



# ATEX E IECEX

HAZARDOUS AREA COMPONENTS AND EQUIPMENT





**GIOVENZANA**  
INTERNATIONAL B.V.



# ATEX and IECEx

## **ATEX & IECEx CATALOG** **Rev. 00/2021**

**GIOVENZANA INTERNATIONAL B.V.** reserves the right to modify all the technical and functional characteristics of the products illustrated in the catalog without prior notice, as this information is intended for general knowledge only and is not legally binding.

All images are included for illustrative purposes. Products are subject to change. The most updated version of this catalog can be downloaded from the website:

[www.giovenzana.com](http://www.giovenzana.com)

# INDEX

<b>COMPANY PROFILE</b>	About us	6/7
	Giovenzana for Hazardous locations	
<b>ATEX DIRECTIVE GUIDE</b>	<b>1 - HAZARDOUS LOCATIONS EQUIPMENT</b>	<b>8/52</b>
	1.1 - What do we know today about explosion hazards in the workplace?	8
	1.2 - Technological response to ignition prevention	15
	1.3 - IEC ZONE SYSTEM (Ex constructions)	16
	1.4 - HazLoc Division System (NEC - NFPA70)	26
	1.5 - One certification scheme per Area	31
	1.6 - IEC Zone System: modes of protection for electrical and non-electrical products	36
	1.7 - Examples of Type Testing (Intek Laboratory)	43
	1.8 - IEC Zone System: ATEX and IECEx markings	46
	1.9 - North America (HazLoc): protection modes and markings	50
1.10 - The ATEX DIRECTIVE applied to industrial production	52	
<b>PRODUCT INDEX</b>		<b>P. 57/82</b>

<b>SWITCH DISCONNECTORS</b> » SE, SQ Series	II 2D Ex tb IIIC T85°C Db Zone 21-22 (Dust) T <sub>amb</sub> = -20°C .. +55°C IP65		58/59
<b>ENCLOSURES</b> » BNA, BNB Series	II 2G Ex eb IIC Gb - II 2D Ex tb IIIC Db Zone 1-2 (Gas) - Zone 21-22 (Dust) T <sub>amb</sub> = -60°C .. +150°C IP65		60/61
<b>CAM SWITCHES</b> » P0, PX, C0, CX Series	II 2D Ex tb IIIC T85°C Db Zone 21-22 (Dust) T <sub>amb</sub> = -20°C .. +55°C IP65		62/63
<b>ROTARY GEAR LIMIT SWITCHES</b> » FGR2 Ex Series	II 3G Ex dc ec IIB T5 Gc - II 2D Ex tb IIIC T85°C Db Zone 2 (Gas) - Zone 21 (Dust) T <sub>amb</sub> = -20°C .. +70°C IP65		64/65
<b>PRE-WIRED THERMOPLASTIC LIMIT SWITCHES</b> » FCT Ex Series	II 3G Ex dc ec IIB T5 Gc - II 2D Ex tb IIIC T95°C Db Class I Division 2 Groups C, D Zone 2 (Gas) - Zone 21-22 (Dust) T <sub>amb</sub> = -25 .. +60°C IP6X e IPX4 (Haz Loc) - IP67 (not classified areas)		66/69
<b>MICRO SWITCHES</b> » MFI Ex Series	II 3G Ex dc ec IIB Gc Zone 2 (Gas) Class I Division 2 Groups C, D		70/72
<b>FESTOON SYSTEM</b> » 30 Ex, 41 Ex Series	II 2G Ex h IIB T5 Gb - II 2D Ex h IIIC T85° Db Zone 1-2 (Gas) - Zone 21-22 (Dust) T <sub>amb</sub> = -25°C .. +80°C IP65		73/76
<b>CONTROL STATIONS Ex</b>	II 2G Ex db eb IIC T6/T5/T4 Gb II 2D Ex tb IIIC 85/100/135°C Db Zone 1-2 (Gas) - Zone 21-22 (Dust) Materials: Stainless Steel AISI 316L, GRP and Alluminium Alloy.		77/79
<b>JUNCTION BOXES Ex</b>	II 2G Ex eb IIC Gb - II 2D Ex tb IIIC Db Zone 1-2 (Gas) - Zone 21-22 (Dust) IP6X		80/81
<b>STAINLESS STEEL ENCLOSURES Ex</b>	II 2G Ex eb IIC T6/T5/T4 Gb II 2D Ex tb IIIC 85/100/135°C Db Zone 1-2 (Gas) - Zone 21-22 (Dust) With certified ceramic terminals (for low and high temperatures) With certified thermoplastic terminals (for standard temperatures)		82



# GIOVENZANA INTERNATIONAL B.V.

is one of the world's leading suppliers of **industrial safety technology**.

We develop **tailor-made technical solutions** thanks to our design capability and production flexibility.

Our high-quality products are designed, manufactured and assembled in our production warehouses in **Italy and Hungary**.

We can guarantee customers **complete control over the quality of our products** to meet current market requirements.

Our main characteristics are a **strong international outlook** and a willingness to innovate by realising customer requirements.

The wide variety of products offered, together with the expertise of our Research and Development Department, allow us to satisfy even the most unusual situations.

The technicians and sales staff at Giovenzana International B.V. aim to provide comprehensive customer support during the sales and after-sales processes.

**Quality, competence and safety solutions** guide us on a daily basis to develop the best products for the most demanding market requirements.



## ATEX - IECEX - EAC Ex - INMETRO AND UL HAZLOC CERTIFIED COMPONENTS

**Giovenzana International B.V.** develops, implements projects and builds safety systems and solutions, equipment and components. The aim is to protect people and the environment through safe and certified solutions.

Also for **Hazardous Areas**, Giovenzana offers a continuously evolving range of products suitable for use in potentially explosive atmospheres: zones 1-2 (Gases) and zones 21, 22 (Dusts).

Giovenzana has obtained all **ATEX and IECEX (QAN and QAR) company system certifications** for potentially explosive atmospheres:

- 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.

For further information please email [giovenzana@giovenzana.com](mailto:giovenzana@giovenzana.com) or visit our website: [www.giovenzana.com](http://www.giovenzana.com)



## 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.

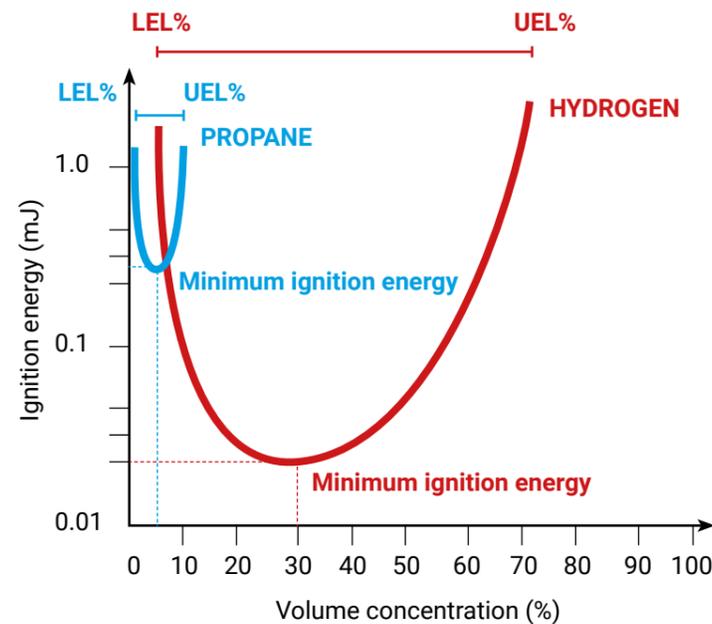
**Explosive atmospheres in the workplace** are said to exist when the substance is released into the environment under "normal" conditions of pressure and atmosphere, i.e. at atmospheric pressure and in the presence of a percentage of oxygen close to 20-21%.

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<sup>3</sup>.

## 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  $T_{5mm}$ .

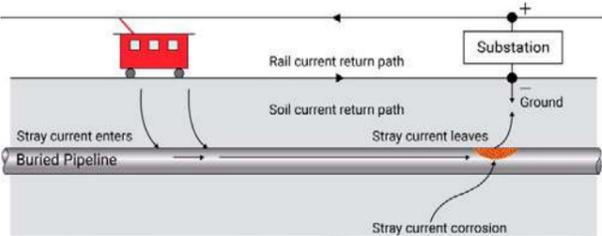
Here are some examples.

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.

## 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	 <p>The diagram shows a substation with a positive terminal (+) and a ground connection (-). A rail current return path leads to a train. A soil current return path leads to a buried pipeline. Stray current enters the pipeline from the soil and leaves back to the ground, causing stray current corrosion.</p>
Static electricity	

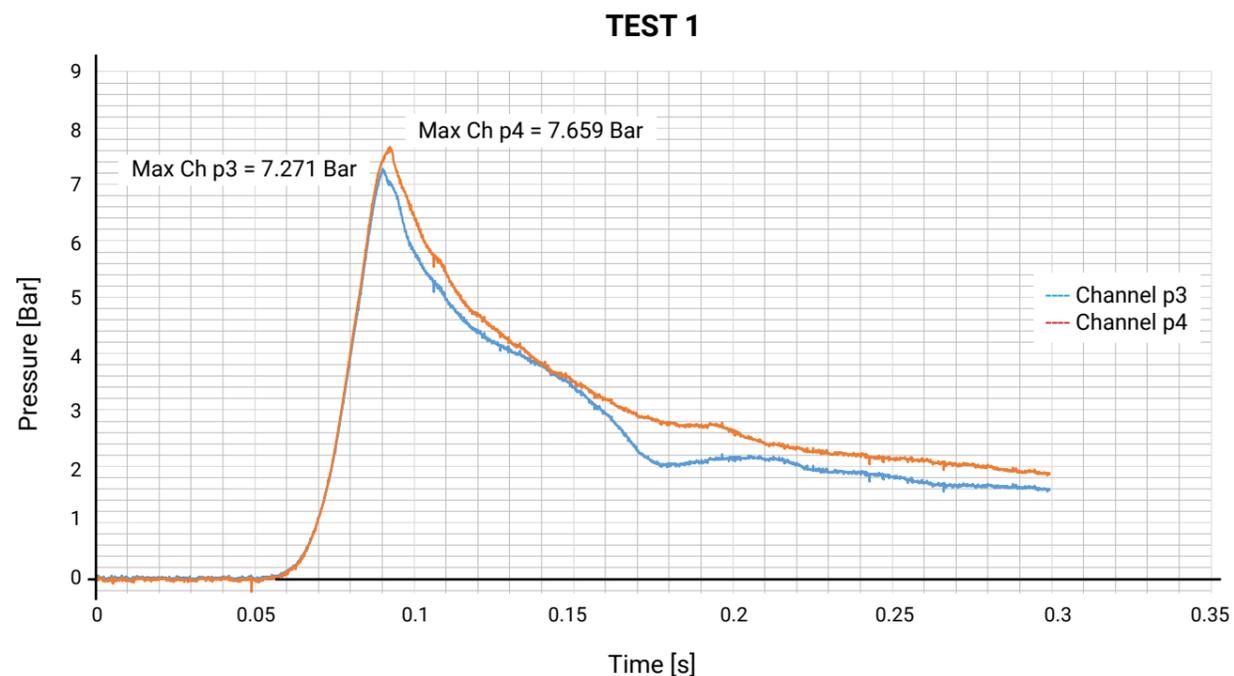
Potential ignition sources	
Lightning	
Electromagnetic waves (radio frequency) from $10^4$ Hz to $3 \times 10^{12}$ Hz	
Electromagnetic waves from $3 \times 10^{11}$ Hz to $3 \times 10^{15}$ Hz	
Ionising radiation	
Ultrasonics	
Adiabatic compressions and shock waves	
Chemical reactions (exothermic)	

## 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.

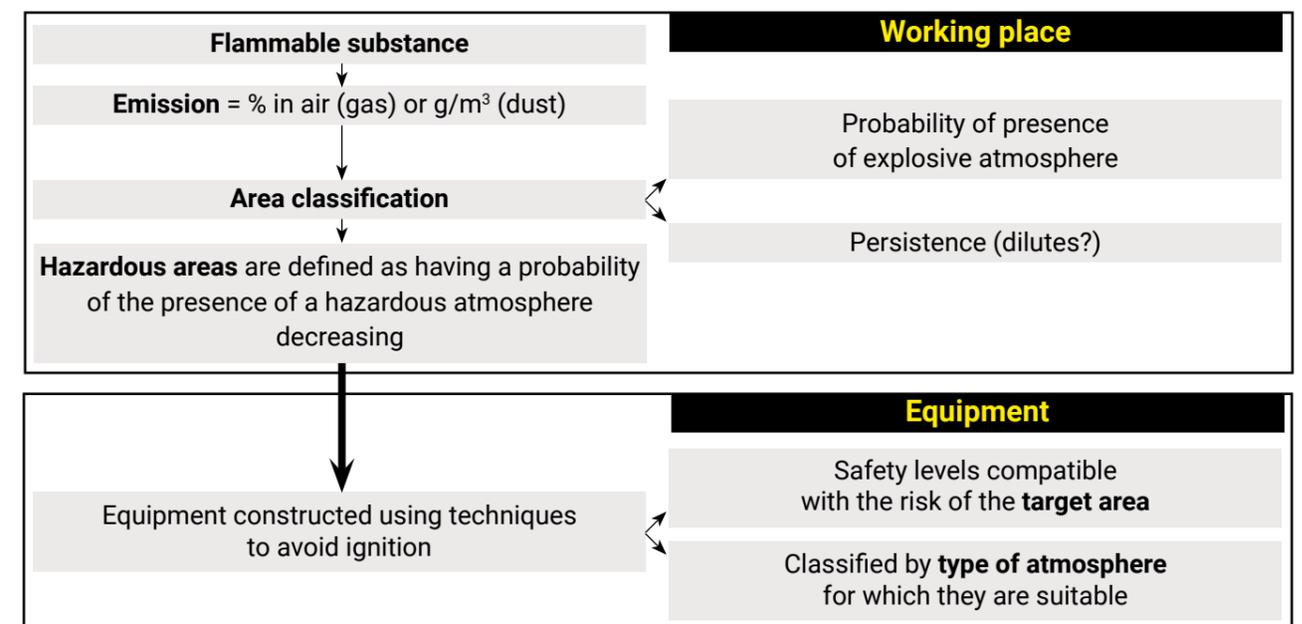
Both approaches are based on prevention of ignition, i.e. on the concepts that an electrical apparatus intended to be installed in a hazardous area must:

- 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.

