	80	60
SE800004BEXB0	4	EXB0 - Yellow	86	80	80	80	60
SE100003BEXB9	3	EXB9 - Grey	100	86	100	86	67
SE100004BEXB9	4	EXB9 - Grey	100	86	100	86	67
SE100003BEXB0	3	EXB0 - Yellow	100	86	100	86	67
SE100004BEXB0	4	EXB0 - Yellow	100	86	100	86	67

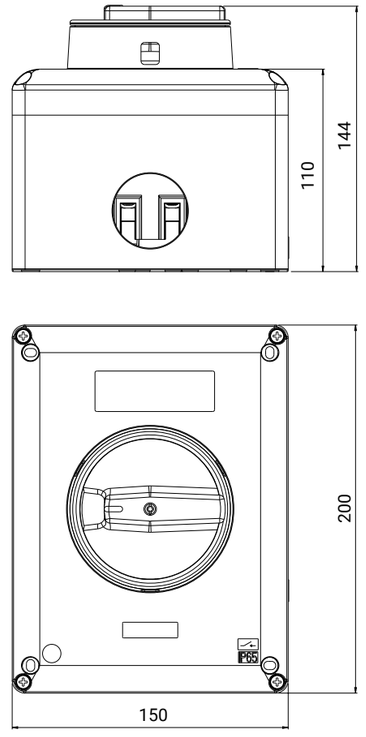
SQ025 / SQ032

2 holes for M25 cable gland +
2 holes for M20 cable gland



SQ040 / SQ063 / SE63 / SE80 / SE100

2 holes for M40 cable gland



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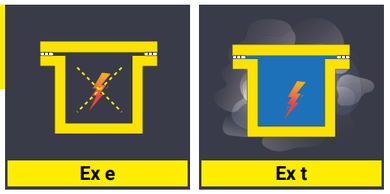
INTERNATIONAL B.V.

REGOLUS Ex ENCLOSURES
» BNA, BNB SERIES

Empty Boxes intended for fixed installation on the walls, made in cast aluminum alloy, for hazardous areas.



GAS **DUST**

II 2G Ex eb IIC Gb - II 2D Ex tb IIIC Db
Zone 1-2 (Gas) - Zone 21-22 (Dust)

FEATURES

- Aluminium enclosure
- Painted in RAL 7035 (grey) or PANTONE 102C (yellow)
- Stainless steel screws
- Impact resistant: 7 Joules
- Degree of protection: IP65
- Ambient temperature: -60 °C ... +150 °C

STANDARDS OF REFERENCE
SCHEME IEC
IEC 60079-0, IEC 60079-7, IEC 60079-31

CERTIFICATIONS
ATEX, IECEx

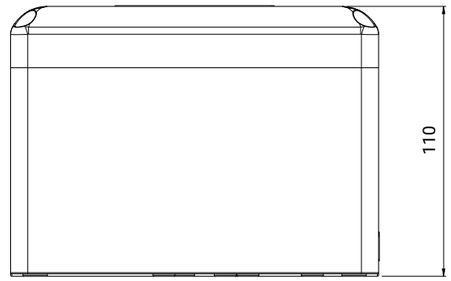
DIRECTIVE
ATEX 2014/34/UE

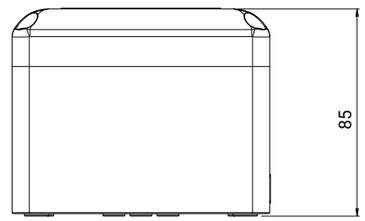
TYPE OF PROTECTION
- Increased safety (Ex “e”)
- Protection by enclosures (Ex “tb”)

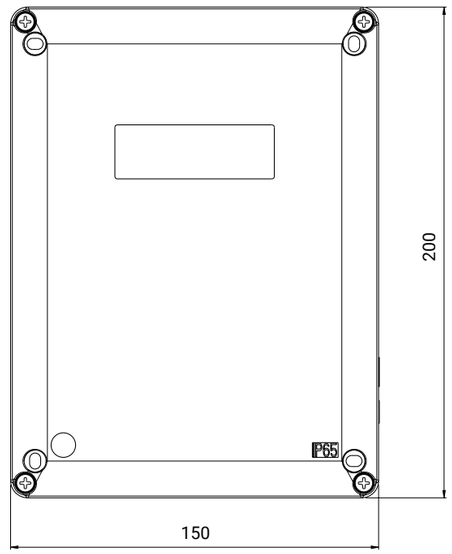
BNA / BNB SERIES		
CODE	**OVERALL DIMENSIONS**	**FINISHING COLOUR COVER/BOTTOM**
BNA/8NGEX	150 × 200 × 110 mm	Cover: grey / Bottom: black
BNA/8NYEX	150 × 200 × 110 mm	Cover: yellow / Bottom: black
BNB/8NGEX	105 × 140 × 85 mm	Cover: grey / Bottom: black
BNB/8NYEX	105 × 140 × 85 mm	Cover: yellow / Bottom: black

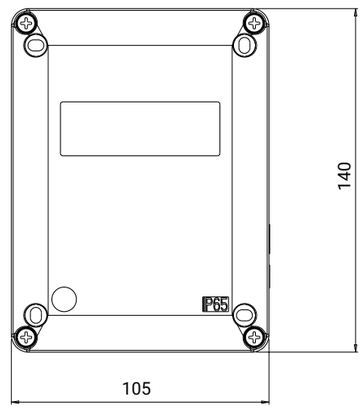
BNA SERIES **BNB SERIES**

The permissible bores for housing entry are given in the instruction manual.









GIOVENZANA INTERNATIONAL B.V.

PHOENIX Ex CAM SWITCHES » P0, PX, C0, CX SERIES

Ex t

DUST

Low voltage cam switches protected by metallic enclosure and with rotating actuation, for hazardous areas.

II 2D Ex tb IIIC T85°C Db
Zone 21-22 (Dust)

FEATURES

- Various configurations of contacts and poles number - Labelling "0 - I"
- Aluminium enclosure
- Painted in RAL 7035 (grey) or PANTONE 102C (yellow)
- Stainless steel screws
- Padlockable switch
- Available product lines:
  - P0 & PX series - 12A, 16A, 20A (max 3 wafers)
  - C0 & CX series - 25A, 32A, 40A (max 2 wafers)
- Impact resistant: 7 Joules
- Degree of protection: IP65
- Ambient temperature: -20°C ... +55°C
- On request we can provide special electrical configurations (e.g.: electrical locks, no. of positions, switching angles switching angles, etc.).

