

# Gas Detectors--- Explosion and Protective Classifications

## 01: Ex/Explosion



### Why explosion protection?

**Explosive Substances** : Many production sites produce certain combustible substances. About two-thirds of underground coal mines have explosive substances; in the chemical industry, more than 80% of the production plant area has explosive substances.

**Oxygen**: Oxygen in the air is everywhere.

**Ignition source**: In the production process, the use of a large number of electrical instruments, a variety of friction sparks, mechanical wear and tear sparks, electrostatic sparks, high temperatures and so on unavoidable, especially when the instrumentation, electrical failure.

When the concentration of explosive substances mixed with oxygen is within the explosive limit, if there is an explosive source, an explosion will occur. Therefore, it is necessary to take explosion-proof.

### Format of Explosion Protection Marking

Usually factories or mining areas of explosive hazardous media, according to its ignition energy, the minimum ignition temperature and the presence of explosive hazardous gases at the scene of the time cycle of scientific classification and grading to determine the explosion-proof equipment explosion-proof signs and explosion-proof shape.

Explosion-proof electrical equipment according to GB3836 standard requirements, **explosion-proof equipment marking content includes = explosion-proof form + explosion-proof grade + electrical category + temperature group + equipment protection level.**

We can match the corresponding explosion-proof level according to the logo on the equipment, such as **Exia II CT4Ga = ia (intrinsically safe) + IIC (MESG ≤ 0.5) + T4 (135 °C < t ≤ 200 °C) + Ga (explosive gas environment, zone 0).**

## Ex explosion-proof type:

Ex d, Ex e, Ex p, Ex i(Ex ia, Ex ib), Ex o, Ex q, Ex m, Ex n, DIP(DIP A, DIP B), Ex s

**Ex ia class (zone 0-2)**, the highest level of explosion protection:

Electrical equipment that cannot ignite explosive gas mixtures during normal operation, one failure and two failures.

For normal operation, the safety factor is 2.0;

For one fault, the safety factor is 1.5;

For two faults, the safety factor is 1.0.

In normal operation, sparking contacts with explosion-proof enclosure, gas-tight enclosure or doubled must be added to increase the safety factor.

**Ex ib Class (Zone 1-2):**

Electrical equipment that cannot ignite explosive gas mixtures during normal operation and one fault.

The safety factor for normal operation is 2.0;

A safety factor of 1.5 for a fault.

In normal operation, sparking contacts must be protected by explosion-proof or gas-tight enclosures, and there must be means of self-indicating faults.

## Type of electrical equipment:

**Class I:** electrical equipment for coal mine and underground;

**Class II:** electrical equipment for all other explosive gas environments other than coal mines and underground.

**Class III:** Electrical equipment for explosive dust environments other than coal mines.

According to the maximum experimental safety gap (**MESG**) or the minimum ignition current (**MICR**) to distinguish, **Class II can be divided into: IIA, IIB, IIC** three categories (the larger the gap, the lower the environmental risk)

(MESG) mm

**IIA**  $0.9 \leq \text{MESG}$

**IIB**  $0.5 < \text{MESG} < 0.9$

**IIC**  $\text{MESG} \leq 0.5$

## Temperature group :

According to the explosive gas mixture according to the difference in ignition temperature, the group is divided into T1, T2, T3, T4, T5, T6 six, the ignition temperature is expressed in t (°C), the maximum permissible surface temperature of each group (the lower the temperature is better) are:

- T1:  $450^{\circ}\text{C} < t$
- T2:  $300^{\circ}\text{C} < t < 450^{\circ}\text{C}$
- T3:  $200^{\circ}\text{C} < t \leq 300^{\circ}\text{C}$
- T4:  $135^{\circ}\text{C} < t \leq 200^{\circ}\text{C}$
- T5:  $100^{\circ}\text{C} < t \leq 135^{\circ}\text{C}$
- T6:  $85^{\circ}\text{C} < t \leq 100^{\circ}\text{C}$

## EPL (equipment protection level) :

The level of protection for equipment based on the likelihood of the equipment becoming a source of ignition and the different characteristics of explosive gas environments, explosive dust environments and explosive environments in coal mines.

### Explosive gas environment:

**Zone 0:** explosive gas environment continuous or long-term existence of the place;

**Zone 1:** explosive gas environment may occur during normal operation of the place; and

**Zone 2:** explosive gas environment is unlikely to occur during normal operation, and if it does occur, it will occur occasionally and for a short period of time.

### Explosive dust environment.

**Zone 20:** the air in the combustible dust clouds appear continuously for a long time often appear to form an explosive environment in the area.

**Zone 21:** Normal operation, the air may occasionally appear in the combustible dust cloud to form an explosive environment in the region.

**Zone 22:** Normal operation, the air in the combustible dust cloud is unlikely to appear, if it occurs, only a short period of time to form the explosive environment of the region.