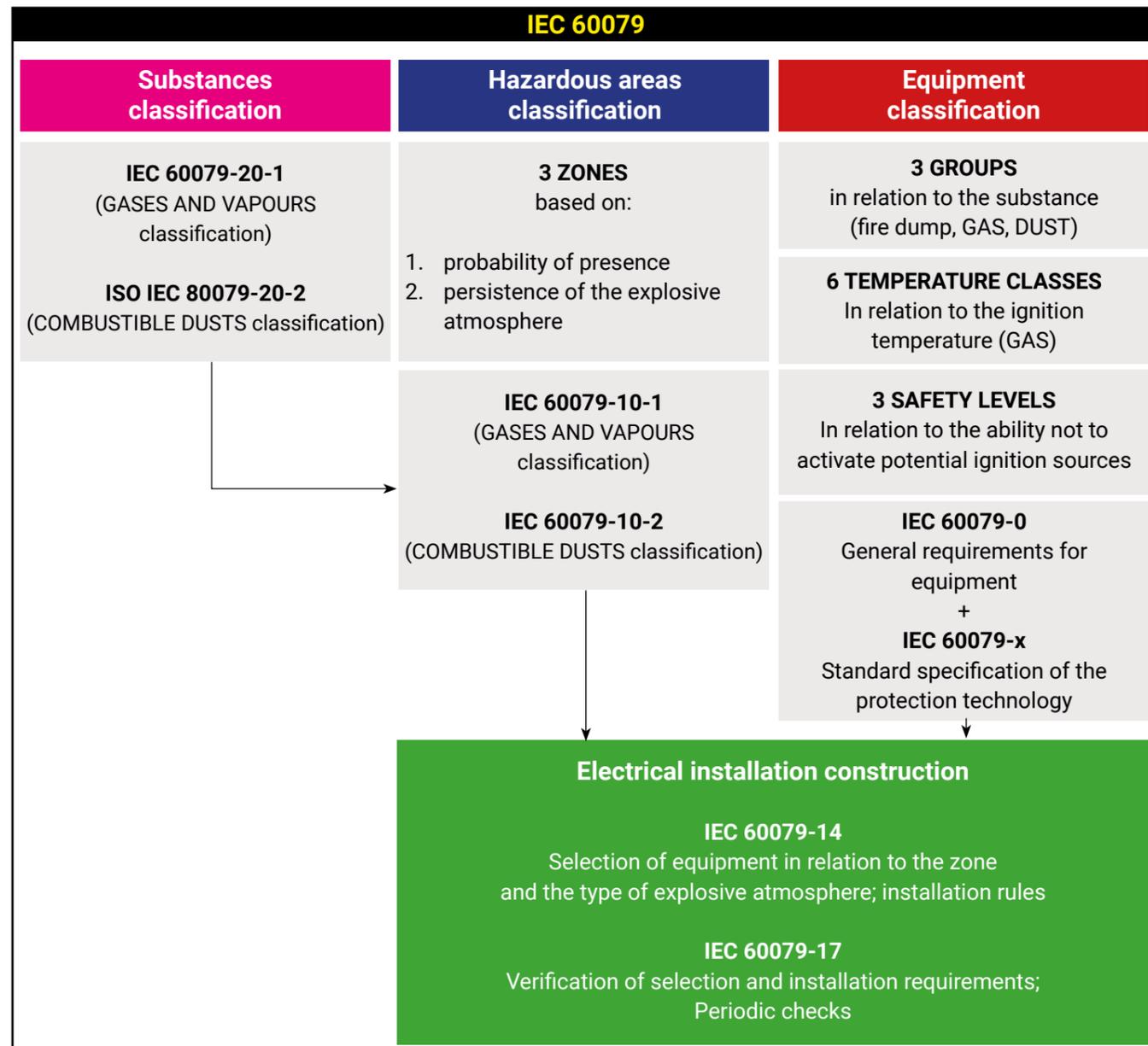
### 1.3 - IEC ZONE SYSTEM (EX CONSTRUCTION)

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
<b>Mines</b>	<b>I</b>	GRISOU GAS
	<b>IIA</b> <b>IIB</b> <b>IIC</b>	PROPANE ETHYLENE ACETYLENE AND HYDROGEN
<b>Surface</b>	<b>IIIA</b> <b>IIIB</b> <b>IIIC</b>	COMBUSTIBLE FIBRES NON-CONDUCTIVE DUST CONDUCTIVE DUST

GROUP II	MIC	MESG (mm)
<b>IIA</b>	> 0.8	> 0.9
<b>IIB</b>	≤ 0.8 and ≥ 0.45	≤ 0.9 and > 0.5
<b>IIC</b>	≤ 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 TcI 350 °C / T5mm 490 °C
ALUMINIUM	IIIC TcI 700 °C / T5mm 320 °C
WHEAT FLOUR	IIIB TcI 430 °C / T5mm 450 °C

### HAZARDOUS AREAS CLASSIFICATION

Areas other than mines are classified as follows.

GASES AND VAPOURS CLASSIFICATION (IEC 60079-10-1)	
<b>ZONE 0</b>	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).
<b>ZONE 1</b>	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).
<b>ZONE 2</b>	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)	
<b>ZONE 20</b>	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).
<b>ZONE 21</b>	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).
<b>ZONE 22</b>	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).

## 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	normal 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.

### 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

### Equipment selection in relation to T class (Gas)

		MAXIMUM SURFACE TEMPERATURE EQUIPMENT						TEMPERATURE CLASSES	MAX SURFACE TEMPERATURE
		T1	T2	T3	T4	T5	T6		
AREAS	T1	✓	✓	✓	✓	✓	✓	T1	450 °C
	T2	✗	✓	✓	✓	✓	✓	T2	300 °C
	T3	✗	✗	✓	✓	✓	✓	T3	200 °C
	T4	✗	✗	✗	✓	✓	✓	T4	135 °C
	T5	✗	✗	✗	✗	✓	✓	T5	100 °C
	T6	✗	✗	✗	✗	✗	✓	T6	85 °C

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

### Choice of equipment in relation to the group

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

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

## Skills and responsibilities

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

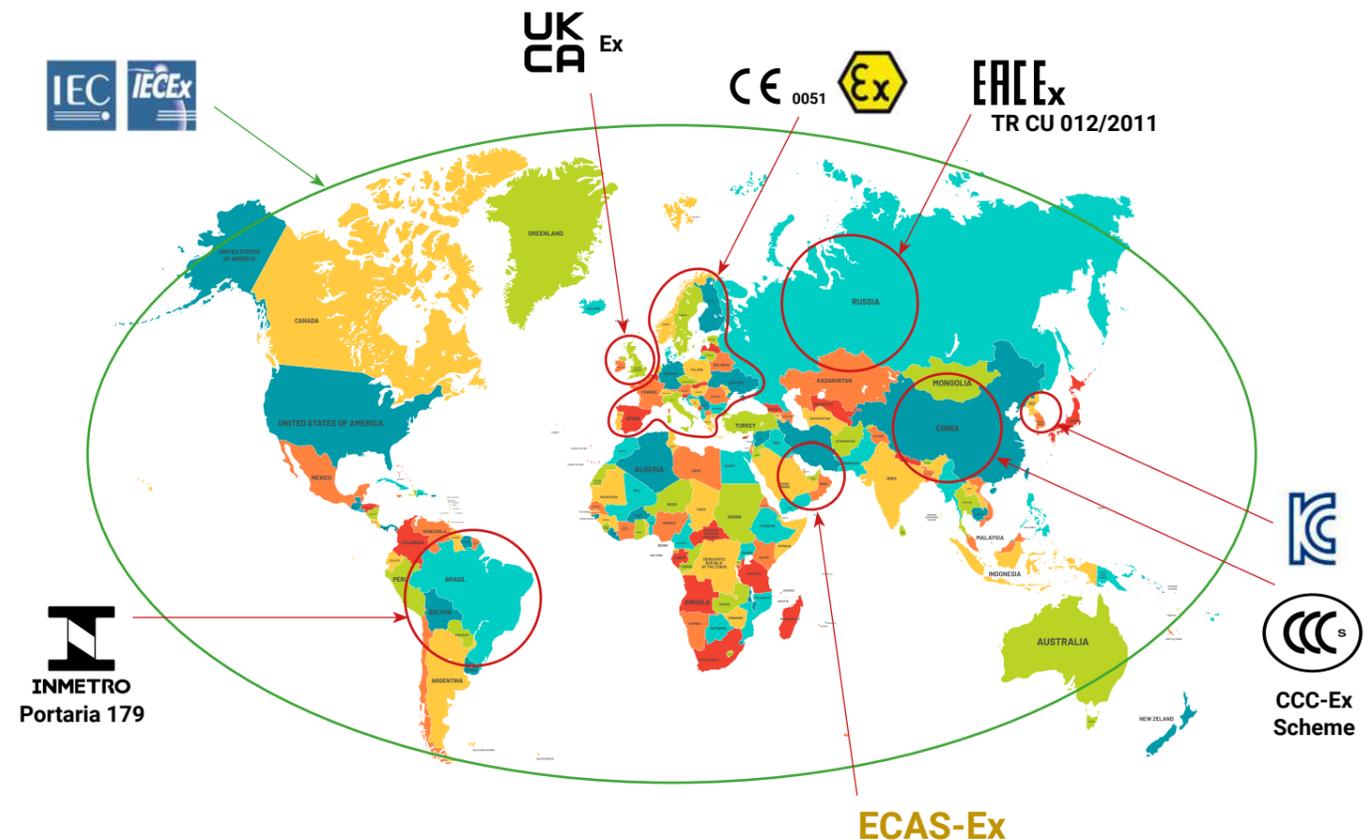
The IEC Zone System is applied by all IEC participating countries. Each country then transposes the IEC standards as local technical standards and legislative regulations: national in some cases or as EU regulations of a group of nations.

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
<b>Gases, vapours, combustible mists</b>	<b>CLASS I</b>	Areas where combustible gases, vapours or combustible mists are or may be present in sufficient quantity to produce explosive or ignitable mixtures	<p>Explosive concentration during normal operations.</p> <p>Explosive concentration present frequently for maintenance/repair or by leakage.</p> <p>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.</p>	<p>The substances are confined in containment systems and can only leave in the event of a breakdown.</p> <p>Explosive concentration prevented by ventilation system. The hazardous zone can be formed as a result of a ventilation system ventilation system.</p> <p>Explosive concentration due to areas bordering Division 1 without prevention by pressurisation or ventilation.</p>
<b>Combustible dusts</b>	<b>CLASS II</b>	Areas with danger of explosion due to the presence of combustible dusts	<p>Dust present in explosive concentration during normal operations.</p> <p>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.</p> <p>Presence of metal dusts such as aluminium and magnesium (group e), in quantities that are dangerous.</p>	<p>Presence of combustible dust in the air, as a result of a fault and in such quantity that it has an explosive concentration.</p> <p>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.</p> <p>Layers of dust in the vicinity or deposited on the equipment which can alter its dissipation capacities and ignite.</p>
<b>Combustible fibres</b>	<b>CLASS III</b>	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.