STANDARDS OF REFERENCE
SCHEME IEC

IEC 60079-0, IEC 60079-31, IEC 60947-3

CERTIFICATIONS

ATEX, IECEx

DIRECTIVE

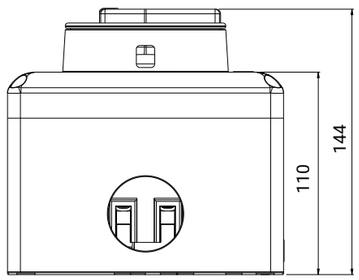
ATEX 2014/34/EU

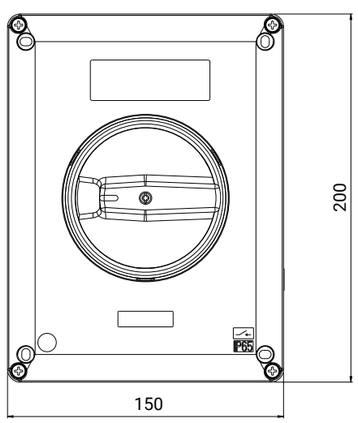
TYPE OF PROTECTION

Protection by enclosures - Ex “tb”

P0 / PX / C0 / CX SERIES

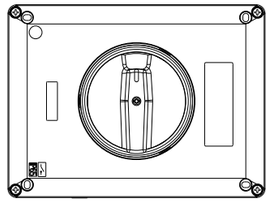
2 holes for M40 cable gland



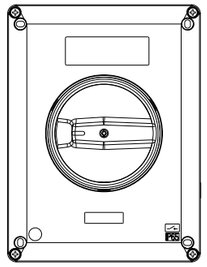


ORDER FORM FOR SPECIAL SCHEMES ON REQUEST

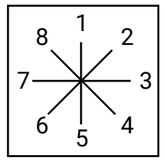
- For the P0 - PX series the maximum number of poles is 6 (3 wafers).
- For C0 - CX series the maximum number of poles is 4 (2 wafers).
- Padlockable only in 0/OFF position (max 3 padlocks).



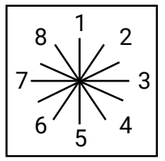
☐ HORIZONTAL position with 0/OFF at 0°



☐ VERTICAL position with 0/OFF at - 90°

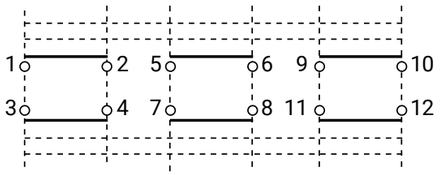


☐ 45° ☐ 90°

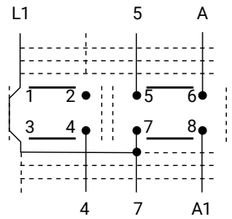


☐ 30° ☐ 60°

POSITION	DESCRIPTION	POSITION	DESCRIPTION
1		7	
2		8	
3		9	
4		10	
5		11	
6		12	



EXAMPLE



WAFER	CONT.	POSITIONS	
3	11 - 12		
	9 - 10		
2	7 - 8		
	5 - 6		
1	3 - 4		
	1 - 2		

EXAMPLE

WAFER	CONT.	POS.		
		1	2	3
2	7 - 8			X
	5 - 6		X	X
1	3 - 4		X	
	1 - 2		X	

☐ Opened contact

X Closed contact

X X Closed contact without continuity

X X Closed contact with continuity

1 2 Spring return

X / X Short-circuited contacts

X Opened contact with early closure

	CATEGORY	AMP/kW	VOLT
Rated current Ie	[ ] AC-21A	A	V
	[ ] AC-22A	A	V
Nominal voltage Ue	[ ] AC-23A [ ] 1F [ ] 3F	kW	V
	[ ] AC-3 [ ] 1F [ ] 3F	kW	V

Series	
Actuator	[ ] Grey cover / Black knob (B9) [ ] Yellow cover / Black knob (B0)
Notes	
Company	
Contact details	elephone: E-mail: Quantity: Expiry date: Order number:

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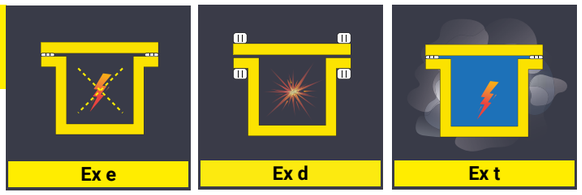
INTERNATIONAL B.V.

ROTARY GEAR LIMIT SWICHES
» FGR2 Ex SERIES



GAS DUST

Rotary gear limit switch FGR2 Ex used to control the number of rotation or direction angle of industrial and building machines, for hazardous areas.

II 3G Ex dc ec IIB T5 Gc
II 2D Ex tb IIIC T85°C Db
Zona 2 (Gas) - Zona 21 (Dust)

FEATURES

- Ratio: from 012 to 200
- With single or rear shaft
- With 4 or 6 microswitches
- Stainless steel screws
- Impact resistant: 4 Joules (Low mechanical risk)
- Degree of protection: IP65
- Ambient temperature: -20°C ... +70°C

STANDARDS OF REFERENCE
SCHEME IEC
IEC 60079-0, IEC 60079-31, IEC 60079-1, IEC 60079-7

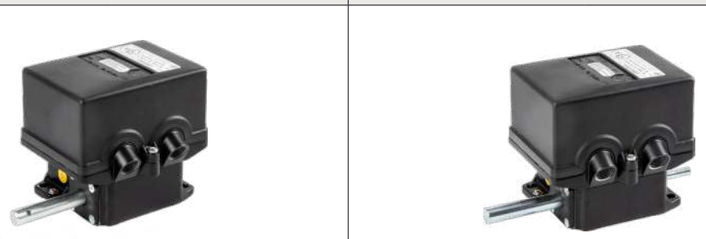
CERTIFICATIONS
ATEX, IECEx

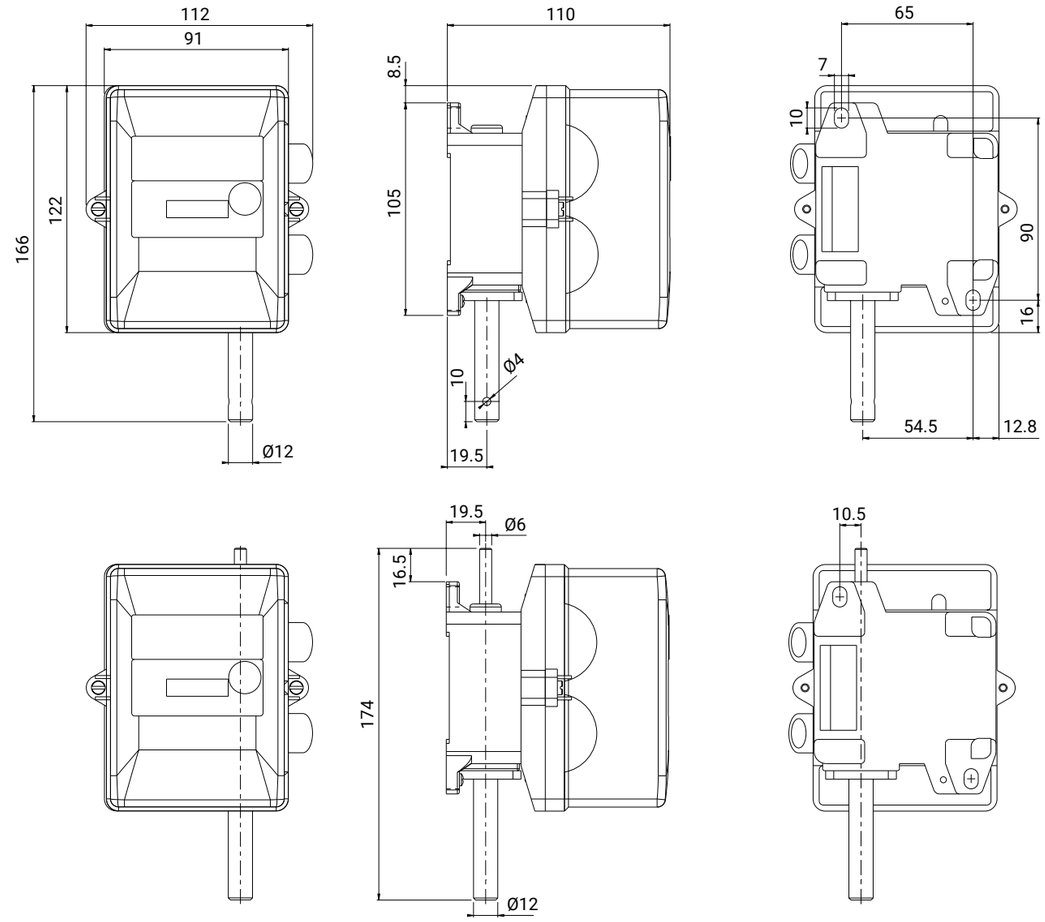
DIRECTIVE
ATEX 2014/34/EU

TYPE OF PROTECTION
- Limited breathing housing (Ex “dc ec”)
- Protection by enclosures (Ex “tb”)

