

ATEX 94/9/EC Directive ➤ Groups and zones

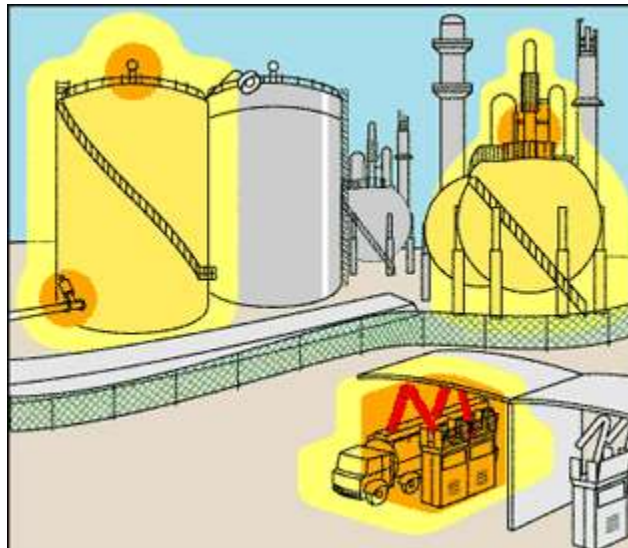
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Groups

Zone	Category	Presence of explosibles atmospheres
Group II equipment		
zone 0	category 1 G	Continuous, frequent or for long periods
zone 20	category 1 D	
zone 1	category 2 G	Intermittent in normal operation (likely)
zone 21	category 2 D	
zone 2	category 3 G	Occasional or for short periods (never in normal operation)
zone 22	category 3 D	
Group I equipment		
	category M 1	Presence (methane, dust)
	category M 2	Risk of presence (methane, dust)

Zones

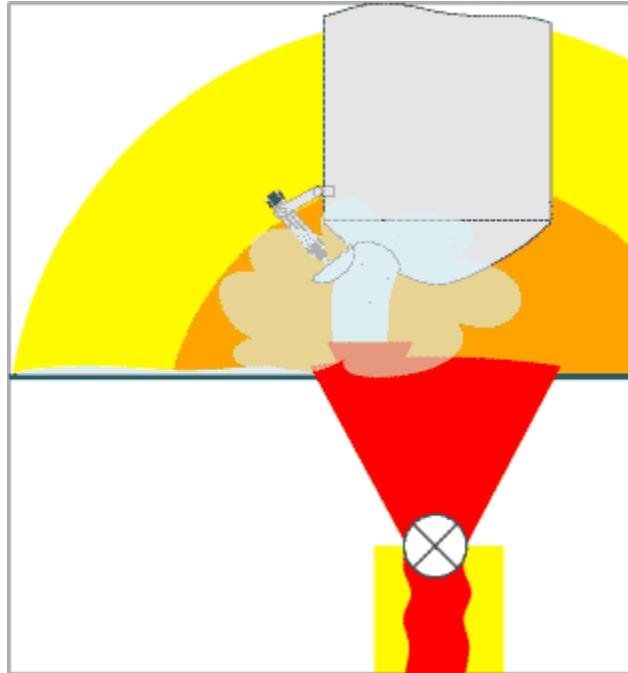
Hazardous areas for Group II are further divided in zones, these zones relate to the predicted occurrence of when an explosive atmosphere may be present in the area. These zones are defined as being:



Gas

Color	Zones	Presence of gas
Red	0	Continuously present (during long periods)
Orange	1	Not likely to be present (regular service)
Yellow	2	

Nota: Drawing and colors are just an example and should not be used for an actual plant, the design of which is the chief architect's responsibility.



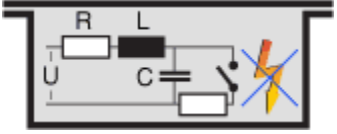






Dusts



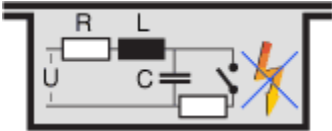
Color	Zones	Presence of dusts
Red	20	Continuously present (during long periods)
Orange	21	Not likely to be present (regular service)
Yellow	22	Accidentally present (short-time-service - never in regular service)

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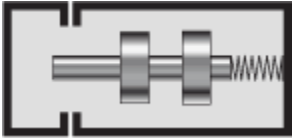
Types of protection for electrical apparatus for use in gas atmospheres