## 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

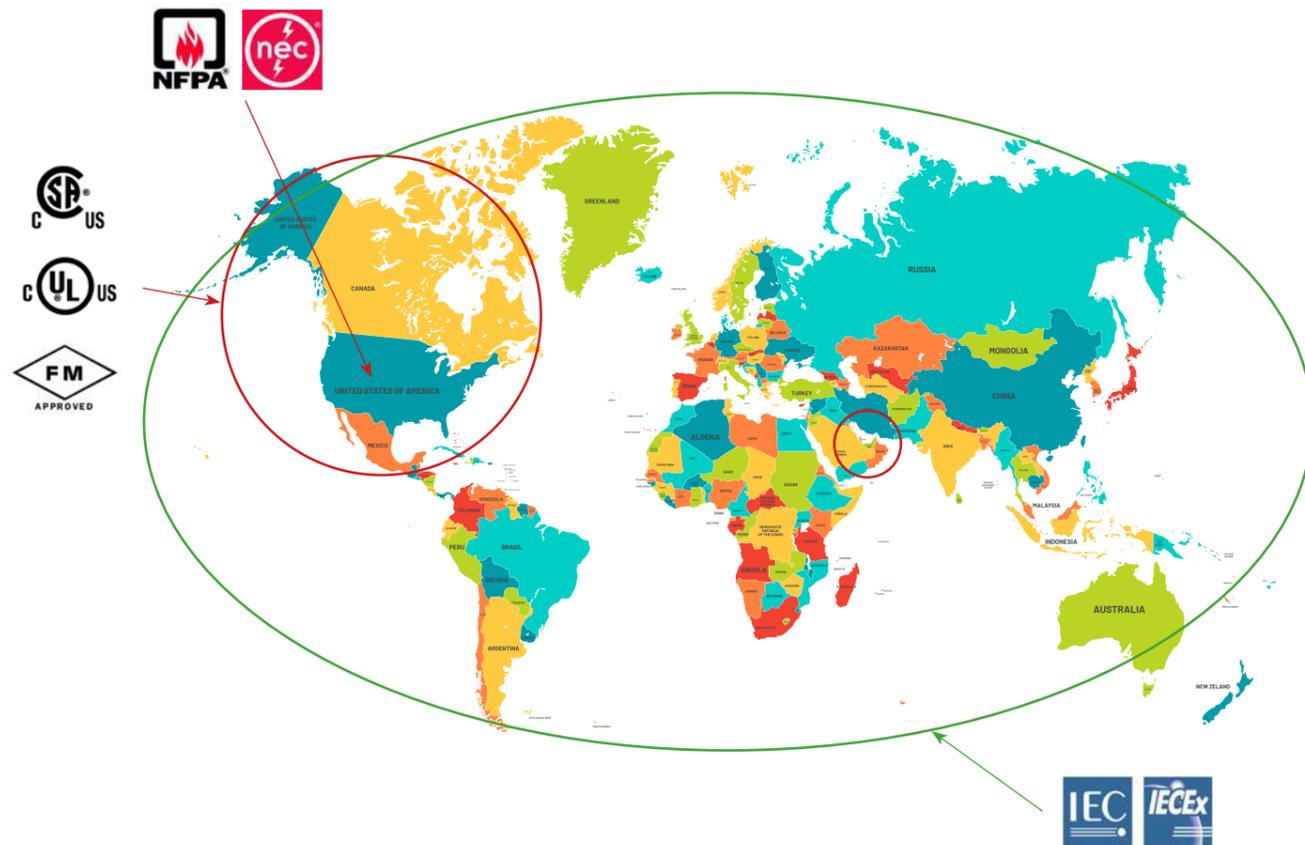
As North American countries (USA and Canada) are participants in IEC, the IEC Zone system has been implemented since the beginning of this century. **NEC 505 and 506 articles** therefore regulate equipment requirements for locations classified in Zones rather than Divisions.

GASES - ART. 505		DUSTS - ART. 506	
<b>HAZARDOUS AREAS CLASSIFICATION</b> (CLASS I remains)		<b>HAZARDOUS AREAS CLASSIFICATION</b> (CLASS II disappears)	
<b>CLASS I</b>	ZONE 0	ZONE 20	
	ZONE 1	ZONE 21	
	ZONE 2	ZONE 22	
<b>EQUIPMENT CLASSIFICATION IN GROUPS</b>		<b>EQUIPMENT CLASSIFICATION IN GROUPS</b>	
GROUP IIA		GROUP IIIA	
GROUP IIB		GROUP IIIB	
GROUP IIC		GROUP IIIC	
<b>Comparison with Art. 500</b>		<b>Comparison with Art. 500</b>	
GROUP IIA	GROUP D	GROUP IIIA	CLASS III
GROUP IIB	GROUP C	GROUP IIIB	CLASS II, GROUP F
GROUP IIC	GROUPS B and A	GROUP IIIC	CLASS II, GROUP E
<b>EQUIPMENT CLASSIFICATION BY T CLASS</b>		<b>Marking</b> The IEC construction for the NEC takes the prefix "AEx".	
<b>TEMPERATURE CLASS</b>	<b>MAX SURFACE TEMPERATURE</b>	<b>Zone 21, AEx tb IIIB T165 °C</b>	
T1	450 °C		
T2	300 °C		
T3	200 °C		
T4	135 °C		
T5	100 °C		
T6	85 °C		
<b>Marking</b> The IEC construction for the NEC takes the prefix "AEx".			
<b>Class I, Zone 0 AEx ia IIB T6</b>			

### 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.

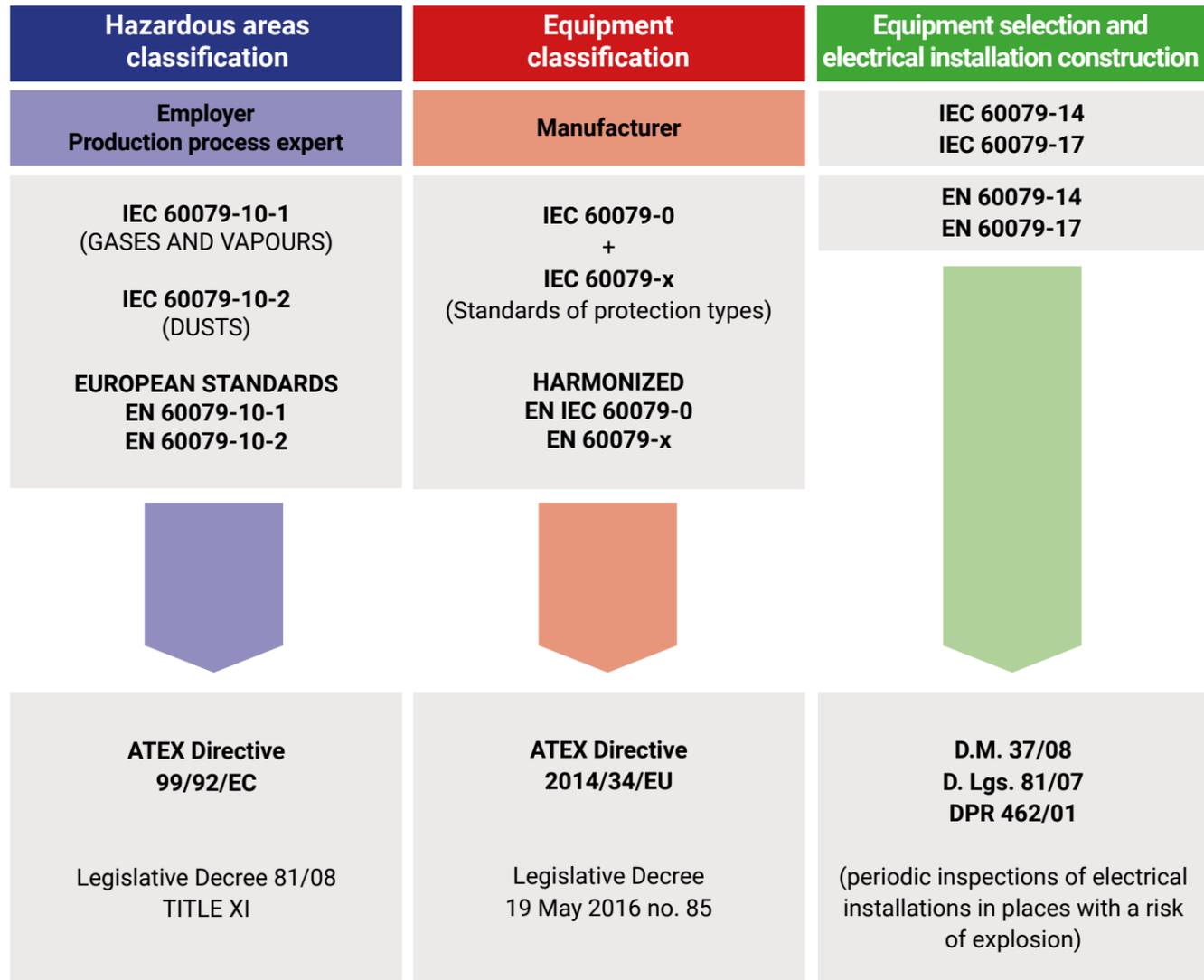
For workplaces with explosive atmospheres, the EU has adopted two harmonised health and safety directives, known as the ATEX directives.

The **ATEX Directive 2014/34/EU** is the product directive: it sets out the **Essential Safety Requirements** and related procedures for the conformity 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.**



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.

## 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).

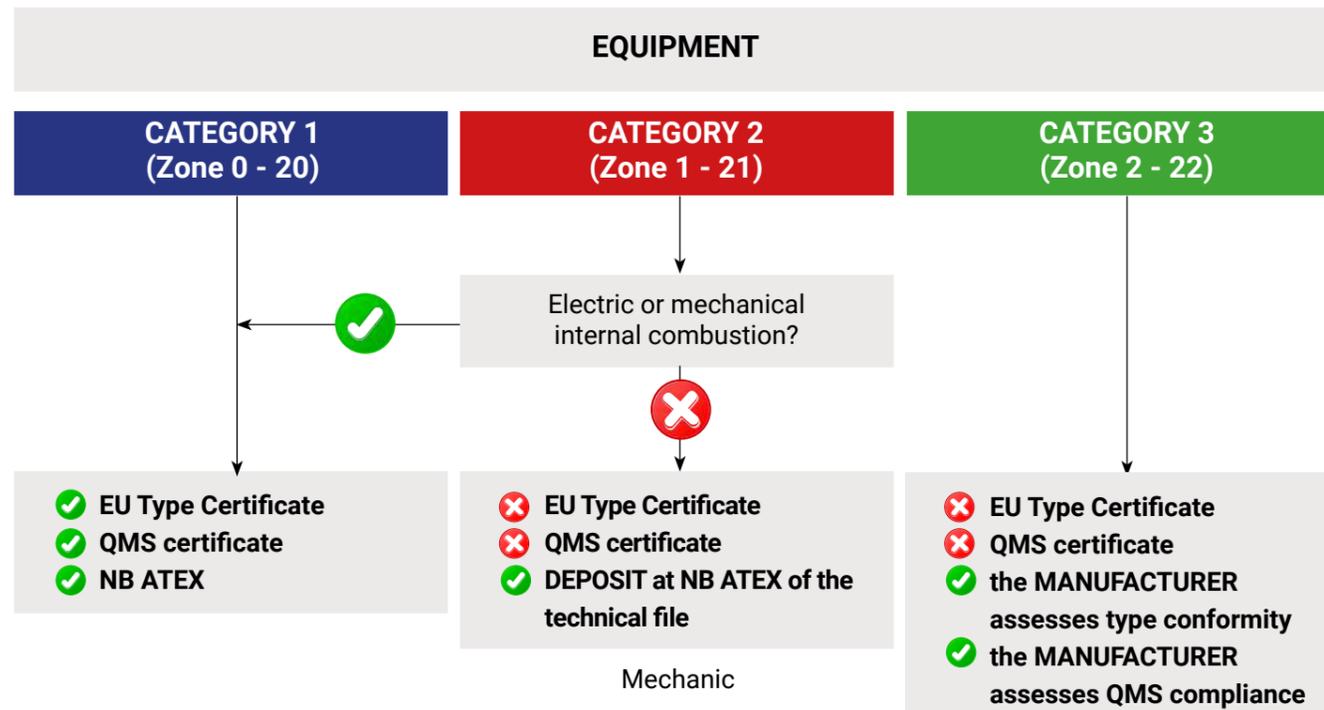
The Directive specifies, depending on the product category, whether the conformity assessment can be carried out independently, i.e. the manufacturer assesses and declares conformity (self-certification), or whether it must be carried out by a **Certification Body**.

**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:

<b>IECEx TR</b>	Type test report	Type testing in accordance with IEC 60079 and/or ISO IEC 80079.
<b>IECEx CoC</b>	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.
<b>IECEx QAR</b>	Quality Assessment 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:

<b>PROTECTION</b>	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.
<b>PREVENTION</b>	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).