Housing	Aluminium housing Antistatic plastic cover
Ratio	012 - 033 - 050 - 100 - 200
Protection class	IP65
Shaft Type	Steel mounted on ball bearings Version available with coaxial shaft
Fixing type	Bottom with stainless steel screws Front (flanged with FLG accessory)
Micro switches	MFI-Ex Series Max 6 - micrometric adjustment
Cam block	Self-lubricating and transparent support for easy viewing of the cam
Cable entry	M16 (max 2) not included
Options	Available 15 pinions
Rated operational current	8 A (1 A)
Ambient temperature	-20°C ... +70°C

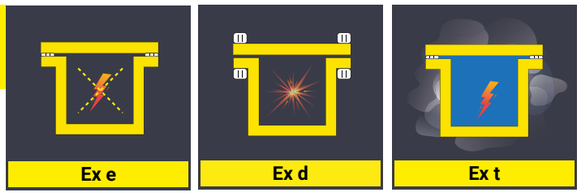
FGR2 Ex SERIES

	SINGLE SHAFT		REAR SHAFT	
				
RATIO	**4 MICRO SWITCHES**	**6 MICRO SWITCHES**	**4 MICRO SWITCHES**	**6 MICRO SWITCHES**
				
012	**FGR2006EX**	**FGR20066EX**	**FGR2006BEX**	**FGR2006B6EX**
033	**FGR2007EX**	**FGR20076EX**	**FGR2007BEX**	**FGR2007B6EX**
050	**FGR2008EX**	**FGR20086EX**	**FGR2008BEX**	**FGR2008B6EX**
100	**FGR2009EX**	**FGR20096EX**	**FGR2009BEX**	**FGR2009B6EX**
200	**FGR2010EX**	**FGR20106EX**	**FGR2010BEX**	**FGR2010B6EX**



GIOVENZANA
INTERNATIONAL B.V.

THERMOPLASTIC PRE-WIRED LIMIT SWITCHES » FCT Ex SERIES



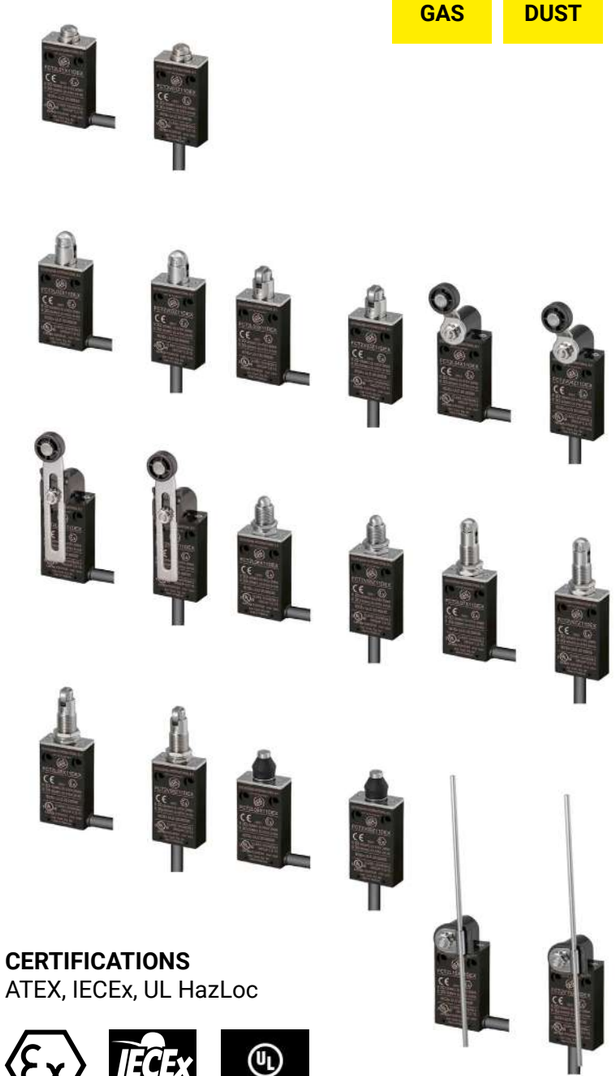
GAS DUST

Thermoplastic pre-wired limit switches with an indissociable cable for hazardous areas.

II 3G Ex dc ec IIB T5 Gc
II 2D Ex tb IIIC T 95°C Db
Class I Division 2 Groups C, D T5
Zona 2 (Gas) - Zona 21-22 (Dust)

FEATURES

- Horizontal or vertical input cable
- 10 different types of actuators
- 2 different types of internal microswitches, both with NO and NC contacts:
  - **SLOW-ACTING CONTACT ELEMENTS (X11):** the contact element of a device for manual or automatic control circuits where speed of movement of the contact depends on the speed of motion of the actuator.
  - **CONTACT ELEMENTS ACTING INDEPENDENTLY (Z11):** the contact element of a device for manual or automatic control circuits where the speed of motion of the contact is virtually independent of the speed of motion of the actuator. Commonly called “quick trigger” the electrical behavior of these elements means that the contact is fast in order even in the slow movements of the actuator.
- Ambiental temperature: -25°C ... +60°C
- Impact resistant: 4 Joules (Low mechanical risk)
- Degree of protection:
  - IP 6X and IPX4 according to IEC 60079 for hazardous areas;
  - IP67 according to IEC 60529 for non-hazardous areas.



STANDARDS OF REFERENCE
SCHEME IEC
IEC 60079-0, IEC 60079-1, IEC 60079-7, IEC 60079-31

DIRECTIVE
ATEX 2014/34/EU

CERTIFICATIONS
ATEX, IECEx, UL HazLoc

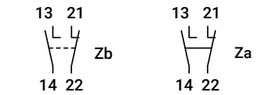
ELECTRIC DATA	
Industrial reference standard	Comply to IEC EN 60947-5-1
Ui	500 V AC/DC
Ith	10 A

Maximum load ratings for use in classified areas			
Equipment with slow-action contact (Models FCT..X11..)			
Categorisation IEC EN 60487-5-1 - AC15			
Ue	120 V	240 V	400 V
Ie	6 A	3 A	2 A
Categorisation IEC EN 60487-5-1 - DC13			
Ue	24 V	125 V	240 V
Ie	2.5 A	0.55 A	0.27 A
UL508			
A300			
Q300			

