



Competence in explosion protected crane technology

Electrical equipment

ATEX	II (1)2 G	Ex	db [ia Ga]	IIC	T4	Gb
IECEX		Ex	db [ia Ga]	IIC	T4	Gb
NEC 505	Class I, Zone 1	AEx	db [ia Ga]	IIC	T4	Gb
IECEX (dust)		Ex	tb	IIIC	T90°C	Db
NEC 506	Zone 21	AEx	tb	IIIC	T90°C	Db
NEC 500	Class I, Division 1			Group C,D	T4	

Non-electrical equipment

ATEX	II 2 G	Ex	h	IIC	T6	Gb
IECEX		Ex	h	IIC	T6	Gb
EN 13463-1	II 2 G		c k	IIC	T6	

ATEX: Explosion protection for Europe
IECEX: International explosion protection
NEC: Explosion protection for USA



Ex labelling also available as an app:

Types of protection for electrical equipment in explosive atmospheres

Type of protection	Symbol	Zone	Diagram	Main application	Standard
general requirements					IEC 60079-0 EN 60079-0 UL 60079-0
increased safety	e, eb ec	1 2		terminal and junction boxes, control stations for installing Ex components (with a different type of protection), squirrel-cage motors, light fittings	IEC 60079-7 EN 60079-7 UL 60079-7
flameproof enclosures	da d, db dc	0 1 2		switchgears, control stations, indicating equipment, control systems, motors, transformers, heating equipment, light fittings	IEC 60079-1 EN 60079-1 UL 60079-1
pressurized enclosure	px, pxb py, pyb pz, pzc	1 21 1 21 2 22		switchgear and control cabinets, analysers, large motors <i>old identification for dust: pD21, pD22</i>	IEC 60079-2 EN 60079-2 UL 60079-2
intrinsic safety	ia ib ic	0 20 1 21 2 22		instrumentation technology, fieldbus technology, sensors, actuators [Ex ib] = associated electrical apparatus – installation in the safe area <i>old identification for dust: iaD = for use in Zone 20, 21, 22 ibD = for use in Zone 21, 22</i>	IEC 60079-11 EN 60079-11 UL 60079-11
				intrinsically safe systems	IEC 60079-25 EN 60079-25 UL 60079-25
liquid immersion	o, ob oc	1 2		transformers, starting resistors	IEC 60079-6 EN 60079-6 UL 60079-6
powder filling	q, qb	1		sensors, display units, electronic ballasts, transmitters	IEC 60079-5 EN 60079-5 UL 60079-5
encapsulation	ma mb mc	0 20 1 21 2 22		switchgear with small capacity, control and signalling units, display units, sensors <i>old identification for dust: maD = for use in Zone 20, 21, 22 mbD = for use in Zone 21, 22</i>	IEC 60079-18 EN 60079-18 UL 60079-18
type of protection "n"	nA, nAc nC, nCc nR, nRc	2 2 2		all electrical equipment for Zone 2 nA = non-sparking devices nC = sparking devices and components nR = restricted breathing enclosures	IEC 60079-15 EN 60079-15 UL 60079-15
optical radiation	op_ op_ op_	0 20 1 21 2 22		op is = inherently safe optical radiation op pr = protected optical radiation op sh = optical radiation interlock	IEC 60079-28 EN 60079-28
protection by enclosure	ta tb tc	20 21 22		switchgear, control stations, junction boxes, control boxes, motors, light fittings <i>old identification: tD A21 = under procedure A for Zone 21 tD B21 = under procedure B for Zone 21</i>	IEC 60079-31 EN 60079-31 UL 60079-31 IEC 61241-1 EN 61241-1 ISA 61241-1

Equipment category and equipment protection level (EPL)

According to EU directive 2014/34/EU (ATEX)		According to IEC and CENELEC		Sufficient safety	
Group	Equipment category	EPL			
Mines susceptible to firedamp					
I	M1	Ma			during rare malfunctions
I	M2	Mb			until de-energizing of the equipment
Explosive gas atmosphere					
II	1G	Ga	Zone 0		during rare malfunctions
II	2G	Gb	Zone 1		during expected malfunctions
II	3G	Gc	Zone 2		in normal operation
Explosive dust atmosphere					
II	1D	Da	Zone 20		during rare malfunctions
II	2D	Db	Zone 21		during expected malfunctions
II	3D	Dc	Zone 22		in normal operation

(1) G associated apparatus – installation in non-hazardous area

Types of protection for non-electrical equipment in explosive atmospheres

Type of protection	Symbol	Diagram	Main application	Standard
basic methods and requirements				ISO 80079-36 EN ISO 80079-36
constructional safety "c"	h		couplings, pumps, gear drives, chain drives, belt drives <i>old marking according to EN 13463-5: c</i>	ISO 80079-37 EN ISO 80079-37
control of ignition sources "b"	h		pumps, belt drives <i>old marking according to EN 13463-6: b</i>	ISO 80079-37 EN ISO 80079-37
liquid immersion "k"	h		submerged pumps, gears <i>old marking according to EN 13463-8: k</i>	ISO 80079-37 EN ISO 80079-37
flameproof enclosures "d"	h		brakes, couplings <i>old marking according to 13463-3: d</i>	IEC 60079-1 EN 60079-1
protection by enclosure "t"	h		equipment for explosive dust atmospheres	IEC 60079-31 EN 60079-31
pressurized enclosure "p"	h		pumps	IEC 60079-2 EN 60079-2

Groups

IEC/CENELEC/NEC 505/NEC 506		NEC 500	
Group I	Mines susceptible to firedamp		—
	methane		
Group II	Explosive gas atmosphere		Class I
Subdivisions	Typical gas		Subdivisions
IIA	propane	propane	Class I, Group D
IIB	ethylene	ethylene	Class I, Group C
IIC	hydrogen	hydrogen	Class I, Group B
	acetylene	acetylene	Class I, Group A
Group III	Explosive dust atmosphere		Class II, Class III
Subdivisions	Typical dust		Subdivisions
IIIA	combustible flyings	fibers/flyings	Class III
IIIB	non-conductive dust	non-conductive dust	Class II, Group G
IIIC	conductive dust	carbonaceous dust	Class II, Group F
		combustible metal dust	Class II, Group E

Temperature classification

Maximum surface temperature	Gas temperature classes		Maximum surface temperature	Gas temperature classes	
	Equipment marking NEC 500	CENELEC/IEC/NEC 505		Equipment marking NEC 500	CENELEC/IEC/NEC 505
450°C	T1	T1	200°C	T3	T3
300°C	T2	T2	180°C	T3A	
280°C	T2A		165°C	T3B	
260°C	T2B		160°C	T3C	
230°C	T2C		135°C	T4	T4
215°C	T2D		120°C	T4A	
			100°C	T5	T5
			85°C	T6	T6

Zones

Dangerous explosive atmosphere		Continuously, long-term or frequently	Occasionally	Not likely to occur and for short period only
Gas	CENELEC/IEC/NEC 505	Zone 0	Zone 1	Zone 2
	NEC 500 (Class I)		Division 1	Division 2
Dust	CENELEC/IEC/NEC 506	Zone 20	Zone 21	Zone 22
	NEC 500 (Class II, III)		Division 1	Division 2

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