Explosion Proof Hoist Knowledge

DGCRANE Machinery Limited

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Where explosion proof hoists are needed

Explosion proof hoists are suitable for use in ports, chemical plants, power plants, flour mills, pharmaceutical factories, mines, petrochemicals, railways, metallurgical chemicals, marine engineering, airport construction, military, aviation, aerospace, and other industry sectors.

Approximately 2/3 of the places in coal mines, about 60% to 80% of the places in oil extraction sites and refineries, and over 80% of the workshops in the chemical industry belong to flammable and explosive hazardous areas.

Flammable and explosive hazardous areas mainly refer to the tunnels and chambers of mines, workshops, or warehouses in factories where explosive dangerous gases (or liquids, vapors) are mixed with air to form explosive gas mixtures. These areas can produce combustion or explosion when an ignition source is present.

In these areas, it is necessary to use explosion proof hoists and other types of explosion proof electrical equipment, otherwise, there is a possibility of triggering explosive accidents, which can cause loss of life and property to the workers.

When containers filled with explosive substances are placed in non-hazardous areas, there is still a potential danger in abnormal situations (such as leakage, misoperation, high temperature, etc.). Therefore, the use of explosion proof hoists should also be considered in these areas to avoid accidental dangers.

Explosion Proof Hoist's Marking



On the exterior of explosion proof hoist equipment, a clear and permanent embossed or debossed marking of "Ex" should be placed prominently.

Classification Of Explosion Proof Hoist

Explosive gas & vapour	I:coal mines		
		II A (methane)	
	II:places other than coal mines	II B (ethylene)	
		II C (hydrogen&acetylene)	
Combustible dust		III A(Inflammable catkins)	
	III:Explosive dust environments other than coal mines	III B(Non-conductive dust)	
		III C(Conductive dust)	

Notes:

- This is the latest standard GB/T 3836.1-2021.
- IIB class explosion proof hoists can be used under conditions suitable for IIA class explosion proof hoists; IIC class can be used under conditions for both IIA and IIB class explosion proof hoists.

Explosion Proof Zone

When an explosion proof hoist operates in an explosive gas environment, its working area is classified as Zone 1 or Zone 2 as defined in GB 3836.14-2000.

When an explosion proof hoist operates in a combustible dust environment, its working area is classified as Zone 21 or Zone 22 as specified in GB 12476.3-2007.

Gas & Vapour	Zone 0	Places where explosive gas mixtures are continuously present, appear frequently for short periods, or exist for long periods.
	Zone 1	Places where explosive gas atmospheres may occur.

	Zone 2	Places where an explosive gas atmosphere is unlikely to occur. If it does occur, it is only occasional and for a short duration.				
Dust	Zone 20	Places where combustible dust is continuously or frequently present.				
	Zone 21	Places where mixtures of combustible dust and a may occur.				
	Zone 22	Occasions where combustible dust appears occasionally and exists only for a short duration.				

Classifications for Temperature

Explosive temperature is the highest temperature of a surface of an explosion proof products when this explosion proof products work normally.

As we know, explosion proof products is still an products which will produce heat when normal operated, but if the temperature of surface of explosion proof products is higher than spontaneous ignition temperature of the outside combustible gas or dust, this products will ignite the combustible gas or dust outside the enclosure directly, in a word, explosion proof products have become an ignition source itself even electrical circuits inside the enclosure are explosion proof type. So the temperature group may be classified into different groups.

Note: When we intended to install an explosion proof products in an gas or dust atmosphere where the spontaneous ignition temperature is $100^{\circ}C(T5)$, so we could exactly install explosion proof electrical products whose temperature group is $85^{\circ}C(T6)$ but we could not install explosion proof products whose temperature group is $135^{\circ}C(T4)$.

• The maximum surface temperature of Class I explosion proof hoist equipment should not exceed:

 $--450^{\circ}$ C: when there is no accumulation of coal dust on the surface of the equipment or measures are taken to prevent such accumulation.

• For the maximum surface temperature grouping of Class II and dust class

Temperature Class		Maximum surface temperature	
Gas & Vapour	Dust		
]	Γ1	450° ℃	
1	Γ2	300°C	
1	Г3	200°C	
1	Γ4	135°C	
1	Γ5	100°C	
Т6		85℃	

explosion proof hoist equipment, see the table below.

Gas &Vapour								
Explosion-p roof degree	T1	T2	Т3	T4	T5	Т6		
IIA	Acetylene <pre> <pre> <pre> <pre> <pre> <pre> </pre> </pre> <pre> <pre> <pre> <pre> <pre> <pre> <pre> <pre> </pre> </pre> </pre> </pre> </pre> <pre> </pre> </pre> </pre> </pre> </pre> </pre> <pre> <pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre></pre>	Ethanol butane propylene acetic acid ethyl two lu methane thiophene cyclopenta ne dimethyla mine	Pentane decane ethyl cyclopentan e turpentine naphtha petroleum fuel oil butyl chloride thiophene	Acetaldehyde trimethylami ne				

IIB	Propyne acrylonitri le hydrogen cyanide coke oven gas	Ethylene ethylene oxide acrylic acid methyl furan	dimethyl ether、 acrolein、 tetrahydrof uran、 hydrogen sulfide	ethyl methyl ether thyl oxide thyl oxide tetrafluoroeth ylene	
IIC	Hydrogen 、 carbon disulfide	Acetylene			carbon disulphi de

Dust							
Explosion-proof type	T1	T2					
A or B	Magnesium, red phosphorus, calcium carbide, soap power, green fuel, phenol fuel, polyethylene, polypropylene, polyurethane, polyvinyl chloride, hard rubber, natural resin, rosin, wheat flour, corn starch, cotton fiber, staple fiber, anthracite culm, charcoal dust	rice flour、 cocoa powder、 malt flour、 coconut powder、 pulverized coal、 brown coal dust、 pulverized bituminous coal、 coal dust for gas					

Equipment Protection Level(EPL)

In accordance with the likelihood of the equipment becoming an ignition source and the distinct characteristics posed by explosive gas environments, explosive dust environments, and explosive environments in coal mines with firedamp, equipment protection levels are prescribed for the equipment.