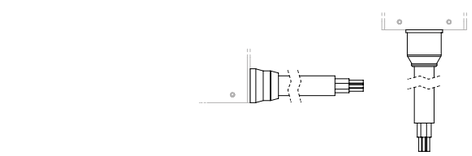
Equipment with snap-action contact (Models FCT..Z11..)			
Categorisation IEC EN 60487-5-1 - AC15			
Ue	120 V	240 V	400 V
Ie	3 A	4 A	3 A
Categorisation IEC EN 60487-5-1 - DC13			
Ue	24 V	125 V	240 V
Ie	2.5 A	0.55 A	0.27 A
UL508			
A300			
Q300			

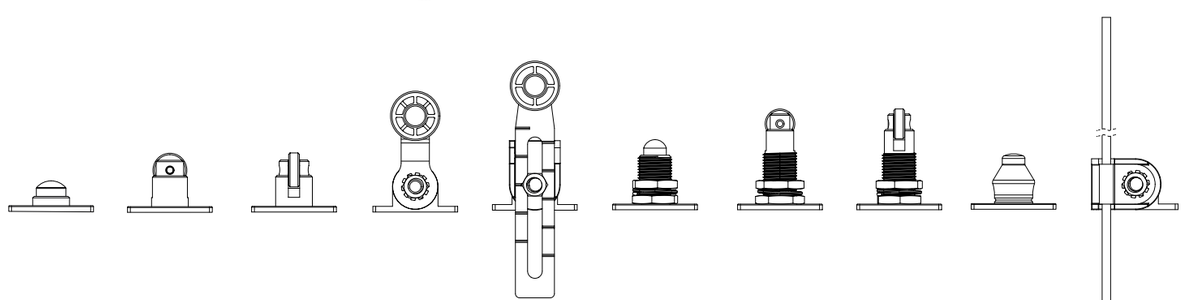
CODES TABLE

F C T			0 1		1 1	D	E X
SERIES	**CONNECTION TYPE**	**CONNECTION ORIENTATION**	**ACTUATOR**		**CONTACT TYPE**	**HOUSING**	**MARKING**
FCT thermoplastic limit switches	**2** pre-wired with 2 m cable (standard) **x** pre-wired with custom cable lenght (lenght = **x** meters)	**L** horizontal output **V** vertical output	**01** steel end plunger **02** roller plunger **03** 90° roller plunger **04** metal revolving lever and Ø17.5 nylon roller **05** adjustable metal revolving lever and Ø17.5 nylon roller **06** steel end plunger with threaded flange **07** roller plunger with threaded flange **08** 90° roller plunger with threaded flange **09** steel end plunger with rubber protection **10** rod lever type		**X11** 1NO+1NC slow action Zb **Z11** 1NO+1NC snap action Za	**D** plastic with 20 mm fixing holes spacing	**ATEX** **IECEx** **UL HazLoc**

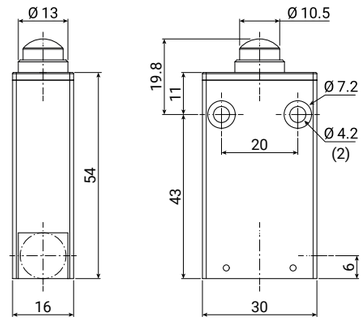


X11 **Z11**

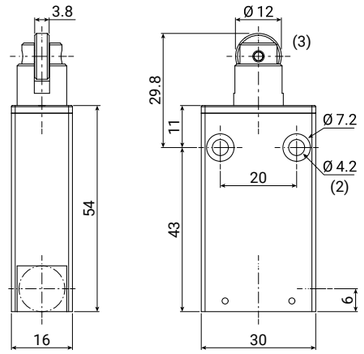




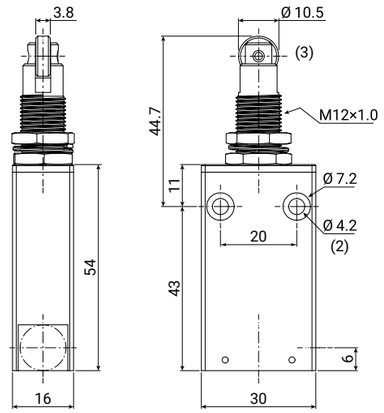
01 **02** **03** **04** **05** **06** **07** **08** **09** **10**



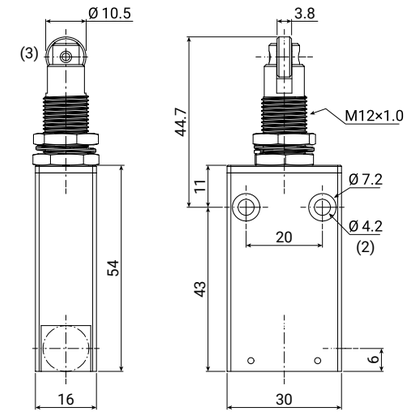
01 steel end plunger



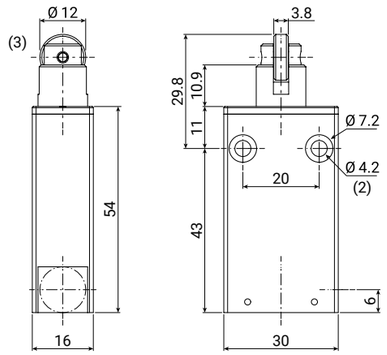
02 roller plunger



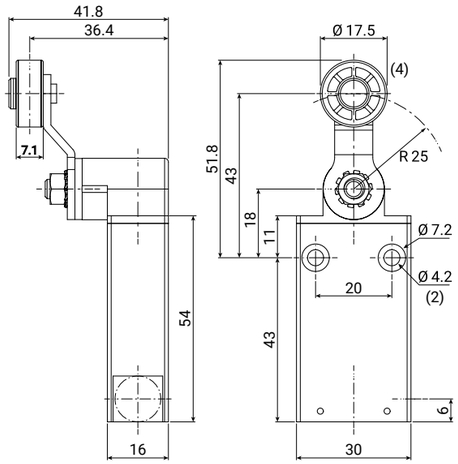
07 roller plunger with threaded flange



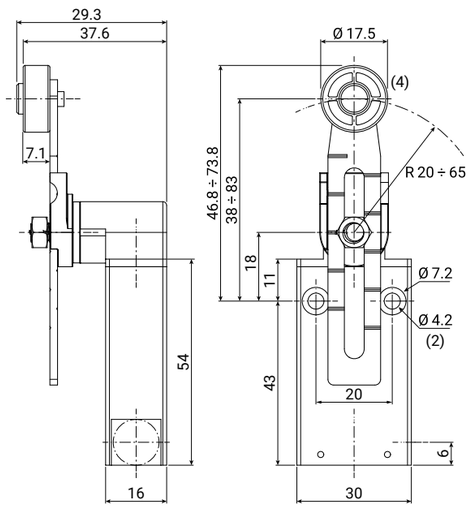
08 90° roller plunger with threaded flange



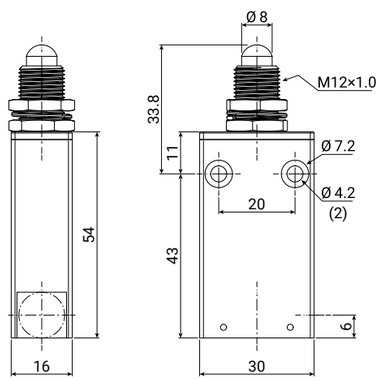
03 90° roller plunger



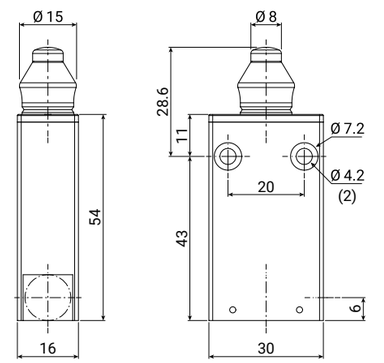
04 metal revolving lever and Ø17.5 nylon roller



