



Dust - a Safety Risk

Why dust is an explosive subject

 **COOPER** Crouse-Hinds



One spark may be enough!

A dust explosion needs three things: Air, combustible dust, a source of ignition!

Combustible and explosive dusts occur more often than you think.

For example during the processing of

- wood and fiber materials
- foods, beverages, tobacco and fodder
- coal
- metals and metal alloys

But technical chemical products of plastic, resin and rubber can create combustible dusts and explosive atmospheres.

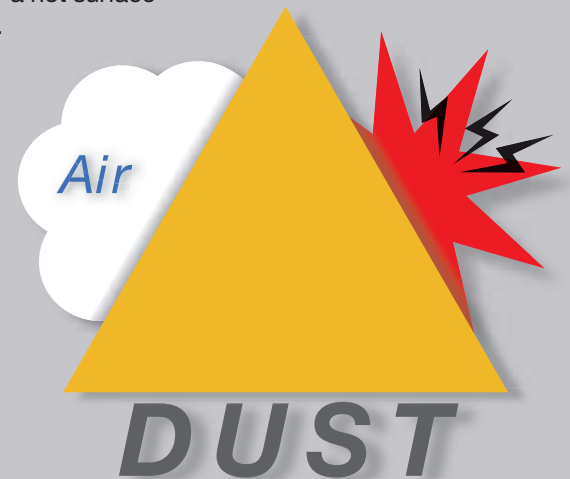
If you store combustible dusts on hot surfaces such as overheated electric motors, smoldering fires may occur which can cause an explosion when the dust is kicked up, for example by opening a window. Dust explosions are particularly dangerous because the shock wave can kick up more dust and trigger a chain reaction. The result is often destruction on a dramatic scale and danger to human life.

Dust is almost everywhere – air too! But you can prevent sources of ignition!

In connection with building and organizational measures and by choosing suitable equipment certified for use in dust Ex-areas the risk of an explosion can be minimized. Cooper Crouse-Hinds GmbH offers you a wide selection of electrical equipment for safe use in dust Ex-areas.

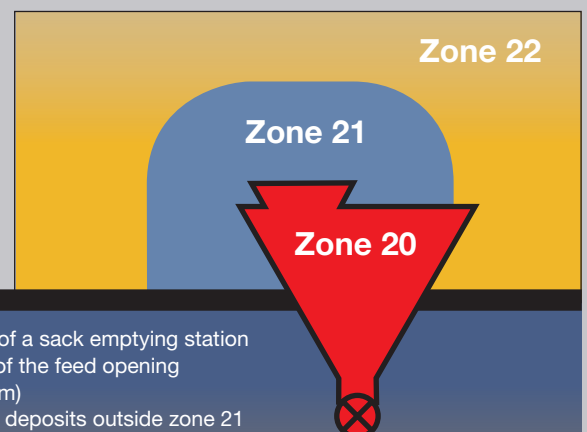
The following three conditions must be satisfied for a dust explosion:

- A cloud of combustible substances with a particle size of <0.5 mm. The concentration of this dust cloud must be between the lower explosion limit (LEL) and the upper explosion limit (UEL). The LEL for many food dusts, for example is between 30 and 60 g/m³, the UEL is 2 to 6 kg/m³.
- A sufficient amount of air oxygen.
- A suitable ignition source, e.g. an electrical spark which may occur when pulling a plug out of a socket or a hot surface (e.g. 300°C to 600 °C).



Always the right equipment

According to their potential risk, dust explosion areas are classified in different zones in the European Union to which equipment categories 1D to 3D are assigned. This zone classification can be demonstrated particularly well by the example of a sack emptying station without dust suction.



Zone 20: Filling hopper of a sack emptying station
Zone 21: Close vicinity of the feed opening (e. g. radius 1 m)
Zone 22: Area with dust deposits outside zone 21

One spark may be enough!

**New dust standard
valid from 7/1/07**

The new standard EN 61241... supersedes the previously valid dust standard EN 50 281 from July 1, 2007.

This new standard EN 61241... must be observed because a high risk potential in dust explosion areas is involved in which peoples' lives are in danger.

The standard takes into account that the demands on the electrical equipment in areas with a risk of dust explosion are increased in comparison with the industrial standard and the previous standard EN 50281.

This obliges the owner to use products which correspond to and conform with the EN 61241 standard exclusively for new installations.

Which individual demands have changed exactly?

- Impact strength of the housings
- Electrostatic discharge capability of the housings
- Aging resistance of the plastics used

In order to always be on the safe side in future, the dust Ex-equipment of the brand comply with the new EN 61241-0 and EN 61241-1 + A1 standards for the dust ignition protection type „protection by housing“ (tD) and are approved accordingly.