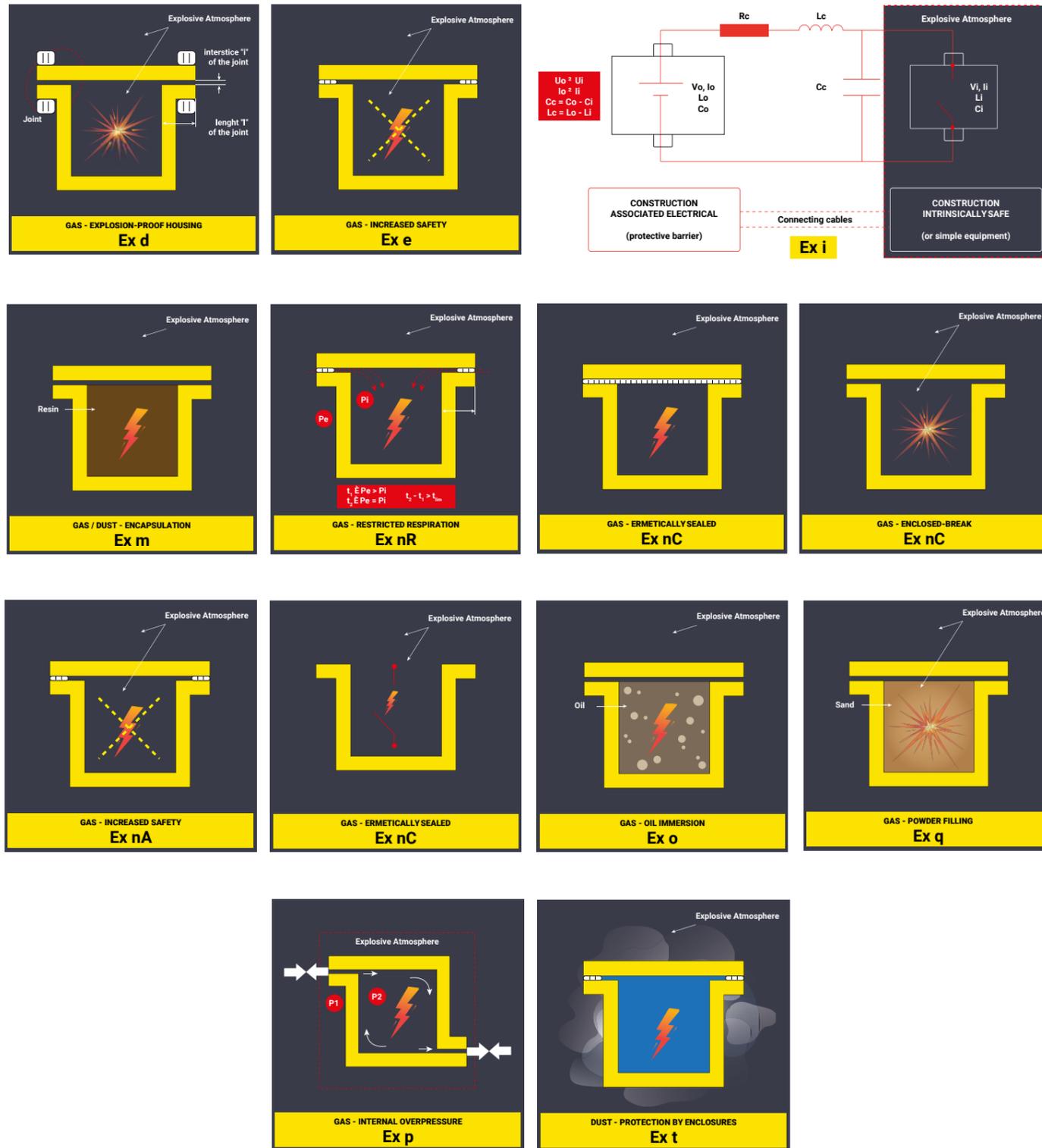
IEC 60079			
Letter indicating protection type	IEC standard	Definition	Explosive Atmosphere
<b>d</b>	<b>60079-1</b>	Explosion-proof enclosures	Gases
<b>p</b>	<b>60079-2</b>	Internal overpressure	Gases and Dusts
<b>e</b>	<b>60079-7</b>	Increased safety	Gases
<b>i</b>	<b>60079-11</b>	Intrinsic safety	Gases and Dusts
<b>n</b>	<b>60079-15</b>	Protection mode "n" (*)	Gases
<b>m</b>	<b>60079-18</b>	Protection by encapsulation	Gases and Dusts
<b>t</b>	<b>60079-31</b>	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 60079-15, the types "nA", "nC" and "nL" were transferred to the standards dealing with the same protection technique respectively.

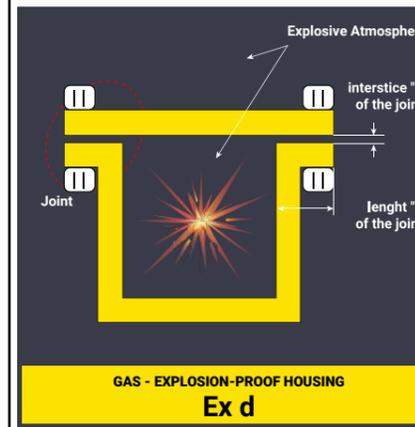
<b>nA</b>	non-sparking for zone 2	From IEC 60079-15	to IEC 60079-7	<b>ec</b>
<b>nC Enclosed Break</b>	Explosion Containment for zone 2	From IEC 60079-15	to IEC 60079-1	<b>dc</b>
<b>nL</b>	Energy Limitation for zone 2	From IEC 60079-15	to IEC 60079-11	<b>ic</b>

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

## SUMMARY TABLE OF PROTECTION TYPES



## IEC 60079-1



**GAS**  
**DUST**

Level	<b>Ga*</b>	<b>Gb</b>	<b>Gc</b>
	<b>Da</b>	<b>Db</b>	<b>Dc</b>

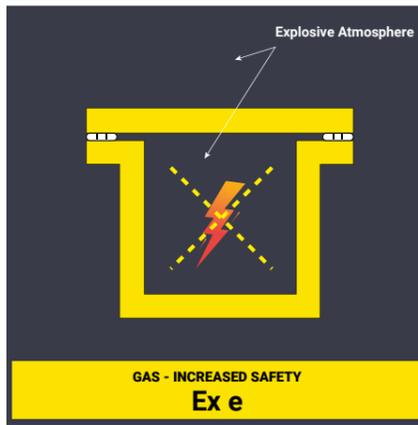
<b>GAS</b>	<b>ZONE 0</b>	<b>ZONE 1</b>	<b>ZONE 2</b>
Level	<b>da</b>	<b>db</b>	<b>dc</b>

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

<b>PROTECTION</b>	<p><b>Explosion-proof enclosures</b></p> <ul style="list-style-type: none"> <li>Equipment and components inside the housing can be standard (both sparking and non-sparking);</li> <li>Gas may enter the enclosure if the explosive atmosphere is ignited: <ul style="list-style-type: none"> <li>the housing withstands the pressure resulting from the explosion, without damage;</li> <li>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.</li> </ul> </li> </ul>						
<b>APPLICATIONS</b>	<ul style="list-style-type: none"> <li>Glittering equipment: switches, electrical actuators, switchboards, lighting equipment power supplies, etc.</li> <li>Non-sparking equipment: motors, fluorescent lamps, junction boxes, etc.</li> </ul>						
<b>INSTALLATION</b>	<ul style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>Keep distance from obstacles (e.g. walls) of the standard according to the gas group.</li> <li>Flame-proof joints must not be painted.</li> <li>Grease to protect the joint against corrosion is permissible, but subject to specific requirements.</li> <li>Special requirements on flange joint taping (not permitted for Group IIC).</li> <li>Choice of inlets in housing:</li> </ul> <table border="1"> <tr> <td>Unused holes</td> <td>Ex d plug, same group, thread co-ordinated with bore, temperature co-ordinated with construction.</td> </tr> <tr> <td>Direct entry into enclosure with cable gland</td> <td>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: <ul style="list-style-type: none"> <li>sealed cable gland (barrier cable gland);</li> <li>cable gland with sealing ring (compression) or grommet seal.</li> </ul> </td> </tr> <tr> <td>Direct entry into enclosure with conduit</td> <td>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: <ul style="list-style-type: none"> <li>between housing and locking fitting: certified components.</li> <li>after the locking fitting: non-certified components (e.g. pipe).</li> </ul> </td> </tr> </table>	Unused holes	Ex d 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: <ul style="list-style-type: none"> <li>sealed cable gland (barrier cable gland);</li> <li>cable gland with sealing ring (compression) or grommet seal.</li> </ul>	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: <ul style="list-style-type: none"> <li>between housing and locking fitting: certified components.</li> <li>after the locking fitting: non-certified components (e.g. pipe).</li> </ul>
Unused holes	Ex d 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: <ul style="list-style-type: none"> <li>sealed cable gland (barrier cable gland);</li> <li>cable gland with sealing ring (compression) or grommet seal.</li> </ul>						
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: <ul style="list-style-type: none"> <li>between housing and locking fitting: certified components.</li> <li>after the locking fitting: non-certified components (e.g. pipe).</li> </ul>						

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

## IEC 60079-7



GAS - INCREASED SAFETY  
**Ex e**

GAS  
 DUST

Level	<input type="checkbox"/> Ga	<input checked="" type="checkbox"/> Gb	<input checked="" type="checkbox"/> Gc
	<input type="checkbox"/> Da	<input type="checkbox"/> Db	<input type="checkbox"/> 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.

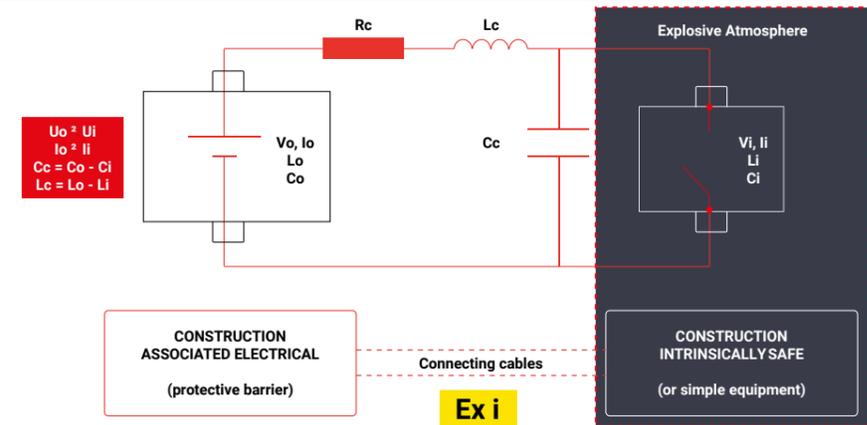
- Terminal blocks and equipment terminals; coils; rotating electrical machines; lighting equipment; transformers; junction and junction boxes for general purposes; resistance heating devices (other than heating cables).

### 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	<input checked="" type="checkbox"/> Ga	<input checked="" type="checkbox"/> Gb	<input checked="" type="checkbox"/> Gc
	<input checked="" type="checkbox"/> Da	<input checked="" type="checkbox"/> Db	<input checked="" type="checkbox"/> Dc

GAS	ZONE 0	ZONE 1	ZONE 2
DUST	ZONE 20	ZONE 21	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  $U_o, I_o, P_o, L_o, C_o$  under any condition (defined by the EPL).
- Cables and field construction defined by construction and certificate parameters, respectively:  $L_c/C_c$ ; input quantities  $U_i, I_i, L_i, C_i$ .
- **Protection**

coordination between output and cable/input parameters:  
 $U_o \leq U_i$   
 $I \leq I_i$   
 $P_o \leq P_i$   
 $C_i + C_c \leq C_o$   
 $L_i + L_c \leq L_o$

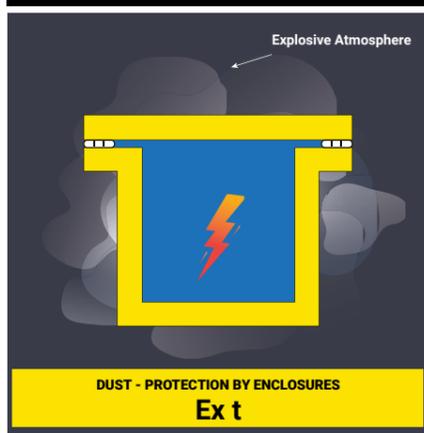
### APPL.

- 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



<input type="checkbox"/>	GAS		
<input checked="" type="checkbox"/>	DUSTS		
Level	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	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<sup>3</sup> and can accommodate **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**.

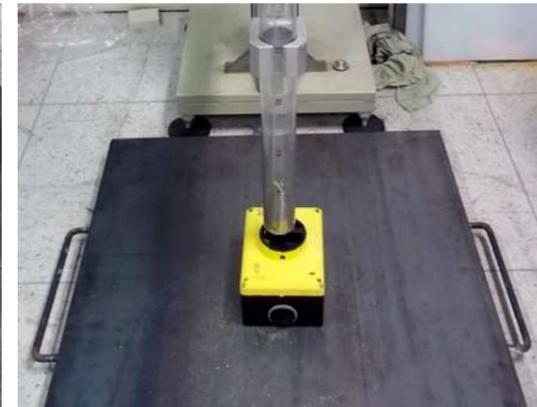


The gas control and mixing system has been designed to realize normative mixtures with oxygen and hydrogen, acetylene, ethylene, propane or methane. The correctness of the mixtures is compared by means of sample mixtures using a gas chromatograph.