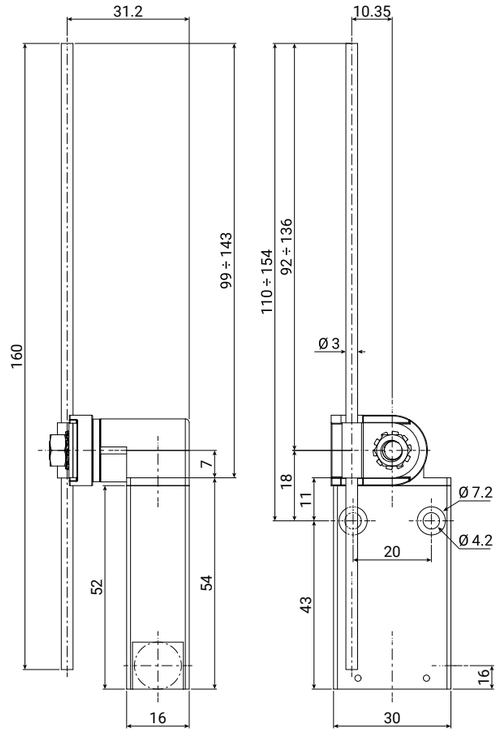
05 adjustable metal revolving lever and Ø17.5 nylon roller



06 steel end plunger with threaded flange



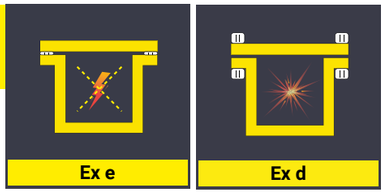
09 steel end plunger with rubber protection



10 rod lever type

GIOVENZANA INTERNATIONAL B.V.

MICROSWITCHES
» MFI Ex SERIES



GAS

Microswitch components to be used as NO or NC contact for hazardous areas.

II 3G Ex dc ec IIB Gc
Zone 2 (Gas)
Class I Division 2 Groups C, D

FEATURES

- High reliability snap-action operation
- Equipped with self-cleaning silver alloy switch contacts
- Available with pin plunger or different types of actuator lever
- Service Temperature: -20°C ... +89°C

STANDARDS OF REFERENCE
SCHEME IEC
IEC 60079-0, IEC 60079-1, IEC 60079-7, UL121201

CERTIFICATIONS
ATEX, IECEx, UL HazLoc

DIRECTIVE
ATEX 2014/34/EU

TYPE OF PROTECTION
- Restricted breathing case (Ex “dc ec”)

GENERAL CHARACTERISTICS	
According to	IEC / EN 61058
Working temperature	-20 °C ... +89 °C North America only -36 °F ... +126 °F
Mechanical life	1 × 10^6 cycles/min
Electrical life	1 × 10^5 cycles/min
Terminal type	Screw terminals

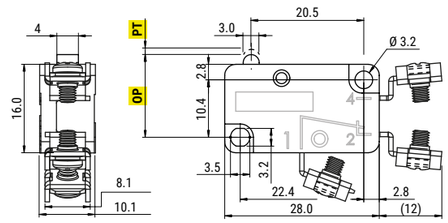
ELECTRICAL CHARACTERISTICS	
Rated thermal current Ith	8 A
Rated insulated voltage Ui	250 V
Rated impulse withstand voltage Uimp	1500 V
Rated operating current Ie	Resistive load: 8 A - 250 V Inductive load: 1A - 250 V
Electric shock protection	Class II
Pollution class	2

