

Hazardous Location Information

International Area Classification Combustible Dust IECEx & ATEX

OVERVIEW

IEC have produced a range of standards for “Electrical apparatus for use in the presence of Combustible Dust”. These standards have subsequently been adopted by the EU as ATEX-EN standards. This is the first time there has been international standards for this type of protection.

Where there is Combustible Dust presence, this combustible dust may be deposited on any surface within the area and this in turn may be the cause of an explosion. Where there is a dust explosion, it will invariably cause a secondary explosion that can cause death – injury to personnel as well as damage to plant and lost production. The initial explosion will disturb, lift, the surrounding dust which in turn is ignited, causing the secondary explosion that inevitably causes the most damage.

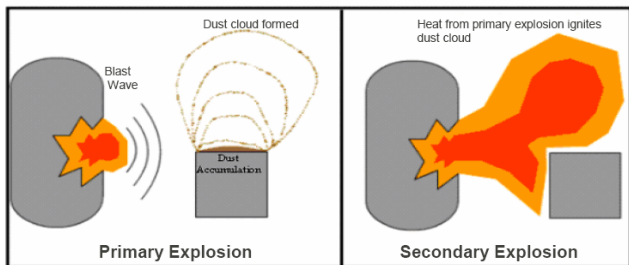


Figure 2

Combustible Dusts Ex zones are shown as Zone 20, Zone 21 and Zone 22. These Dust zones are similar in concept to the Gas Zone 0, 1 and 2. Plant areas are mostly classified as Zone 21 or Zone 22. Zone 20 is mostly limited to the interior of assemblies such as silos or hoppers.

IEC & ATEX Zone	ATEX Category	Description
Zone 20	D1	Always present
Zone 21	D2	Present during production
Zone 22	D3	Short periods or Fault conditions

Two Dust Groups:

Non-Conductive Dust		Conductive Dust
Natural Products	(Flour)	Metal Dust (Aluminium)
Chemical Products		

Conductive Dust areas can only be classified as Zone 21 or Zone 20. Zone 22 Ex equipment is not permissible where there is the presence of Conductive Dust.

Dust Ignition Source

Static electricity, hot surfaces, mechanically-triggered sparks, ignition sources in enclosures in which dust has entered. These ignition sources can cause an explosion if they exceed the ignition temperature of the dust during heating.

A safety factor is calculated using the highest ignition temperature (cloud) and the glow temperature (layer) of the respective dust.

$T_{max\ ign} = Layer\ temp - 75K$
 e.g. PVC: $T_{ign} = 380^{\circ}C - 75 = 305^{\circ}C$

$T_{max\ glow} = Cloud\ Temp\ 2/3$
 e.g. PVC glow = $530^{\circ}C \times 2/3 = 353^{\circ}C$

The lower value is used as the T_{max} . e.g. PVC is $T_{max} = 305^{\circ}C$ with the maximum surface temperature of the Ex equipment specified in the certification:
 e.g. MiniPurge: Ex pD II 21 T85°C

This means the MiniPurge® can be used for PVC dust environment because the 85°C is lower than the PVCmax dust 305°C

Industries with potential Combustible Dust Mixtures

- + Chemical Industry Cellulose
- + Pharmaceutical Industry Active ingredients
- + Power Generation Coal
- + Food and Feed Grain, Cocoa, Sugar
- + Plastic Industry Plastic granulates
- + Metalwork Industry Aluminium, Titanium



Foundry: cause of ignition, shell moulding machine

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ATEX

IEC & EN Dust Standards

Dust Standards			
Dust – Type of Protection for Electrical Equipment			
Protection Method	Ex code	IEC / EN Standard	Zone
Intrinsically Safe	iaD	61241-11	20
	ibD	61241-11	21
Flameproof/Enclosure	tD	61241-1	21
Pressurization	pD	61241-4	21
Enclosure <i>(IP5X Non-Conductive dust)</i>	tD	61241-1 IP6X	20
	tD	61241-1 IP6X	21
	tD	61241-1 IP5X	22
Encapsulation	maD	61241-18	20
	mbD	61241-18	21
General Requirements		60079-0	
Classification of Areas		61241-10	
Selection and Installation		61241-14	
Inspection and Maintenance		61241-17	
Determining Ignition Temp. of Dust		61241-2-1	
Determining Ignition Energy of Dust		61241-2-3	

Ex tD Protection by Enclosure

The first option for the protection an instrument - electrical enclosure is "Protection by Enclosures tD" standards 61241-1 (IP6X). The IP rating is to comply with IEC/EN 60529 and tested to IEC/EN 61241-1 (Ex tD) for example thermo-cycling. For an Ambient Temperature of -20°C to 55°C, 6 cycles over a 30 hour period. This simulates the changes in barometric pressure. If no visible dust has entered the enclosure after this testing then the enclosure will be given an IP 6X rating. As can be seen from the above test a standard IP 6X enclosure may not be guaranteed to comply with these requirements.

Contact Expo Sales office for more information.

Ex pD Protection Pressurization

Pressurization is a simple technique where any dust that may be present inside the enclosure is removed before pressure can be applied. "Good House Keeping". Once pressure has been established, preventing any ingress of dust, the power can then be applied. This technique is used on enclosure that, do not or can not comply with the requirements of protection by "Enclosure "tD". This may be due to the design of the enclosure not meeting the requirement of IP6X or IP5X as laid down in IEC / EN 61241-1. General Purpose enclosure with an IP rating of IP6X or IP5X do not normally comply with Combustible Dust – Ex tD Type of "Protection by Enclosure" IEC / EN 61241-1.

Ex pD Action on Loss of Pressurization

The type of "Ex pD" is dependent on the Zone the enclosure is to be installed and the type of equipment that is to be protected within the enclosure.

Action on Loss of Pressurization		
Area Location	Type of apparatus in the Enclosure	
	Ignition-capable apparatus	Apparatus with no sources of ignition in normal operation
Zone 21	Alarm & Trip (1XDP)	Alarm Only (1YDP)
Zone 22	Alarm Only (1ZDP)	pressurization not required

Expo has a range of MiniPurge® DP (Dust Protection) systems have been certified IECEx and ATEX-EN, Ex pD which include the above options.

Zone 21 with ignition-capable apparatus requires an automatic device to disconnect the power when pressure is below the minimum. See MiniPurge® Data Sheet MXDP for details of the 1XDP (Zone 21) system.

Zone 21 with no source of ignition requires only an ALARM when pressure is below the minimum. See MiniPurge® Data Sheet MZYDP for a 1YDP for details of the 1YDP (Zone 21) system.

Zone 22 with ignition-capable apparatus requires only an ALARM when pressure is below the minimum. See MiniPurge® Data Sheet MZYDP for details of the 1ZDP (Zone 22) system.

Ex pD Enclosure Certification

By fitting an Ex pD certified MiniPurge® DP system to a pressurized enclosure does not certify the enclosure and contents to the IEC / EN standards. Expo can offer their range of Pressurized Enclosure which includes for the clients contents as part the ATEX Certification.

The MiniPurge® DP system range includes FM (Factory Mutual) certified for Class II, Div 1 Grp E,F,G & Div 2 Grp F,G.

Expo Consultancy Services can also assist in obtain the certification for the completed assembly for both IECEx and ATEX.

Please ask for more details on Ex tD, Ex pD and FM X,Y,Z DP protection by contacting your local Expo Sales office.

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