**PHYSICAL AND ENVIRONMENTAL TEST**



Impact test (hot)

Impact test (cold)



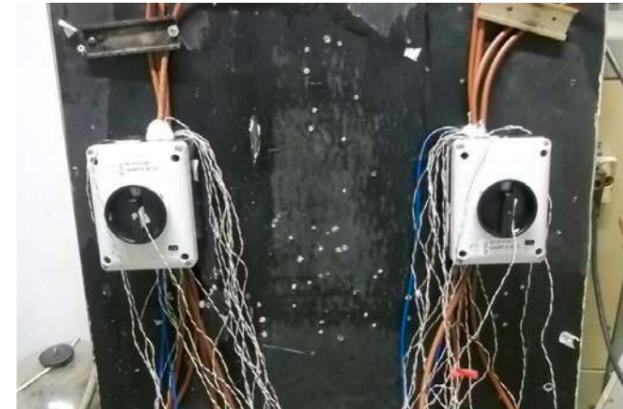
IP Dust Test



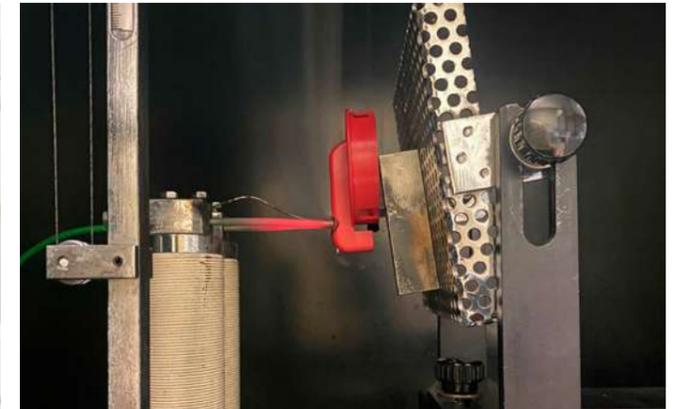
IP Test X4 (water)



IP Test X5 (water)



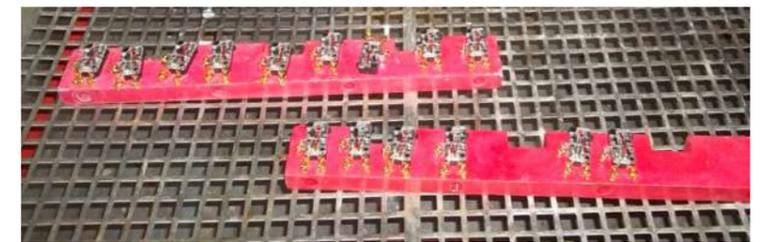
Thermal Test



Glow Wire Test



Thermal Endurance  
to heat and to cold  
Test



**LOW VOLTAGE TEST**



## 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
$-25\text{ °C} \leq T_{amb} \leq +100\text{ °C}$ $T_{amb}$ if different from $-20\text{ °C}/+40\text{ °C}$				

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

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

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

### 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
	0051		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		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
		II	3G

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

 0051  II 2G  
Ex db eb IIC T5 Gb

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

 0051  II 2G  
Ex h IIC T5 Gb

Some examples:

GIOVENZANA INTERNATIONAL B.V. Strawinskylaan 1105,1077 Amsterdam NL					
		TUV IT 17 ATEX 019 X - IECEX EXA 17.0008 X			
		II 3G Ex dc ec IIB T5 Gc			IP65
		II 2D Ex tb IIC T85 °C Db			
$-20\text{ °C} \leq T_{amb} \leq 70\text{ °C}$		Prod./Year: FGR2009EX			Wxx 20xx

GIOVENZANA INTERNATIONAL B.V. Strawinskylaan 1105,1077 Amsterdam NL					
		TUV IT 15 ATEX 048 - IECEX EXA 16.0008			
		II 2D Ex tb IIIC T85 °C Db			IP65
$-20\text{ °C} \leq T_{amb} \leq 55\text{ °C}$		Prod./Year: SQ032003DEX09			Wxx 20xx
EN 60947-3	Ithe40A	Ue690Vmax	AC22A 32A/690V	AC23A 32A/400V	

## 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		Protection level (EPL)
			Group	Category	
Gases and vapours	Always, temporarily or often present	ZONE 0	II		
	Occasionally present	ZONE 1	II	1G	Ga Gb Gc
	Very seldom or only present for a short period	ZONE 2	II	2G	3G
Dusts	Always, temporarily or often present	ZONE 20	II		
	Occasionally present	ZONE 21	II	1D	Da Db Dc
	Does not occur or only seldom for a short period	ZONE 22	II	2D	3D

### 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

T1 < 450°C

T2 < 300°C

T3 < 200°C

T4 < 135°C

T5 < 100°C

T6 < 85°C

Temperature classes

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		Input protection EN 60529		
Limitations	Code	IP	Protection from solids/dusts	Protection from water
No restrictions	-	0	no protection	no protection
Special conditions noted in the certificate	X	1	protection from solid objects > 50 mm	protection against vertical drops of drops of water
This product is a component certified for use in a complete system	U	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

Directive:  
ATEX 2014/34/EU

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

<sup>5</sup> ta (zones 20, 21, 22) - tb (zones 21, 22) - tc (zones 22)  
<sup>6</sup> Areas of maximum application

Example:

CE 0051  
NB 12 ATEX 1007 X



II 2G Ex db IIC T6 Gb  
II 2D Ex tb IIIC T80°C Db

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	intrinsic safety	Ex i <sup>1</sup>		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 <sup>3</sup>		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 <sup>5</sup>		20 - 21 - 22	EN 60079-31
Protection principle	Protection type	Code	Symbol	To use in zone	EN 60079-31

Protection

<sup>1</sup> ia (zone 0, 1, 2, 20, 21, 22) - ib (zone 1, 2, 21, 22) - ic (zone 2, 22)

<sup>3</sup> ma (zone 0, 1, 2, 20, 21, 22) - mb (zone 1, 2, 21, 22) - mc (zone 2, 22)

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

### Example of marking for gases

PROTECTION TECHNIQUE (optional except for I.S.)	PERMITTED CLASS
<b>Explosionproof for Class I, Division 1, Groups B, C, D T5 -40 °C ≤ T<sub>amb</sub> ≤ +60 °C</b>	
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)

### Example of marking for combustible dusts

PROTECTION TECHNIQUE	PERMITTED CLASS
<b>Dust-ignitionproof for Class II, Division 1, Groups E, F, G T5 -40 °C ≤ T<sub>amb</sub> ≤ +60 °C</b>	
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)

### Class I Zone 1 classification example

**Class I Zone 1 AEx de IIB+H2 T5**  
**-40 °C ≤ T<sub>amb</sub> ≤ +60 °C**

AMBIENT TEMPERATURE  
(Other than -25 °C + 40 °C)

## 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



## 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



**HAZARDOUS  
LOCATION  
SOLUTIONS**



**GIOVENZANA SAFETY DEVICES**

**New Solutions for operating in explosive atmospheres  
and hazardous areas.**

**REGOLUS Ex SWITCH DISCONNECTORS**  
» SQ, SE SERIES

Low voltage three or four poles disconnecter, 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 AC21/690V:  
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**

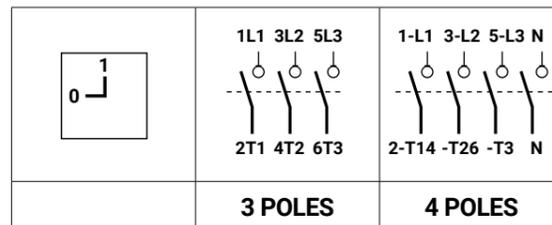
**SCHEME IEC**  
IEC 60079-0, IEC 60079-31, IEC 60947-3

**CERTIFICATIONS**

ATEX, IECEX, EAC-Ex, INMETRO



**ELECTRICAL SCHEMES**



**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)**

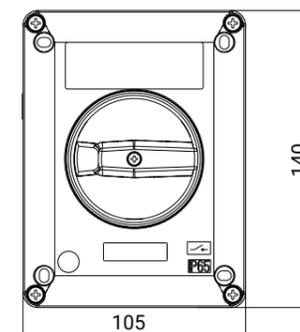
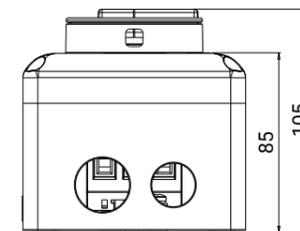
CODE	POLES	ENCLOSURE	Ith [A]	Ithe [A]	AC 21A/690V [A]	AC 22A/690V [A]	AC 23A/690V [A]
SQ025003DEX09	3	EX09 - Grey	32	32	32	25	25
SQ025003DEX10	3	EX10 - Yellow	32	32	32	25	25
SQ032003DEX09	3	EX09 - Grey	40	40	40	32	32
SQ032003DEX10	3	EX10 - Yellow	40	40	40	32	32
SQ040003DEXB9	3	EX09 - Grey	63	63	63	63	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

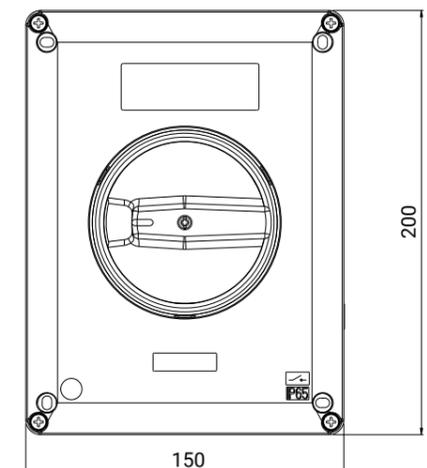
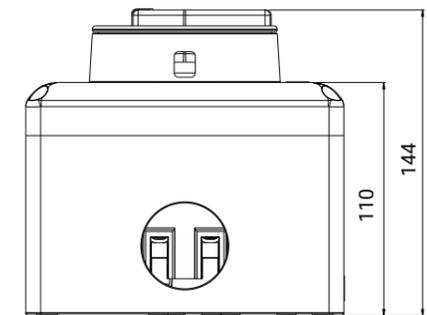
**SQ025 / SQ032**

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



**SQ040 / SQ063 / SE63 / SE80 / SE100**

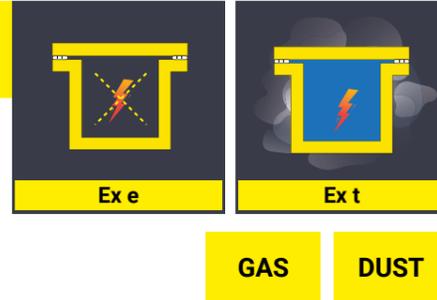
2 holes for M40 cable gland





**REGOLUS Ex ENCLOSURES**  
» BNA, BNB SERIES

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



**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, EAC-Ex, INMETRO



**DIRECTIVE**

ATEX 2014/34/UE

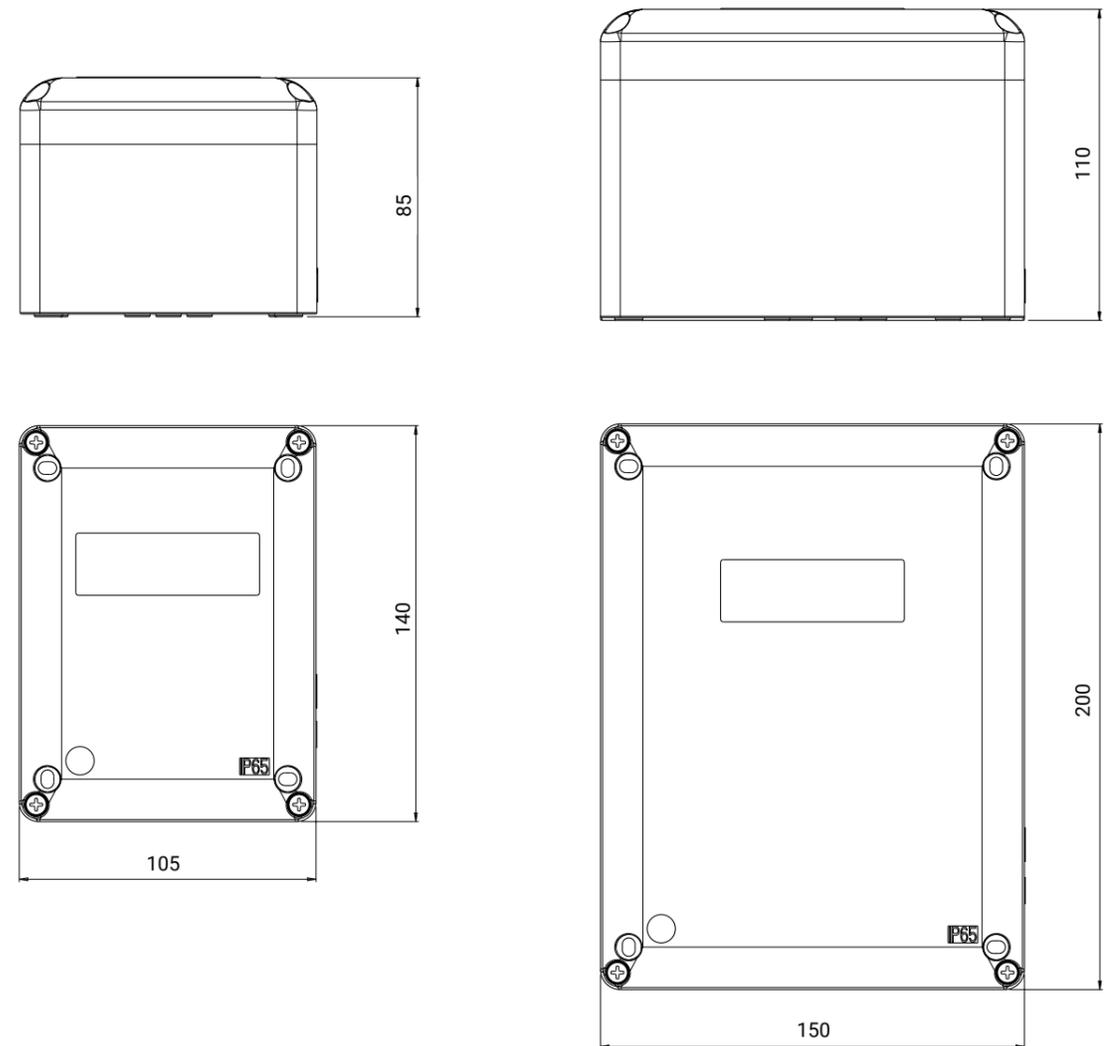
**TYPE OF PROTECTION**

- 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

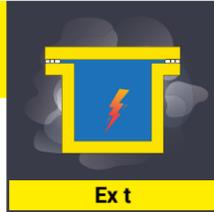
**BNA SERIES** | **BNB SERIES**

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



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

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



Ex t

DUST

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

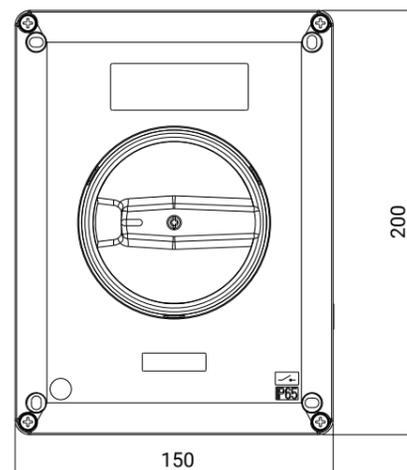
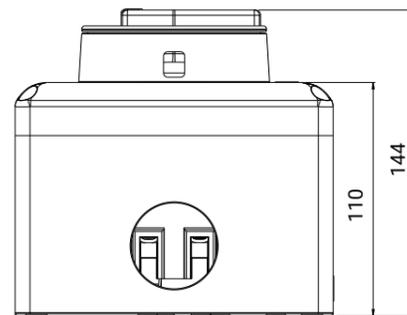
**FEATURES**

- 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:
  - PO & 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.).