Micro switches with screw terminals

1 NC - 1 NO

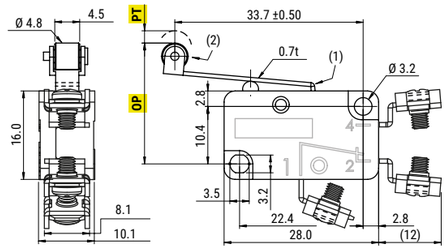
SNAP ACTION

MFI.Ex Pin plunger



OF	max	5.1	N
RF	min	1.9	N
PT	max	1.4	mm
OT	min	0.8	mm
OP		14.4 ±0.5	mm

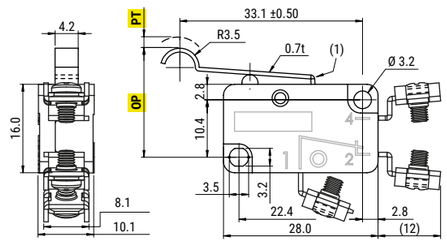
MFI.1Ex Long roller lever



OF	max	3.2	N
RF	min	1.0	N
PT	max	3.3	mm
OT	min	0.8	mm
OP		20.3 ±1.2	mm

(1) Lever in stainless steel
(2) Roller in plastic

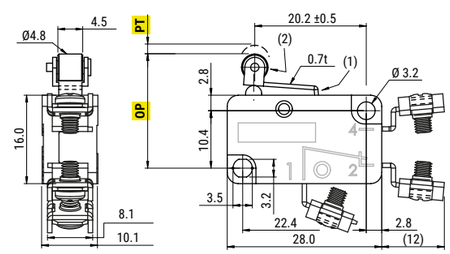
MFI.2Ex Simulated roller lever



OF	max	3.2	N
RF	min	1.0	N
PT	max	3.3	mm
OT	min	0.8	mm
OP		18.4 ±1.2	mm

(1) Lever in stainless steel

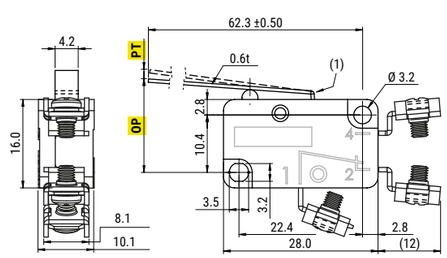
MFI.3Ex Roller lever



OF	max	5.1	N
RF	min	1.9	N
PT	max	1.4	mm
OT	min	0.6	mm
OP		20.3 ±0.8	mm

(1) Lever in stainless steel
(2) Roller in plastic

MFI.4Ex Long lever



OF	max	1.3	N
RF	min	0.15	N
PT	max	7.6	mm
OT	min	2.2	mm
OP		15.1 ±2.6	mm

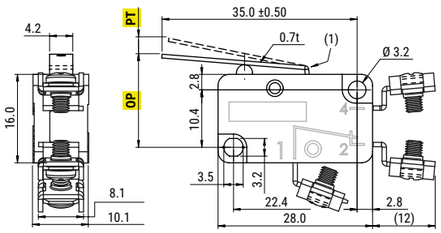
(1) Lever in stainless steel

Micro switches with screw terminals

1 NC - 1 NO

SNAP ACTION

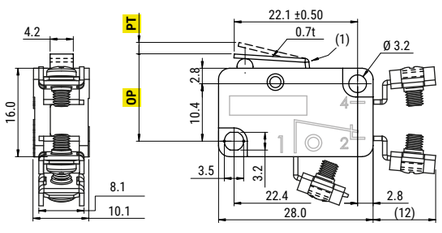
MFI.5Ex Lever



OF	max	3.2	N
RF	min	1.2	N
PT	max	3.3	mm
OT	min	0.8	mm
OP		15.1 ±1.2	mm

(1) Lever in stainless steel

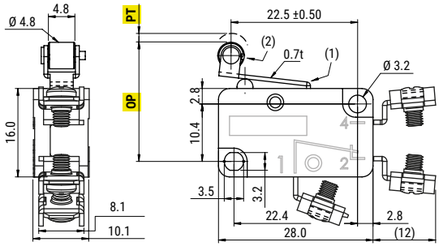
MFI.6Ex Short lever



OF	max	5.1	N
RF	min	1.9	N
PT	max	1.6	mm
OT	min	0.6	mm
OP		15.1 ±0.6	mm

(1) Lever in stainless steel

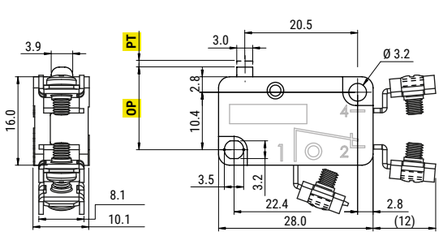
MFI.7Ex Roller lever L = 16 mm



OF	max	4.5	N
RF	min	1.9	N
PT	max	1.8	mm
OT	min	0.8	mm
OP		21.1 ±0.6	mm

(1) Lever in stainless steel
(2) Roller in plastic

MFI.8Ex Pin plunger 90°



OF	max	5.1	N
RF	min	1.9	N
PT	max	1.4	mm
OT	min	0.8	mm
OP		14.4 ±0.5	mm

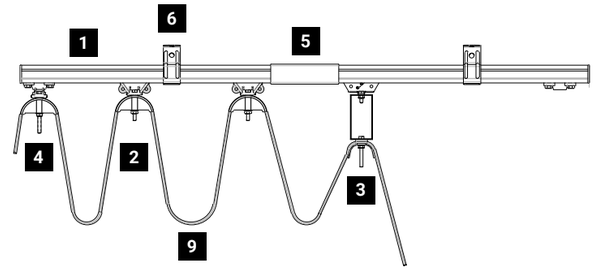
GIOVENZANA INTERNATIONAL B.V.

FEESTON SYSTEM Ex » 30, 41 Ex SERIES

GAS **DUST**

The Festoon-Ex mechanical system is composed by the different kind of trolleys able to transfer cables moving it in linear translation, for hazardous areas.
The trolleys are equipped with shaped saddle able to sustain the cables that leanings against the saddle itself forming a curve.

II 2G Ex h IIB T5 Gb - II 2D Ex h IIIC T85°C Db Zone 1-2 (Gas) - Zone 21-22 (Dust)



NR.	COMPONENT	DESCRIPTION
1	**C-RAIL BAR**	In galvanized steel
2	**TROLLEY**	Supports the cable
3	**TOWING TROLLEY**	Connects to the mobile device and allows the movement
4	**HEAD CLAMP**	Cable-supporting element without movement
5	**JOINT**	Connects two C-rail bars
6	**SUPPORT**	Holds the C-rail bar
7	**END STOP**	Prevents the exit of the trolley from the C-rail bar
8	**END CAP**	Closes and protects the C-rail bar
9	**CABLE**	Transmits the energy

FEATURES

- Available the 30 and 41 lines composed of a“C” bar fixed along the crane’s axis of movement.
- The cable is supported by trolleys that slide hanging from the bar to“C”.
- Safety: the cables are flame resistant, the conductors are completely protected.
- Can be used for straight tracks such as curved tracks, for internal and external applications.
- Easy installation.
- Line maintenance is extremely low.
- Both lines 30 and 41 offer a complete selection of articles and accessories to customize the line according to customer specifications.
- Ambient Temperature: -25°C ... +80°C

STANDARDS OF REFERENCE
SCHEME IEC
EN ISO 80079-36

DIRECTIVE
ATEX 2014/34/EU

CERTIFICATIONS
ATEX, IECEx, EAC-Ex

CRANE TECHNOLOGY

Cranes and Hoists
Recycling plans
Galvanized plants

PRODUCTION AUTOMATION

Electric systems
Automated conveyors

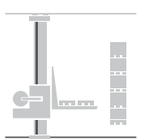
BMU

Building maintenance units
Airport and terminal stations
Skyscrapers
Cleanroom technology

PORT TECHNOLOGY

RTG cranes
STG cranes

STORAGE

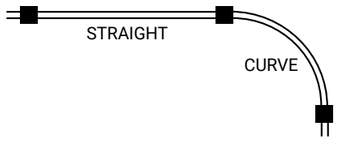


High-bay warehouses
Automated storage

GIOVENZANA
INTERNATIONAL B.V.

C-RAIL BAR			
SERIES	**BAR HEIGHT**	**LOAD CAPACITY**	**MATERIAL**
30 Ex	30 mm	100 kg/m	Galvanized steel
41 Ex	41 mm	140 kg/m	

AVAILABLE MODULES	
STRAIGHT	4 meters
CURVE	90° curve - radius 1.5 meters (only for line 41 Ex)



30 EX SERIES

	CODE	DESCRIPTION
	**30607001**	"C" bar of 4 metres
	**30607002**	Joint
	**30607003**	Track support bracket
	**30607017**	Track support bracket, Ceiling fixing
	**30607004**	Support arm bracket, bracket fixing
	**30607015**	End cap

	CODE	DESCRIPTION
	**30607016**	Cable clamp
	**30607005EX**	End stop
	30607007EX	Towing trolley single execution
	**30607010EX**	Steel trolley for flat cable Saddle: 68 mm
	**30607011EX**	PA Trolley for flat cable Saddle: 55 mm
	**30607021EX**	Trolley for round cable

30 EX SERIES

	CODE	DESCRIPTION
	**30607022EX**	Tilting trolley for round cable Ø26-40
	**30607020EX**	Head clamp Saddle: 55 mm
	30607006EX	Head clamp Saddle: 76 mm
	**30607025EX**	Accessory for round cable trolley Ø10-25
	**30607026EX**	Accessory for round cable trolley Ø26-40
	**30607023EX**	Tilting towing trolley for round cable Ø26-40
	**30607029EX**	Trolley without socket/plug

C-RAIL BAR			
SERIES	**BAR HEIGHT**	**LOAD CAPACITY**	**MATERIAL**
30 Ex	30 mm	100 kg/m	Galvanized steel
41 Ex	41 mm	140 kg/m	

41 EX SERIES

	CODE	DESCRIPTION
	**30602001/4**	"C" bar of 4 metres
	**30602002**	Single joint
	**30602034**	Double joint
	**30602003**	Track support bracket
	**30602004**	Track support bracket, ceiling fixing
	**30602038EX**	End stop
	**30602044EX**	Tilting trolley for round cable Ø10-25

	CODICE	DESCRIZIONE
	**30602045EX**	Tilting trolley for round cable Ø26-40
	**30602091EX**	Towing trolley single execution Saddle: 68 mm
	**30602020EX**	Towing trolley double execution Saddle: 68 mm
	**30602086EX**	Steel trolley for flat cable Saddle: 68 mm
	**30602071EX**	Head clamp Saddle: 55 mm
	**30602072EX**	Head clamp Saddle: 76 mm

GIOVENZANA INTERNATIONAL B.V.