EPL	Hazardous Area	Protection Level
Ma	Coal Mine Gas Environment	Maximum
Mb	Coal Mine Gas Environment	High
Ga	Explosive gas atmosphere zone 0	Maximum
Gb	Explosive gas atmosphere zone 1	High
Gc	Explosive gas atmosphere zone 22	General
Da	Explosive dust environment zone 20	Maximum
Db	Explosive dust environment zone 21	High

## 02: IPXX / INGRESS PROTECTION

The IP (INGRESS PROTECTION) system is designed by IEC (International Electrotechnical Commission). The electrical equipment to be classified according to its dust and moisture characteristics, here referred to as foreign objects including tools, human fingers, etc., cannot touch the electrical equipment within the charged part to avoid electric shock.

The IP protection level is composed of two numbers, **the first number** indicates that the device is free from dust and prevents the ingress of foreign objects, and **the second number** indicates that the device is sealed against moisture and water ingress, and the larger the number, the higher the protection level.

Example: The display meter is labeled **IP65**, which means that the product is completely protected against dust ingress and can be rinsed with water without any harm.

级别 level	防爆等级 (第一个X) Explosion protection class (the first number)	防护等级 (第二个X) Protection class (thesecond numberX)
0	无防护, 对外界的人或物无特殊防护 Unprotected, no special protection against external persons or objects	无防护, 对水或湿气无特殊的防护 Unprotected, no special protection against water or moisture
1	防止直径大于 <b>50mm</b> 的固体外物侵入 Protected against solid foreign objects greater than <b>50mm</b> in diameter	防止 <b>水滴 (如凝露)</b> 浸入外壳, 不会对电器造成损坏 Protected against water <b>droplets (e.g. condensation)</b> entering the housing without damaging the unit
2	防止直径大于 <b>12.5mm</b> 的固体外物侵入 Protected against solid foreign objects greater than <b>12.5mm</b> in diameter	当仪表 <b>倾斜到15度</b> 时,滴水不会对仪表造成损坏 No damage to unit from dripping water when unit is tilted <b>15 degrees</b>
3	防止直径大于 <b>2.5mm</b> 的固体外物侵入 Protected against solid foreign objects greater than <b>2.5mm</b> in diameter	<b>水从60度角</b> 落到仪表外壳上无影响 No effect of <b>water</b> on the meter case from a <b>60-degree</b> angle
4	防止直径大于 <b>1.0mm</b> 的固体外物侵入 Protected against solid foreign objects greater than <b>1.0mm</b> in diameter.	<b>水由任何方向</b> 泼到仪表外壳没有伤害影响 Water splashed on the meter case from <b>any direction</b> has no harmful effect
5	防止外物及灰尘侵入, <b>不能完全防止灰尘</b> , 但灰尘的侵入量不会影响电器的正常运作 Prevents the ingress of foreign matter and dust, <b>does not completely prevent the ingress of dust</b> , but the amount of dust ingress will not affect the normal operation of the equipment.	防止持续 <b>至少3分钟</b> 的低压喷水 Protected against low pressure water jets for <b>at least 3 minutes</b> .
6	<b>完全防止外物</b> 及灰尘侵入 <b>Completely prevents</b> foreign objects and dust from entering	防止因大浪的侵袭而浸水造成损坏, 适用于 <b>船舶环境</b> Protected against damage caused by immersion in water due to heavy waves, suitable for <b>marine environments</b>
7		防止在深达1米的水中浸泡 <b>30分钟</b> 的无影响 Protected against immersion in water up to 1 meter deep for <b>30 minutes</b> .
8		防止在深度超过1米的水中 <b>长时间持续浸泡</b> 无影响 Protected against <b>prolonged</b> immersion in water deeper than 1 meter.

## 03: Selection principle of gas detector

### IP(International protection)防护等级



1. according to **the results of the gas explosion hazardous areas** to choose the explosion-proof instrumentation explosion-proof type;
2. according to **the gas explosion hazardous areas of explosive gases and vapors may occur in the explosion level of explosion-proof instrumentation** to choose the explosion-proof level;
3. according to **the gas explosion hazardous areas of explosive gases and vapors may occur in the spontaneous combustion temperature** selection of explosion-proof instrumentation temperature group.

Special emphasis: Class 0 area is only allowed to use ia class intrinsically safe detector and other electrical equipment specially designed for class 0 area (special type "s").

爆炸危险场所 Explosion Hazardous Locations	适用的电气设备类型 Applicable types of electrical equipment
0区 zone 0	Ex ia
	Ex s
1区 zone 1	适用于0区的防护类型 Type of protection suitable for Zone 0
	Ex d, Ex e, Ex ib, Ex m, Ex o, Ex p, Ex q
	Ex s
2区 zone 2	适用于0区或1区的防爆类型 Type of explosion protection suitable for Zone 0 or Zone 1
	Ex n

There are **three kinds of explosion-proof external boxes available** in our company (corrosive background gas is recommended to use stainless steel explosion-proof external box).



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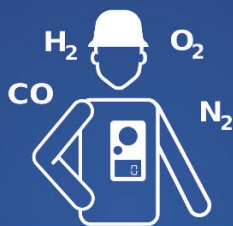
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