**P0 / PX / C0 / CX SERIES**

2 holes for M40 cable gland



**STANDARDS OF REFERENCE**

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

**CERTIFICATIONS**

ATEX, IECEx, EAC-Ex, INMETRO



**DIRECTIVE**

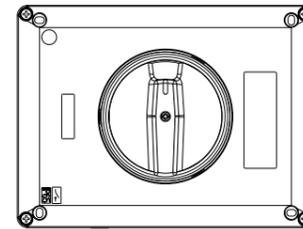
ATEX 2014/34/EU

**TYPE OF PROTECTION**

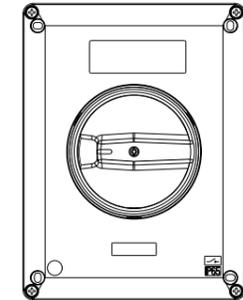
Protection by enclosures - Ex "tb"

**ORDER FORM FOR SPECIAL SCHEMES ON REQUEST**

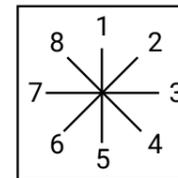
- For the P0 - PX series the maximum number of poles is 6 (3 wafers).
- For C0 - CX series the maximum number of poles is 4 (2 wafers).
- Padlockable only in 0/OFF position (max 3 padlocks).



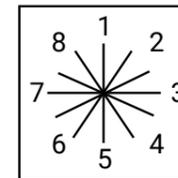
HORIZONTAL position with 0/OFF at 0°



VERTICAL position with 0/OFF at - 90°

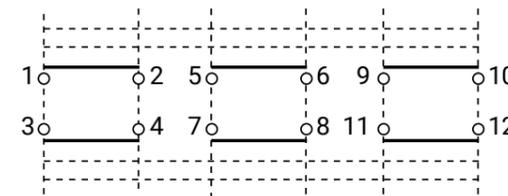


45°  90°

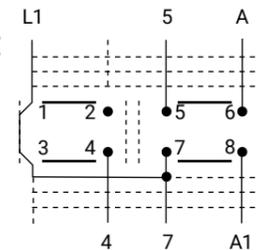


30°  60°

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



**EXAMPLE**



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

**EXAMPLE**

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

- Opened contact
- Closed contact
- Closed contact without continuity
- Closed contact with continuity
- Spring return
- Short-circuited contacts
- Opened contact with early closure

	CATEGORY	AMP/kW	VOLT
Rated current Ie	[ ] AC-21A	A	V
Nominal voltage Ue	[ ] AC-22A	A	V
	[ ] 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	telephone: E-mail: Quantity: Expiry date: Order number:



**THERMOPLASTIC PRE-WIRED  
LIMIT SWITCHES » FCT Ex SERIES**

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**

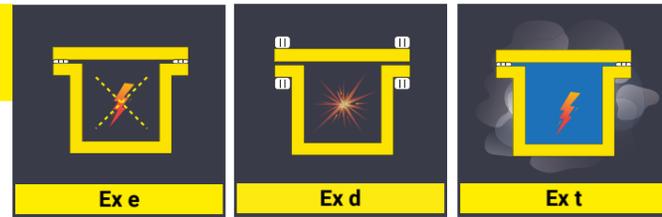
- Horizontal or vertical input cable
- 10 different types of actuators
- 2 different types of internal microswitches, both with NO and NC contacts:
  - **SLOW-ACTING CONTACT ELEMENTS (X11):** the contact element of a device for manual or automatic control circuits where speed of movement of the contact 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**

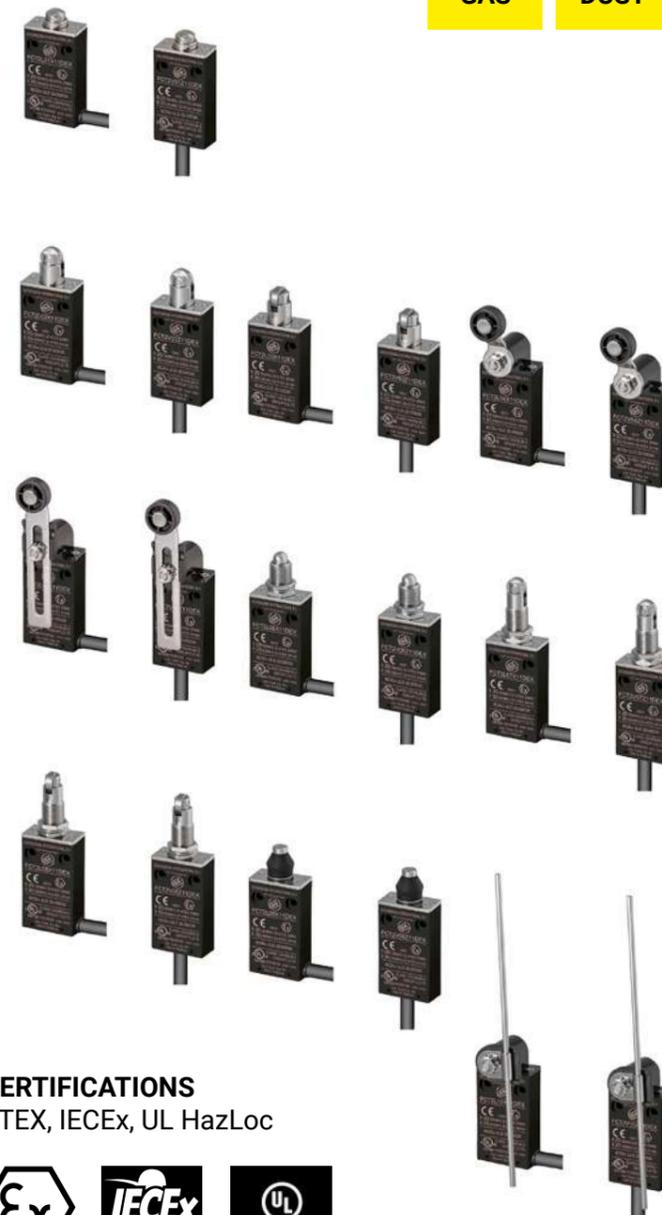
IEC 60079-0, IEC 60079-1, IEC 60079-7, IEC 60079-31

**DIRECTIVE**

ATEX 2014/34/EU



**GAS**   **DUST**



**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

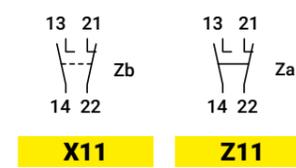
UL508

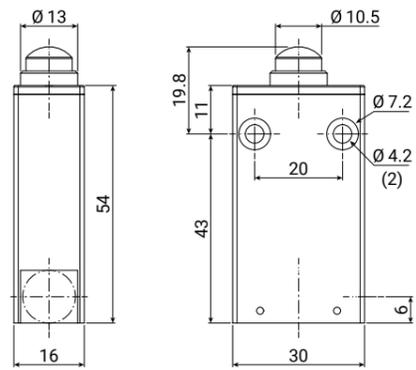
A300

Q300

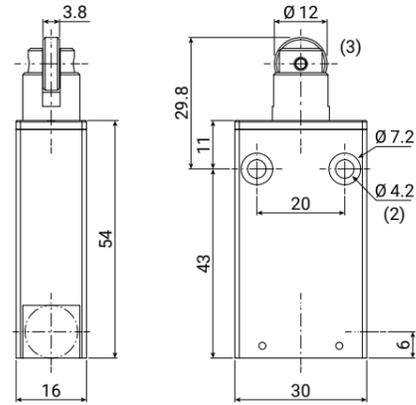
**CODES TABLE**

F	C	T		0	1	1	1	D	E	X
SERIES			CONNECTION TYPE	CONNECTION ORIENTATION	ACTUATOR		CONTACT TYPE	HOUSING	MARKING	
FCT			2	L	01	X11	D	ATEX		
thermoplastic limit switches			pre-wired with 2 m cable (standard)	horizontal output	02	Z11	plastic with 20 mm fixing holes spacing	IECEx		
			x	vertical output	03			UL HazLoc		
			pre-wired with custom cable length (length = x meters)		04					
					05					
					06					
					07					
					08					
					09					
					10					

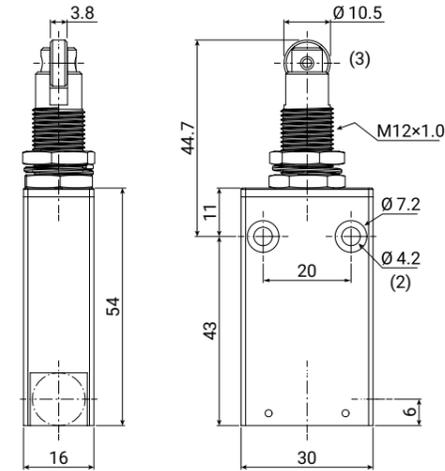




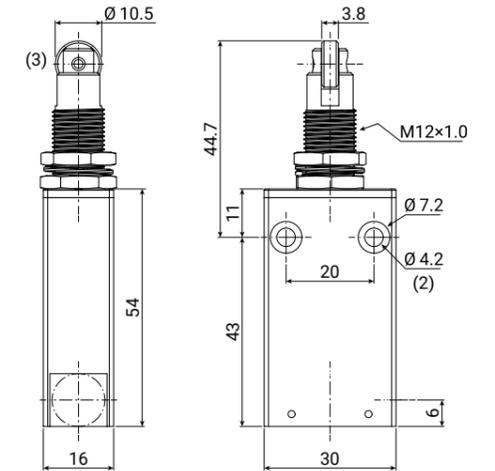
**01 steel end plunger**



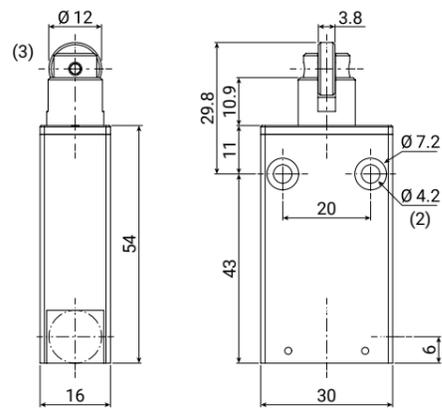
**02 roller plunger**



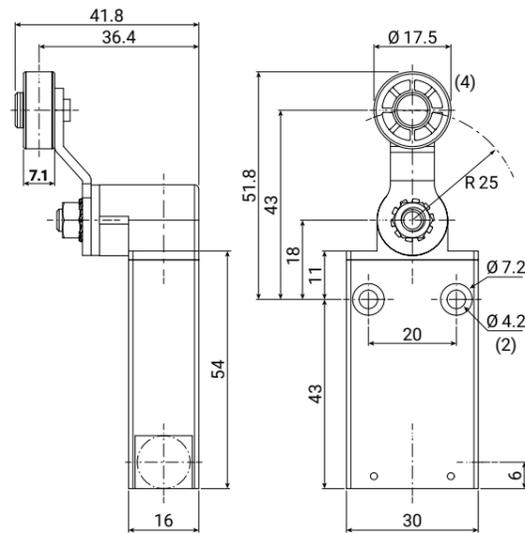
**07 roller plunger with threaded flange**