LOCAL CONTROL STATIONS
» CS**S/A/G*****EX.. SERIES

With EX e ENCLOSURE
Suitable for installation in Zone: 1, 2, 21, 22

GAS **DUST**

AISI 316L | **Aluminium Alloy** | **GRP**

Equipment for explosive GAS and DUST atmospheres, having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Ideal solutions for efficient operation and monitoring of multiple electrical circuits and machinery in explosion hazardous areas.
Designed to meet the requirements for **ON and OFF-SHORE use**, in petrochemical and marine applications and for any other industry where an explosive atmosphere may be present.
The product is fully customizable in size and material of the enclosure, number of holes, type of operators.

It can be equipped with following **Ex de certified components**:

- Contacts and operation heads;
- Emergency push buttons;
- Signal lamps with or without push button;
- Measuring instruments: ammeters, voltmeters, millameters;
- Circuit breaker, contactors, miniature relays, busbars;
- Load isolation switches with handle;
- Rotary switches;
- Operation Windows;
- Pressing Line Terminals.

Our technical department will support you in designing the best solution according to your needs and within the limits of the certificate.

LOCAL CONTROL STATIONS » CS**S/A/G*****EX.. SERIES
GENERAL FEATURES

Materials	Stainless steel AISI 316L Aluminium with low content of copper GRP (Glassfiber Reinforced Polyester)
Surface treatment	Stainless steel: Acid treatment (pickling) Aluminium: Standard with polyester powder coating RAL 7001
Optional accessories depending of enclosure material	• Electropolish treatment (Stainless Steel only); • Side gland plates (Stainless Steel only); • Hinges; • Drain/breather valve; • Traffolyte/Stainless steel certificate label; • Internal mounting plate; • Locking facility (Stainless Steel only); • Earth continuity plates (GRP only); • Passing through earth bolt.
Mechanical data	
Degree of protection	IP66 / IP67
Ambient temperature range	-50°C to 95°C (depending on the component used) Other possible ranges are with: • min temperature: -50°C to -20°C • max temperature of: 40°C to 95°C
Body	CS/JB**A/G*****EX Series Copper-free aluminium / GRP CS/JB** S******EX AISI 316L stainless steel
Hardware, screws and locking devices	AISI 316L stainless steel
Electrical data	Depending on mounted components.
Temperature Class	T6 (T85°C), T5 (T100°C), T4 (135°C) (depending on the component used)
Marking	**Global (IECEx):** Ex ia IIC/IIB T6/T5/T4 Ga2 or Ex eb IIC/IIB T6/T5/T4 Gb1 or Ex e IIC/IIB T6/T5/T4 Gb1 or Ex db eb ia/ib mb [3] IIC/IIB T6/T5/T4 Gb1 and/or Ex tb IIIC T85°C/T100°C/T135°C Db **Europe (ATEX)** II 1 G Ex ia IIC/IIB T6/T5/T4 Ga2 or II 2 G Ex eb IIC/IIB T6/T5/T4 Gb1 or II 2(1) G Ex db eb ia/ib mb [3] IIC/IIB T6/T5/T4 Gb1 or II 2G (1D) Ex db e ia/ib mb [Ex iaD] IIC/IIB T6/T5/T4 Gb1 and/or II 2 D Ex tb IIIC T85°C/T100°C/T135°C Db

LOCAL CONTROL STATIONS » CS**S/A/G*****EX.. SERIES
GENERAL FEATURES

Notes	1) Others type of protection additional to Ex e/eb depending to the components actually mounted. 2) In case of enclosures containing Ex e/Ex eb terminals and/or Ex ia Ga already certified components (with compatible marking) only. 3) Associated equipment protection depending on the components actually mounted (see lists): e.g. [ia/ib Ga/ia IIIC Da] and/or [ia IIIC Da] or [ia/ib/ia Ga/ia IIIC Da] and/or [ia/ib/ia Ga] [ia IIIC Da]
Standard certificate label	Made by self adhesive UV and corrosion resistant polyester, approved by certified Laboratory.
Compliant with	IEC 60079-0 & EN IEC 60079-0 - Equipment - General requirement IEC 60079-1 & EN IEC 60079-1 - Equipment protection by flameproof enclosures "d" IEC 60079-7 & EN IEC 60079-7 - Equipment protection by increased safety "e" IEC 60079-11 & EN IEC 60079-11 - Equipment protection by intrinsic safety "i" IEC 60079-18 & EN 60079-18 - Equipment protection by encapsulation "m" IEC 60079-31 & EN 60079-31 - Equipment dust ignition protection by enclosure "t"
Enclosure and components	**ENCLOSURES** **Type of protection Ex eb:** It provides an impact resistant enclosure for electrical equipment and ensures that the contents will not produce a spark, temperature or current creepage that could ignite the external flammable atmosphere in a hazardous area zone, location or workspace. **Type of protection Ex tb:** It avoids combustible dust (IIIC) penetration into the enclosure and ensures surface temperature limitation for use in explosive dust atmospheres. **COMPONENTS** **Type of protection Ex db:** Electric equipment is installed in enclosure suitable to withstand the pressure raised during the internal explosion and avoids flame transmission to the external potentially explosive atmosphere. **Type of protection Ex ia / ib:** The energy of the circuit which could be capable of igniting a potentially explosive atmosphere is limited so that neither sparking nor heating of the electrical components can ignite the surrounding potentially explosive atmosphere. **Type of protection Ex mb:** Encapsulation allows the separation of the alive parts from the explosive atmosphere.

GIOVENZANA INTERNATIONAL B.V.

JUNCTION BOXES » JB**S/A/G*****EX.. SERIES

With EX e ENCLOSURE
Suitable for installation in Zone: 1, 2, 21, 22

Ex e | Ex t

GAS | DUST

AISI 316L | Aluminium Alloy | GRP

Equipment for explosive GAS and DUST atmospheres, having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.
Ideal solutions for distribution of multiple electrical circuits in explosion hazardous areas.
Designed to meet the requirements for **ON and OFF-SHORE use**, in petrochemical and marine applications and for any other industry where an explosive atmosphere may be present.

- **Fully customizable** for enclosure size and material, number of holes and mechanical machining.
- **Suitable for the housing Ex e/eb and Ex i terminals** and can be supplied with internal mounting plate to facilitate terminal board mounting.
- Maximum numbers of terminals varies according to: terminals section and current, enclosure size, operating temperature and required temperature class.

Our technical department will support you in designing the best solution according to your needs and within the limits of the certificate.