Protection symbol	Zones			Description	Drawing
	0	1	2		
"d"		X	X	Flameproof enclosure Type of protection in which the parts which can ignite an explosive atmosphere are placed in an enclosure which can withstand the pressure developed during an internal explosion of an explosive mixture and which prevents the transmission of the explosion to the explosive atmospheres surrounding the enclosure.	
"e"		X	X	Increased safety Type of protection in which measures are applied so as to prevent with a higher degree of safety the possibility of excessive temperatures and of the occurrence of arcs or sparks in the interior and on the external parts of electrical apparatus, which does not produce them in normal service.	
"i"	"ia" "ib"	X	X	Intrinsically safety Type of protection when no spark or any thermal effect in the circuit, produced in the test conditions prescribed in the standard (which include normal operation and specific fault conditions), is capable of causing ignition.	
"m"		X	X	Encapsulation Type of protection in which the parts which can ignite an explosive atmosphere are enclosed in a resin sufficiently resistant to the environmental influences in such a way that this explosive atmosphere cannot be ignited by either sparking or heating which may occur within the encapsulation.	
"n"			X	Non incendiaire Type of protection in which the parts which can ignite an explosive atmosphere are enclosed in a resin sufficiently resistant to the environmental influences in such a way that this explosive atmosphere cannot be ignited by either sparking or heating which may occur within the encapsulation.	
"o"		X	X	Immersion Type of protection in which the electrical apparatus is immersed in oil.	
"p"		X	X	Pressurised enclosure Type of protection in which the protective inert gas inside the enclosure is maintained at a higher pressure than that of the surrounding atmosphere.	
"q"		X	X	Powdery filling Type of protection in which the enclosure is filled with a material in a finely granulated state.	

Types of protection for electrical apparatus for use in the presence of combustible dust

Protection symbol	Zones			Description	Drawing
	0	1	2		
"tD"		X	X	<p>Flameproof enclosure</p> <p>Electrical apparatus protected by enclosure and surface temperature limitation for use in areas where combustible dust may be present in quantities which could lead to a fire or explosion hazard.</p> <p>The ignition protection is based on the limitation of the maximum surface temperature of the enclosure and other surfaces which may come into contact with dust and on the restriction of dust ingress into the enclosure by the use of "dust-tight" or "dust-protected" enclosures.</p> <p>This standard is not applicable to electrical apparatus intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by fire and/or combustible dust; nor does it take account of any risk due to an emission of flammable or toxic gas from the dust.</p>	
"mD" "maD" "mbD"	X	X	X	<p>Encapsulation Intrinsically safety</p> <p>Electrical apparatus protected by encapsulation type of protection 'mD' and surface temperature limitation for use in areas where combustible dust may be present in quantities which could lead to a fire or explosion hazard.</p> <p>Type of protection in which the parts which can ignite an explosive atmosphere are enclosed in a resin sufficiently resistant to environmental influences in such a way that a dust cloud or layer cannot be ignited during installation or operation.</p>	
"iD"	X	X	X	<p>Intrinsically safety</p> <p>Intrinsically safe apparatus intended for use in potentially explosive dust cloud or dust layer environments and for associated apparatus that is intended for connection to intrinsically safe circuits which enter such environments.</p> <p>Applicable to electrical apparatus in which the electrical circuits themselves are incapable of causing an explosion in the surrounding combustible dust environment.</p>	

Types of protection for non-electrical apparatus

Protection symbol	Zones			Description	Drawing
	0	1	2		
"c"	X	X	X	<p>Construction safety</p> <p>This standard establishes manufacturing requirements which have been proven safe, in order to avoid any inflammation sources such as friction or heating sparks. It applies to apparatus where movement and friction can occur (clutches, brakes, bearings, springs...).</p>	

Temperature classes

Group I	
Temperatures $\leq 150^{\circ}\text{C}$ or $\leq 450^{\circ}\text{C}$ according to coal dust accumulation on equipment	
Group II	
Temperature class for gas (G)	Permissible surface temperature of electrical equipment
T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C

Ignition temperature for dusts

The dust ignition temperature depends on the its consistency and its nature.

The ignition temperatures for various types of dust are available from reference tables: examples

Dusts	Ignition temperature	
	Clouds	5 mm layer
Aluminium	560°C	$\geq 450^{\circ}\text{C}$
Charcoal	520°C	320°C
Coal dust (lignite)	380°C	225°C
Cocoa	590°C	250°C
Coffee grounds	580°C	290°C
Corn	530°C	460°C
Methyl cellulose	420°C	320°C
Paper fiber	570°C	335°C
Phenolic resin	530°C	$>450^{\circ}\text{C}$
Polyethylene	440°C	melts
PVC	700°C	$>450^{\circ}\text{C}$
Sugar	490°C	460°C
Soot	810°C	570°C
Toner	520°C	melts
Wheat	510°C	300°C

Nota: these temperature information are given as examples and cannot be used as reference table.

All the information about groups, protection type and temperature classes have to be mentioned on the [equipment marking](#)