Dust explosion-protected equipment of the CEAG brand are of course subject to extensive quality assurance measures. We naturally have a quality management certified by DIN EN ISO 9001: 2000 with additional regular auditing by an independent test body (ATEX Audit). (Fig. 1)

Our dust explosion-protected light fittings and electrical equipment comply with the latest standards and have all the important national and international approvals. For instance, our products are subjected to a conformity evaluation process for use in dust Ex-areas in which a named independent body tests their technical suitability for use in Ex-areas of zones 20, 21 and 22 (device category 1/2/3D). With the EC type test certificate or type test certificate / declaration of conformity, the test body certifies the appropriate suitability and grants approval. (Fig. 2)

Protect yourself



(Fig. 1)



(Fig. 2)

Fluorescent luminaires in the dust test chamber: Our products are tested rigorously. This gives you safety.





mineral dust

**Dust explosions are not
- and more common**

Approximately 2,000 dust explosions occur in the EU with average damages of 1 million Euro per incident. In an explosion at the ... 14 people died, 17 were injured and 1 million Euro were caused!

An analysis of almost 600 dust explosions revealed that 31 % were caused by wood powder and food dusts, 13 % by mineral dust. Silos, dedusting and conveying systems, kilns, heatings, saws, carpenteries are particularly affected.



metal dust

saw dust

mill dust

more dangerous
- than you think!



Explosions occur every year in
factories with damages of about 25,000 € per accident.
In the case of the Rolandmühle in Bremen alone,
there were 100 accidents and damages of 50 million €.

Major damage cases in Germany re-
sulted from: 25 % by wood dust, 25 % by food
dust, 15 % by plastic dust and 9 % by coal
dust. Common sources are conveyor systems, mills, drying
plants, grain elevators, dry shops and mixing systems.



One spark may be enough!

COOPER Crouse-Hinds

To make your dust Ex-area safe

Electrical equipment for your safety

Mills, mixers or conveyors in areas where there is a risk of dust explosion require electrical energy – reliable, safe and explosion-protected. We provide the safe power supply for your drives with dust explosion-protected switches, motor intermediate terminal boxes and plug devices. And that's not all: Your drives can clearly and visibly be disconnected from the mains supply by our range of plug and sockets. This also makes maintenance of your machines very safe and convenient.

Shining examples of explosion protection

Risks can only be recognized and accidents avoided under good visibility conditions. Therefore good lighting is a must, especially in areas where operations favor the development of dust. Our dust explosion-protected light fittings and downlights provide reliable light here whilst emergency exit luminaires safely show the way in case of a power failure.

All from one provider

Our extensive product portfolio of the CEAG brand offers you products for almost all areas of application:

- Portable light fittings, fluorescent light fittings and downlights
- Emergency exit luminaires
- Plug devices and branching sockets
- Switchgear and terminal boxes
- Command and indicator devices
- Safety switch with emergency stop function

as well as customer-specifically configured switching systems and controls.

Flexible: eXLink connector with branching socket



Recessed ceiling mounting luminaire



eXLink connector in metal version



Guiding the way: Emergency Exit luminaire



Mounted luminaire for more light



Branching socket



Terminal box

Plug device for flexible energy distribution



Control unit



Terminal box in stainless steel version



Safety switch with EMERGENCY STOP

You are responsible

When can dust explode?

Combustible dust-air mixtures have different ignition temperatures. The surface temperature of the equipment in areas with a risk of dust explosion may reach 2/3rd of the minimum ignition temperature of the surrounding dust-air mixture at the maximum and with a 5 mm thick layer of dust must be at least 75 °K below the minimum ignition temperature of the dust (glow temperature). It is therefore the owner's job to ensure that the cleaning and maintenance intervals of installations with a dust explosion risk are scheduled so that no dust layers thicker than 5 mm are allowed to form. At higher dust deposits the minimum ignition temperature (glow temperature) of the dusts are reduced drastically. Examples for the ignition and glow temperatures can be taken from the table below.

Dust type (name of the solid)	Minimum ignition temperature of a dust layer (glow temperature) in acc. with IEC 61241-2-1 proc. A	Minimum ignition temperature of a dust cloud in acc. with IEC 61241-2-1 proc. B
Natural products (examples)		
Cellulose	370	500
Coal	270	590
Cocoa	460	580
Cork	300	470
Cotton	350	560
Flour	470	410
Fodder	295	520
Grain	290	420
Milk powder (full, spray)	330	520
Paper	335	570
Peat	320	500
Sawdust	300	400
Starch	530	380
Sugar	360	450
Tea	300	510
Tobacco	300	450
Chemical-technical products (examples)		
Laminate (grinding dust)	330	510
Petrol coke	280	690
Polyvinyl acetate	340	500
Polyvinyl chloride	430	680
Rubber	220	460
Soot	385	620
Sulfur	280	280
Metals (examples)		
Aluminum	280	530
Bronze	260	390
Iron	300	310
Magnesium	410	610
Manganese	285	330
Zinc	440	570

Source: BIA - Report (excerpt) Combustion and Explosion Variables
Issued by: HVBG

You the owner are responsible for the protection of the work force and safety of your plant according to the new European ATEX directive 1999/92/EC (ATEX 137).

This work force protection directive also covers electrical installations in areas where there is a risk of dust explosion. This EC directive has become valid in all member states by national laws and regulations and supplements the product-related (technical) work protection as it is governed by the ATEX directive 94/9/EC among other things (characteristic requirements). The work protection directive 1999/92/EC also governs the carrying out of a risk assessment and division of Ex-areas into zones. In accordance with this directive, only appropriately certified electrical equipment may be used in areas with a risk of dust explosion.



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