JUNCTION BOXES » JB**S/A/G*****EX.. SERIES GENERAL FEATURES

Materials	Stainless steel AISI-316L Aluminium with low content of copper GRP (Glassfiber Reinforced Polyester)
Surface treatment	Stainless steel: Acid treatment (pickling) Aluminium: Standard with polyester powder coating RAL 7001
Optional accessories depending of enclosure material	• Electropolish treatment (Stainless Steel only); • Side gland plates (Stainless Steel only); • Hinges (GRP and Aluminium); • Drain/breather valve; • Traffolyte/Stainless steel certificate label; • Internal mounting plate; • Locking facility (Stainless Steel only); • Earth continuity plates (GRP only); • Passing through earth bolt.
Mechanical data	
Degree of protection	IP66 / IP67
Ambient temperature range	-50°C to 95°C (depending on the component used) Other possible ranges are with: • min temperature: -50°C to -20 °C • max temperature of: 40 °C to 95 °C
Body	CS/JB**A/G*****EX Series Copper-free aluminium / GRP CS/JB** S******EX AISI316L stainless steel
Hardware, screws and locking devices	AISI316L stainless steel
Electrical data	Depending on mounted components.
Temperature Class	T6 (T85°C), T5 (T100°C), T4 (135°C) (depending on the component used)
Marking	**Global (IECEx):** Ex ia IIC/IIB T6/T5/T4 Ga2 or Ex eb IIC/IIB T6/T5/T4 Gb1 or Ex e IIC/IIB T6/T5/T4 Gb1 or Ex db eb ia/ib mb [3] IIC/IIB T6/T5/T4 Gb1 and/or Ex tb IIIC T85°C/T100°C/T135°C Db **Europe (ATEX)** II 1 G Ex ia IIC/IIB T6/T5/T4 Ga2 or II 2 G Ex eb IIC/IIB T6/T5/T4 Gb1 or II 2(1) G Ex db eb ia/ib mb [3] IIC/IIB T6/T5/T4 Gb1 or II 2G (1D) Ex db e ia/ib mb [Ex iaD] IIC/IIB T6/T5/T4 Gb1 and/or II 2 D Ex tb IIIC T85°C/T100°C/T135°C Db

JUNCTION BOXES » JB**S/A/G*****EX.. SERIES
GENERAL FEATURES

Notes	1) Others type of protection additional to Ex e/eb depending to the components actually mounted. 2) In case of enclosures containing Ex e/Ex eb terminals and/or Ex ia Ga already certified components (with compatible marking) only. 3) Associated equipment protection depending on the components actually mounted (see lists): e.g. [ia/ib Ga/ia IIIC Da] and/or [ia IIIC Da] or [ia/ib/ia Ga/ia IIIC Da] and/or [ia/ib/ia Ga] [ia IIIC Da]
Standard certificate label	Made by self adhesive UV and corrosion resistant polyester, approved by certified Laboratory.
Compliant with	IEC 60079-0 & EN IEC 60079-0 - Equipment - General requirement IEC 60079-1 & EN IEC 60079-1 - Equipment protection by flameproof enclosures 'd' IEC 60079-7 & EN IEC 60079-7 - Equipment protection by increased safety "e" IEC 60079-11 & EN IEC 60079-11 - Equipment protection by intrinsic safety 'i' IEC 60079-18 & EN 60079-18 - Equipment protection by encapsulation "m" IEC 60079-31 & EN 60079-31 - Equipment dust ignition protection by enclosure "t"
Enclosure and components	**ENCLOSURES** **Type of protection Ex eb:** It provides an impact resistant enclosure for electrical equipment and ensures that the contents will not produce a spark, temperature or current creepage that could ignite the external flammable atmosphere in a hazardous area zone, location or workspace. **Type of protection Ex tb:** It avoids combustible dust (IIIC) penetration into the enclosure and ensures surface temperature limitation for use in explosive dust atmospheres. **COMPONENTS** **Type of protection Ex db:** Electric equipment is installed in enclosure suitable to withstand the pressure raised during the internal explosion and avoids flame transmission to the external potentially explosive atmosphere. **Type of protection Ex ia / ib:** The energy of the circuit which could be capable of igniting a potentially explosive atmosphere is limited so that neither sparking nor heating of the electrical components can ignite the surrounding potentially explosive atmosphere. **Type of protection Ex mb:** Encapsulation allows the separation of the alive parts from the explosive atmosphere.

GIOVENZANA INTERNATIONAL B.V.

INCREASED SAFETY ENCLOSURES
» A/G/S*****EX.. SERIES

ATEX IECEx

With EX e ENCLOSURE
Suitable for installation in Zone: 1, 2, 21, 22

Ex e | Ex t

GAS **DUST**

AISI 316L **Aluminium Alloy** **GRP**

Components designed to meet the requirements for **ON and OFF-SHORE use**, in petrochemical and marine applications and for any other industry where an explosive atmosphere may be present.
A/G/S**EX… Series** are suitable for equipment for explosive GAS and DUST atmospheres, having a "high" level of protection, which is not a source of ignition in normal operation or during expected malfunctions.

Applications such as: junction boxes, local control stations and local control panels for Indoor and Outdoor application.

- **Fully customizable** for enclosure size and material, number of holes and mechanical machining.

Our technical department will support you in designing the best solution according to your needs and within the limits of the certificate.

GIOVENZANA INTERNATIONAL B.V.

INCREASED SAFETY ENCLOSURES » A/G/S*****EX.. SERIES
GENERAL FEATURES

Materials	Stainless steel AISI-316L Aluminium with low content of copper GRP (Glassfiber Reinforced Polyester)
Surface treatment	Stainless steel: Acid treatment (pickling) Aluminium: Standard with polyester powder coating RAL 7001
Optional accessories depending of enclosure material	• Electropolish treatment (Stainless Steel only); • Side gland plates (Stainless Steel only); • Hinges (GRP and Aluminium); • Drain/breather valve; • Traffolyte/Stainless steel certificate label; • Internal mounting plate; • Locking facility (Stainless Steel only); • Earth continuity plates (GRP only); • Passing through earth bolt.
Mechanical data	
Degree of protection	IP66 IP66/IP67 (S****EX… only without swing handle element)
Dust Group	IIIC
Ts **Service Temperature range**	-50°C to 105°C (depending on the material and the mechanical machining)
Body	A******EX... Copper-free aluminium G******EX… GRP S******EX AISI316L stainless steel
Hardware, screws and locking devices	AISI316L stainless steel
Marking	**Global (IECEx):** Ex eb IIC Gb Ex tb IIIC Db **Europe (ATEX)** II 2 G Ex eb IIC Gb II 2 D Ex tb IIIC Db
Standard certificate label	Made by self adhesive UV and corrosion resistant polyester, approved by certified Laboratory.
Compliant with	IEC 60079-0 & EN IEC 60079-0 - Equipment - General requirement IEC 60079-7 & EN IEC 60079-7 - Equipment protection by increased safety "e" IEC 60079-31 & EN 60079-31 - Equipment dust ignition protection by enclosure “t”
Enclosure	**Type of protection Ex eb:** It provides an impact resistant enclosure for electrical equipment and ensures that the contents will not produce a spark, temperature or current creepage that could ignite the external flammable atmosphere in a hazardous area zone, location or workspace. **Type of protection Ex tb:** It avoids combustible dust (IIIC) penetration into the enclosure and ensures surface temperature limitation for use in explosive dust atmospheres.

NOTES

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NOTES

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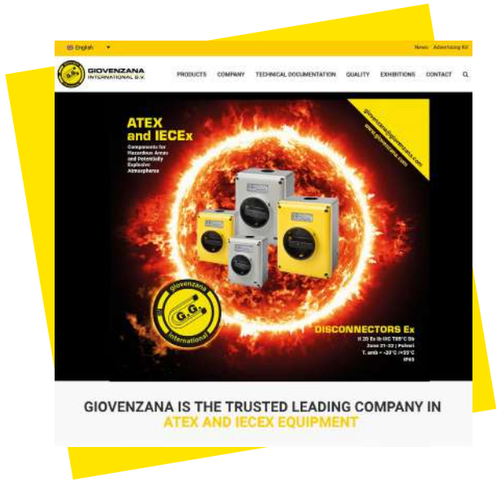

The latest version of Giovenzana's explosion-proof equipment catalogue is available online on our corporate website **www.giovenzana.com**

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