Environment	EPL	Protection Class
	Ma	Very high
Coal mine gas explosive environment	Mb	High
	Ga	Very high
Explosive gas environment	Gb	High
	Gc	General
	Da	Very high
Explosive dust environment	Db	High
	Dc	General

Explosion proof Marking

Explosion proof mark should comply with the requirements of GB 3836.1-2021. The explosion-proof signs are implemented in the following manner:

Protection class symbol						
Explosive gas environment Explosive dust environment						
da	flameproof enclosure	EPL Ga/Ma	ia	Intrinsic safety	EPL Da	
db	flameproof enclosure	EPL Gb/Mb	ib	Intrinsic safety	EPL Db	

dc	flameproof enclosure	EPL Gc	ic	Intrinsic safety	EPL Dc
eb	increased safety	EPL Gb/Mb	ma	encapsulated	EPL Da
ec	increased safety	EPL Gc	mb	encapsulated	EPL Db
ia	Intrinsic safety	EPL Ga/Ma	mc	encapsulated	EPL Dc
ib	Intrinsic safety	EPL Gb/Mb	op is	Intrinsically safe optical radiation	EPL Da、 Db/Dc
ic	Intrinsic safety	EPL Gc	op pr	Protective light radiation	EPL Db/Dc
ma	encapsulated	EPL Ga/Ma	op sh	Light radiation with interlocking device	EPL Da Db/Dc
mb	encapsulated	EPL Gb/Mb	pxb	pressurized	EPL Db
mc	encapsulated	EPL Gc	руb	pressurized	EPL Db
nA	no-spark	EPL Gc	pzc	pressurized	EPL Dc
nC	Spark protection	EPL Gc	sa	special type	EPL Da
nR	Restricted breathing	EPL Gc	sb	special type	EPL Db
ob	Liquid-immersed	EPL Gb/Mb	SC	special type	EPL Dc
ос	Liquid-immersed	EPL Gc	ta	Shell protected type	EPL Da

op is	Intrinsically safe optical radiation	EPL Ga、 Gb、Gc、 Ma/Mb	tb	Shell protected type	EPL Db
op pr	Protective light radiation	EPL Gb、 Gc/Mb	tc	Shell protected type	EPL Dc
op sh	Light radiation with interlocking device	EPL Ga、 Gb、 Gc、 Ma/Mb			
pv	pressurized	EPL Gb/Gc			
pxb	pressurized	EPL Gb/Mb			
pyb	pressurized	EPL Gb			
pzc	pressurized	EPL Gc			
q	Sand-filled	EPL Gb/Mb			
sa	special type	EPL Ga/Ma			
sb	special type	EPL Gb/Mb			
sc	special type	EPL Gc			

Examples of Markings

1. Explosion-proof enclosure for coal mine gas environment with flameproof enclosure "d" (EPL Mb):

Ex db I Mb

2. Explosion-proof enclosure Ex component with intrinsic safety "i" (EPL Ga) output circuit (EPL Gb), for IIC explosive gas environments excluding coal mine gas environment:

Ex db[ia Ga] IIC Gb

3. Equipment with increased safety "e" (EPL Gb) and positive pressure enclosure "px" type (EPL Gb), maximum surface temperature of 125 $^{\circ}$ C, for explosive gas environments excluding coal mine gas environment and for explosive gas environments with ignition temperature above 125 $^{\circ}$ C:

Ex cb pxb IIC 125° C (T4) Gb

4. Equipment with flameproof enclosure "d" (EPL Mb and Gb) and increased safety "e" (EPL Mb and Gb), for coal mine gas environment and explosive gas environments with IIB gas classification outside of coal mine gas environment, and ignition temperature above 200° C:

Ex db eb I Mb

Ex db eb II B T3 Gb

5. Electrical equipment with flameproof enclosure "d" (EPL Gb) for explosive gas environments with ammonia gas only, excluding coal mine gas environment:

Ex db(NH3) Gb

6. Equipment for explosive dust environment with conductive dust, class IIIC "i" (EPL Da) type, maximum surface temperature below 120° C:

Ex ia IIIC T200120° C Da

7. Equipment for explosive dust environment with conductive dust, class IIIC "p" (EPL Db) type, maximum surface temperature below 120° C:

Ex pxb IIIC T120° C Db

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8. Equipment for explosive dust environment with conductive dust, class IIIC "t" (EPL Db) type, maximum surface temperature below 225° C, and below 320° C when tested with a dust layer of 150mm:

Ex tb IIIC T225° C T150320° C Db

9. Potting-type equipment for explosive gas environment with IIC classification "ma" (EPL Ga), maximum surface temperature below 135° C, and potting-type equipment for explosive dust environment with class IIIC "ma" (EPL Da), maximum surface temperature below 120° C:

Ex ma IIC T4 Ga

Ex ma IIIC T200120° C Da