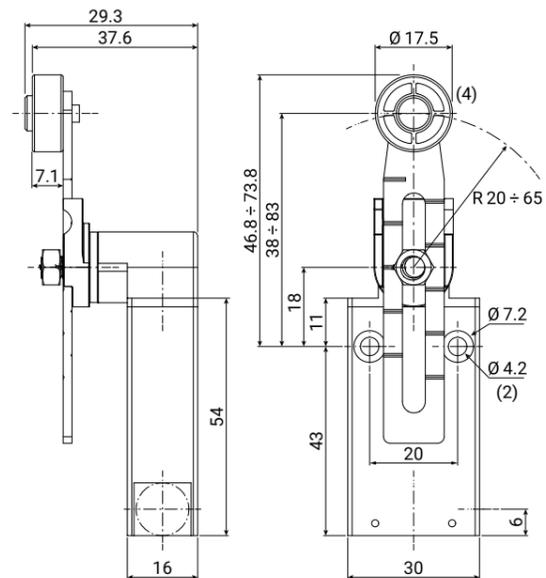
**08 90° roller plunger with threaded flange**



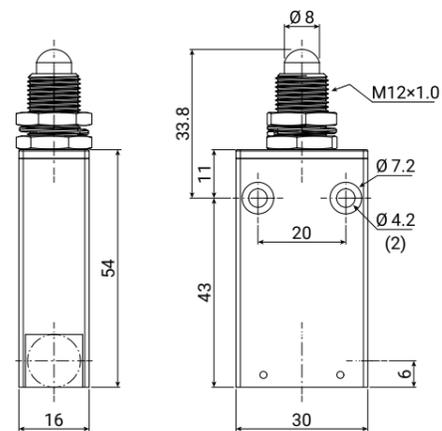
**03 90° roller plunger**



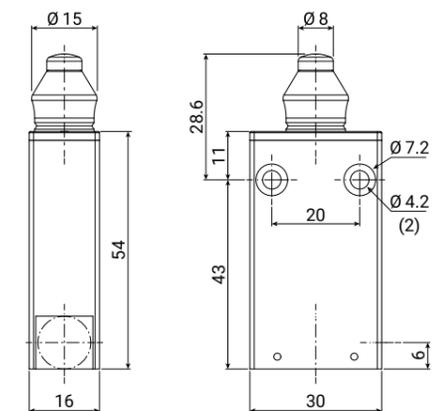
**04 metal revolving lever and Ø17.5 nylon roller**



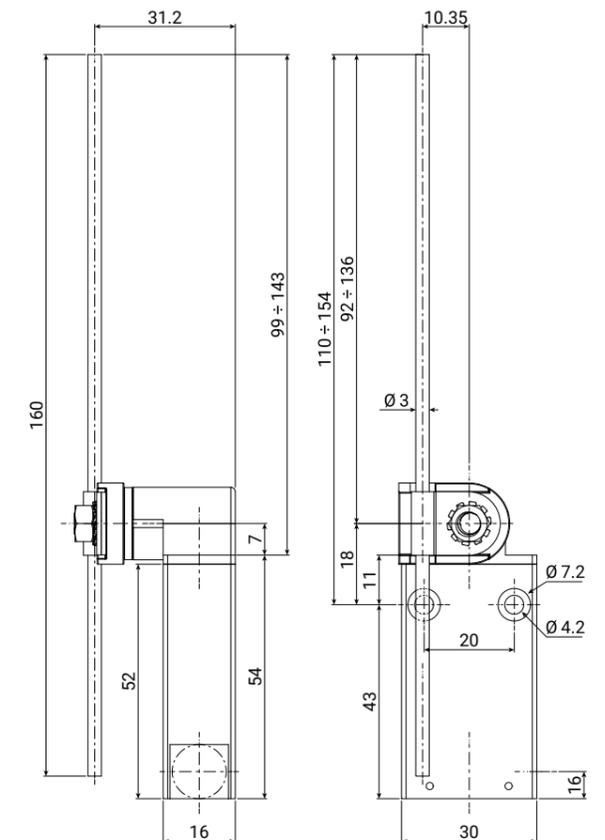
**05 adjustable metal revolving lever and Ø17.5 nylon roller**



**06 steel end plunger with threaded flange**



**09 steel end plunger with rubber protection**



**10 rod lever type**

**MICROSWITCHES**  
» MFI Ex SERIES

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, EAC-Ex, INMETRO, UL HazLoc

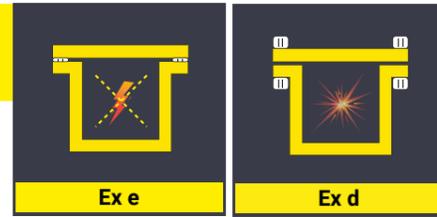


**DIRECTIVE**

ATEX 2014/34/EU

**TYPE OF PROTECTION**

- Restricted breathing case (Ex "dc ec")



**GAS**



**GENERAL CHARACTERISTICS**

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

**ELECTRICAL CHARACTERISTICS**

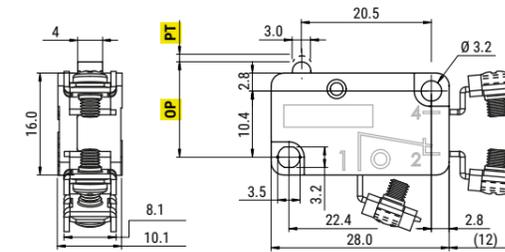
<b>Rated thermal current I<sub>th</sub></b>	8 A
<b>Rated insulated voltage U<sub>i</sub></b>	250 V
<b>Rated impulse withstand voltage U<sub>imp</sub></b>	1500 V
<b>Rated operating current I<sub>e</sub></b>	Resistive load: 8 A - 250 V Inductive load: 1A - 250 V
<b>Electric shock protection</b>	Class II
<b>Pollution class</b>	2

**Micro switches with screw terminals**



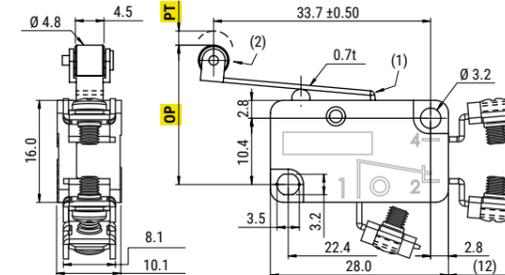
1 NC - 1 NO  
SNAP ACTION

**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

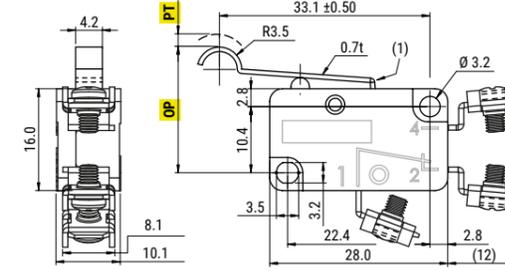
**MFI.1Ex**  
Long roller lever



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

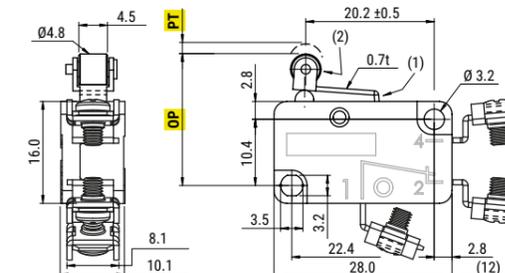
**MFI.2Ex**  
Simulated roller lever



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

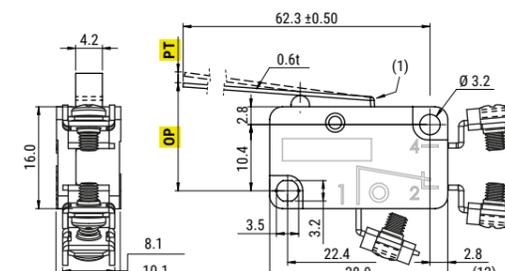
**MFI.3Ex**  
Roller lever



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



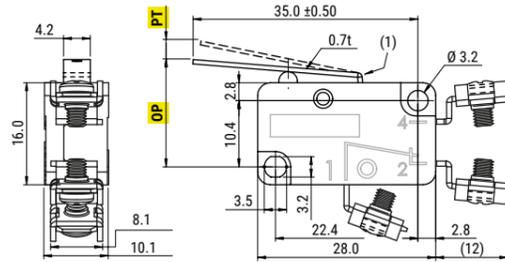
**FEESTON SYSTEM Ex**  
» 30, 41 Ex SERIES

**Micro switches with screw terminals**



1 NC - 1 NO  
SNAP ACTION

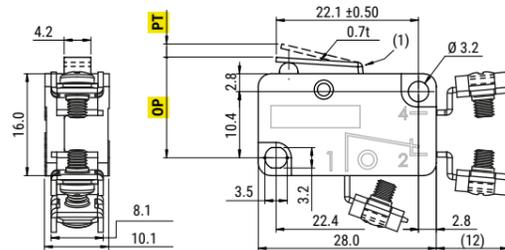
**MFI.5Ex**  
Lever



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

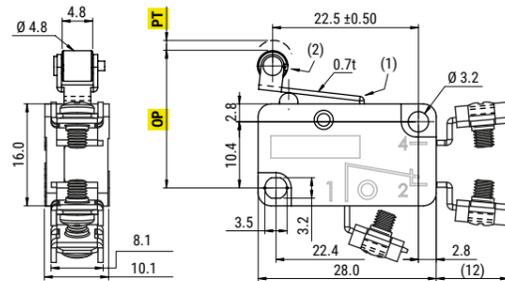
**MFI.6Ex**  
Short lever



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

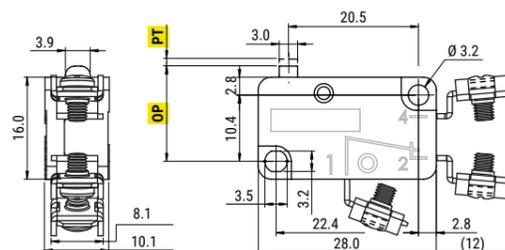
**MFI.7Ex**  
Roller lever L = 16 mm



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

**GAS**

**DUST**

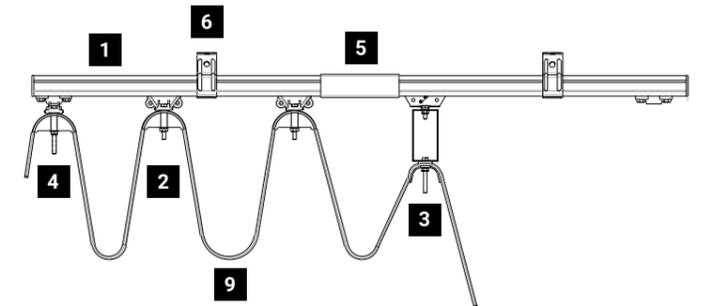
The Festoon-Ex mechanical system is composed by the different kind of trolleys able to transfer cables moving in linear translation, for hazardous areas.

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)**

**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



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

**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 plants  
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

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	

**30 EX SERIES**

CODE	DESCRIPTION	CODE	DESCRIPTION
 <b>30607001</b>	"C" bar of 4 metres	 <b>30607016</b>	Cable clamp
 <b>30607002</b>	Joint	 <b>30607005EX</b>	End stop
 <b>30607003</b>	Track support bracket	 <b>30607007EX</b>	Towing trolley single execution
 <b>30607017</b>	Track support bracket, Ceiling fixing	 <b>30607010EX</b>	Steel trolley for flat cable Saddle: 68 mm
 <b>30607004</b>	Support arm bracket, bracket fixing	 <b>30607011EX</b>	PA Trolley for flat cable Saddle: 55 mm
 <b>30607015</b>	End cap	 <b>30607021EX</b>	Trolley for round cable

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



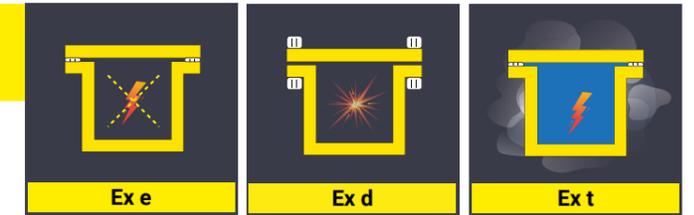
**30 EX SERIES**

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





**CONTROL STATIONS**  
» EX SERIES



**GAS DUST**

Local control stations panel board for operation and monitoring of multiple of electrical circuits and machinery, for hazardous areas. With different push button, pilot lights, contact blocks, switches and accessories.

**II 2G Ex db eb IIC T6/T5/T4 Gb**  
**II 2D Ex tb IIIC 85/100/135°C Db**  
**Zone 1-2 (Gas) - Zone 21-22 (Dust)**

**FEATURES**

- Different casing sizes
- Enclosures in 3 different types of material: AISI 316L, GRP, aluminium alloy
- Customised on request with different certified components and accessories.
- Impact resistant: 7 Joules
- Degree of protection: IP6X

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

**CERTIFICATIONS**  
ATEX, IECEx



**DIRECTIVE**  
ATEX 2014/34/EU

Control stations in GRP



Control stations in AISI 316L



Control stations in aluminium alloy



**The product is fully customisable for:**

- size and material of the housing;
- number of holes;
- type of operators.

Note: the photos of the assembled control panels are for illustrative purposes only. For further information, please contact our Technical Department.

**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	CODICE	DESCRIZIONE
 30602001/4	"C" bar of 4 metres	 30602045EX	Tilting trolley for round cable Ø26-40
 30602002	Single joint	 30602091EX	Towing trolley single execution Saddle: 68 mm
 30602034	Double joint	 30602020EX	Towing trolley double execution Saddle: 68 mm
 30602003	Track support bracket	 30602086EX	Steel trolley for flat cable Saddle: 68 mm
 30602004	Track support bracket, ceiling fixing	 30602071EX	Head clamp Saddle: 55 mm
 30602038EX	End stop	 30602072EX	Head clamp Saddle: 76 mm
 30602044EX	Tilting trolley for round cable Ø10-25		

**CONTROL EQUIPMENT EX**

A wide range of certified operators is available, including: pilot lights in different colours, coloured and symbolised pushbuttons, multi-function pushbuttons, emergency stop devices, rotary and key operated selector switches, potentiometers, caps and buzzers.

The positioning and quantity of the operators can be fully customised to the customer's needs.


**AISI 316L ENCLOSURES**

CODE	OVERALL DIMENSIONS (L x W x H)	CODE	OVERALL DIMENSIONS (L x W x H)
A6S01EX	90 x 90 x 75 mm	A6S20EX	380 x 600 x 210 mm
A6S02EX	100 x 100 x 90 mm	A6S21EX	400 x 500 x 210 mm
A6S03EX	100 x 160 x 90 mm	A6S22EX	450 x 300 x 210 mm
A6S04EX	100 x 220 x 90 mm	A6S23EX	450 x 450 x 210 mm
A6S05EX	150 x 160 x 120 mm	A6S24EX	450 x 450 x 250 mm
A6S06EX	150 x 220 x 120 mm	A6S25EX	450 x 600 x 210 mm
A6S07EX	150 x 280 x 120 mm	A6S26EX	450 x 600 x 250 mm
A6S08EX	200 x 220 x 120 mm	A6S27EX	500 x 700 x 250 mm
A6S09EX	200 x 280 x 120 mm	A6S28EX	600 x 380 x 210 mm
A6S10EX	250 x 280 x 120 mm	A6S29EX	600 x 450 x 250 mm
A6S11EX	250 x 340 x 150 mm	A6S30EX	600 x 600 x 210 mm
A6S12EX	300 x 340 x 150 mm	A6S31EX	600 x 600 x 250 mm
A6S13EX	300 x 400 x 150 mm	A6S32EX	600 x 600 x 300 mm
A6S14EX	400 x 400 x 150 mm	A6S33EX	600 x 750 x 210 mm
A6S15EX	300 x 300 x 210 mm	A6S34EX	600 x 750 x 250 mm
A6S16EX	300 x 380 x 210 mm	A6S35EX	600 x 750 x 300 mm
A6S17EX	300 x 450 x 210 mm	A6S36EX	600 x 900 x 300 mm
A6S18EX	380 x 300 x 210 mm	A6S37EX	750 x 1000 x 300 mm
A6S19EX	380 x 380 x 210 mm	A6S38EX	800 x 1200 x 300 mm


**ALUMINIUM ALLOY ENCLOSURES**

CODE	OVERALL DIMENSIONS (L x W x H)	CODE	OVERALL DIMENSIONS (L x W x H)
ALS02EX	98 x 64 x 34 mm	ALS18EX	330 x 230 x 110 mm
ALS03EX	150 x 64 x 34 mm	ALS19EX	230 x 200 x 110 mm
ALS04EX	58 x 64 x 34 mm	ALS20EX	330 x 230 x 180 mm
ALS05EX	75 x 80 x 57 mm	ALS21EX	220 x 120 x 81 mm
ALS06EX	125 x 80 x 57 mm	ALS22EX	122 x 120 x 91 mm
ALS07EX	175 x 80 x 57 mm	ALS28EX	180 x 180 x 100 mm
ALS08EX	250 x 80 x 54 mm	ALS29EX	280 x 180 x 100 mm
ALS09EX	100 x 100 x 81 mm	ALS30EX	200 x 230 x 180 mm
ALS10EX	160 x 100 x 81 mm	ALS31EX	400 x 310 x 110 mm
ALS11EX	122 x 120 x 81 mm	ALS32EX	400 x 310 x 180 mm
ALS12EX	220 x 120 x 90 mm	ALS33EX	600 x 310 x 110 mm
ALS13EX	260 x 160 x 90 mm	ALS34EX	600 x 310 x 180 mm
ALS14EX	360 x 160 x 90 mm	ALS35EX	400 x 230 x 110 mm
ALS15EX	160 x 160 x 90 mm	ALS36EX	140 x 140 x 90 mm
ALS17EX	280 x 230 x 110 mm	ALS37EX	200 x 140 x 90 mm


**GRP ENCLOSURES**

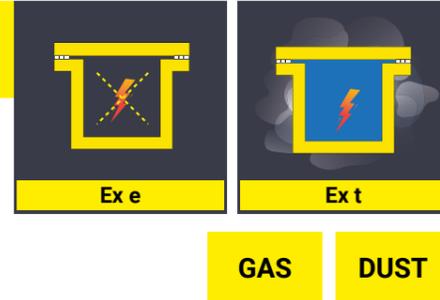
CODE	OVERALL DIMENSIONS (L x W x H)	CODE	OVERALL DIMENSIONS (L x W x H)
GRS01EX	80 x 75 x 55 mm	GRS12EX	255 x 250 x 120 mm
GRS02EX	110 x 75 x 55 mm	GRS13EX	260 x 160 x 90 mm
GRS03EX	122 x 120 x 90 mm	GRS14EX	360 x 160 x 90 mm
GRS04EX	80 x 75 x 75 mm	GRS15EX	400 x 250 x 120 mm
GRS05EX	160 x 75 x 55 mm	GRS16EX	400 x 405 x 120 mm
GRS06EX	160 x 75 x 75 mm	GRS17EX	255 x 250 x 160 mm
GRS07EX	160 x 160 x 90 mm	GRS18EX	400 x 250 x 160 mm
GRS08EX	110 x 75 x 75 mm	GRS19EX	400 x 405 x 201 mm
GRS09EX	190 x 75 x 55 mm	GRS20EX	600 x 250 x 121 mm
GRS10EX	190 x 75 x 75 mm	GRS21EX	600 x 250 x 161 mm
GRS11EX	220 x 120 x 90 mm		



**STAINLESS STEEL ENCLOSURES**  
» EX SERIES

Empty Boxes intended for fixed installation on the walls, made in stainless steel AISI 316L, for hazardous areas.

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



**FEATURES**

- Stainless steel AISI 316L enclosure
- Stainless steel screws
- Resistant to impact: 7 Joule
- Degree of protection: IP6X
- Working temperature: -50°C ... +100°C

**STANDARDS OF REFERENCE**

**SCHEME IEC**

IEC 60079-0, IEC 60079-7, IEC 60079-31

**CERTIFICATIONS**

ATEX, IECEx



**DIRECTIVE**

ATEX 2014/34/EU



**AISI 316L ENCLOSURES**

CODE	OVERALL DIMENSIONS (L x W x H)	CODE	OVERALL DIMENSIONS (L x W x H)
<b>A6S01EX</b>	90 x 90 x 75 mm	<b>A6S20EX</b>	380 x 600 x 210 mm
<b>A6S02EX</b>	100 x 100 x 90 mm	<b>A6S21EX</b>	400 x 500 x 210 mm
<b>A6S03EX</b>	100 x 160 x 90 mm	<b>A6S22EX</b>	450 x 300 x 210 mm
<b>A6S04EX</b>	100 x 220 x 90 mm	<b>A6S23EX</b>	450 x 450 x 210 mm
<b>A6S05EX</b>	150 x 160 x 120 mm	<b>A6S24EX</b>	450 x 450 x 250 mm
<b>A6S06EX</b>	150 x 220 x 120 mm	<b>A6S25EX</b>	450 x 600 x 210 mm
<b>A6S07EX</b>	150 x 280 x 120 mm	<b>A6S26EX</b>	450 x 600 x 250 mm
<b>A6S08EX</b>	200 x 220 x 120 mm	<b>A6S27EX</b>	500 x 700 x 250 mm
<b>A6S09EX</b>	200 x 280 x 120 mm	<b>A6S28EX</b>	600 x 380 x 210 mm
<b>A6S10EX</b>	250 x 280 x 120 mm	<b>A6S29EX</b>	600 x 450 x 250 mm
<b>A6S11EX</b>	250 x 340 x 150 mm	<b>A6S30EX</b>	600 x 600 x 210 mm
<b>A6S12EX</b>	300 x 340 x 150 mm	<b>A6S31EX</b>	600 x 600 x 250 mm
<b>A6S13EX</b>	300 x 400 x 150 mm	<b>A6S32EX</b>	600 x 600 x 300 mm
<b>A6S14EX</b>	400 x 400 x 150 mm	<b>A6S33EX</b>	600 x 750 x 210 mm
<b>A6S15EX</b>	300 x 300 x 210 mm	<b>A6S34EX</b>	600 x 750 x 250 mm
<b>A6S16EX</b>	300 x 380 x 210 mm	<b>A6S35EX</b>	600 x 750 x 300 mm
<b>A6S17EX</b>	300 x 450 x 210 mm	<b>A6S36EX</b>	600 x 900 x 300 mm
<b>A6S18EX</b>	380 x 300 x 210 mm	<b>A6S37EX</b>	750 x 1000 x 300 mm
<b>A6S19EX</b>	380 x 380 x 210 mm	<b>A6S38EX</b>	800 x 1200 x 300 mm

Note: The photos of the stainless steel casing are for illustration purposes only. For further information, please contact our Technical Department.



**JUNCTION BOXES**  
» EX SERIES

Junction boxes for electrical connections in hazardous areas.

**II 2G Ex eb IIC T6/T5/T4 Gb**  
**II 2D Ex tb IIIC 85/100/135°C Db**  
**Zone 1-2 (Gas) - Zone 21-22 (Dust)**

**FEATURES**

- Different enclosure dimensions (**dimension tables on pages 78 -79**)
- Enclosures in 3 different types of material: AISI 316L, GRP, Aluminium
- With thermoplastic terminals for standard temperatures or with certified ceramic terminal for low and high temperatures
- Customised on request with various certified components and accessories
- Impact resistant: 7 Joules
- Degree of protection: IP6X

**STANDARDS OF REFERENCE**

**SCHEME IEC**  
IEC 60079-0, IEC 60079-7, IEC 60079-31

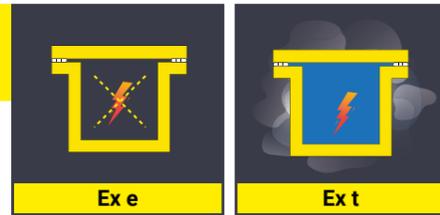
**CERTIFICATIONS**

ATEX, IECEx

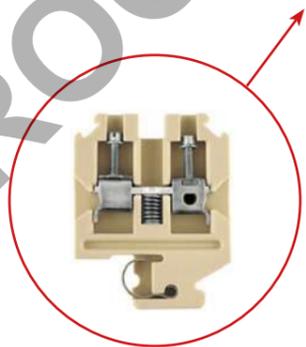


**DIRECTIVE**

ATEX 2014/34/EU



**GAS**    **DUST**



**Junction box**  
**with ceramic certified terminals**  
**FOR HIGH AND LOW TEMPERATURES**



**The product is fully customisable for:**  
**size and material of the housing;**  
**number and material of terminals.**

Note: The photos of the junction boxes are for illustration purposes only.  
For further information, please contact our Technical Department.

Visit our website  
and download the catalogue  
**ATEX and IECEx**



The latest version of Giovenzana's explosion-proof equipment catalogue is available online on our corporate website [www.giovenzana.com](http://www.giovenzana.com)

For further information, please write to [giovenzana@giovenzana.com](mailto:giovenzana@giovenzana.com)



**GIOVENZANA INTERNATIONAL B.V.**

Strawinskylaan, 1105  
1077 XX Amsterdam, **THE NETHERLANDS**  
Ph: +31 (0) 20.4413576  
E-mail: [giovenzana@giovenzana.com](mailto:giovenzana@giovenzana.com)

**G.T.R. LLC**

Likhov lane, h.3, b.2, office 101  
127051, Moscow, **RUSSIAN FEDERATION**  
Ph: +7.499.9228548  
E-mail: [gtr@giovenzana.com](mailto:gtr@giovenzana.com)

**GIOVENZANA CONTROLS INDIA Pvt. Ltd.**

A-102, Knox Plaza, Chincholi, Off Link Road  
Near Mindspace, Malad West  
400064 Mumbai, **INDIA**  
Ph: +91.22.42640071  
E-mail: [ggindia@giovenzana.com](mailto:ggindia@giovenzana.com)

**GIOVENZANA CONNECTING BRASIL LTDA**

Rua Dante Razeira, 102 Cep. 92700-090  
Guafba, Rio Grande do Sul, **BRASIL**  
Ph: (+55) 51 3055 1033  
E-mail: [gcb@giovenzana.com](mailto:gcb@giovenzana.com)

**GIOVENZANA INTERNATIONAL B.V. - Dubai Branch**

Jafza 15, Jebel Ali Free Zone  
P.O. Box 262146 Dubai, **U.A.E.**  
Ph: +971.4.8870788  
E-mail: [uae@giovenzana.com](mailto:uae@giovenzana.com)



**[www.giovenzana.com](http://www.giovenzana.com)**  
**[giovenzana@giovenzana.com](mailto:giovenzana@giovenzana.com)**