

Explosion protection



ATEX CE_{0158} $\text{Ex ec [ia Ga] IIC T4 Gc}$
 IECEx $\text{Ex ec [ia Ga] IIC T4 Gc}$

CE 0158 EU-wide harmonised provisions control number of conformity assessment body marking according to ATEX
 related equipment []: marking of interfaces of the equipment with impact in hazardous area
 equipment without []: use within hazardous areas
 EPL Equipment Protection Level

NEC 500 **Class I Division 1 Groups A, B, C, D T4**
 NEC 505 **Class I Zone 1 AEx ec [ia Ga] IIC T4 Gc**

ATEX: explosion protection for Europe
 IECEx: international explosion protection
 NEC: explosion protection for the USA

Device classification				
combustible material	device category	EPL	adequate safety	zone
group I				
methane	M1	Ma	in case of few rare faults	
coal dust	M2	Mb	until device is switched off	
group II				
gas	1G	Ga	in case of few rare faults	0
mist	2G	Gb	in case of predictable faults	1
vapors	3G	Gc	in case of normal use	2
dust	1D	Da	in case of few rare faults	20
	2D	Db	in case of predictable faults	21
	3D	Dc	in case of normal use	22

Explosive atmosphere							
combustible material	explosion hazard	permanent		occasional		short-term	
class I							
gas	NEC 500	division 1		division 1		division 2	
	ATEX/IECEx/NEC 505	zone 0	zone 1	zone 1	zone 2	zone 2	zone 2
class II							
dust	NEC 500	division 1		division 1		Division 2	
	ATEX/IECEx/NEC 505	zone 20	zone 21	zone 21	zone 22	zone 22	zone 22
class III							
fibers and lint	NEC 500	division 1		division 1		division 2	
	ATEX/IECEx/NEC 505	zone 20	zone 21	zone 21	zone 22	zone 22	zone 22

Temperature classes			
ATEX/IECEx/NEC 505		NEC 500 marking	admissible surface temperature
gas	dust		
T1	T450 °C	T1	450 °C
T2	T300 °C	T2	300 °C
		T2A	280 °C
		T2B	260 °C
		T2C	230 °C
		T2D	215 °C
T3	T200 °C	T3	200 °C
		T3A	180 °C
		T3B	165 °C
		T3C	160 °C
T4	T135 °C	T4	135 °C
		T4A	120 °C
T5	T100 °C	T5	100 °C
T6	T85 °C	T6	85 °C

Classification of explosive atmosphere		
	ATEX/IECEx/NEC 505	NEC 500
mining	group I	
methane	I	mining
gas	group II	class I
propane	IIA	CI I, Group D
ethylene	IIB	CI I, Group C
hydrogen	IIC	CI I, Group B
acetylene	IIC	CI I, Group A
dust/fibers	group III	class II, III
fibers and lint	IIIA	CI III
non-conductive dust	IIIB	CI II, Group G
conductive dust	IIIC	CI II, Group E, F

Ignition protection types for electrical equipment in hazardous areas						
symbol	protection class	icon	protection principle	gas	dust	standard
Ex o, ob oc	oil immersion		exclusion of explosive atmosphere	zone 1 zone 2		IEC60079-6 EN60079-6 UL60079-6
Ex q, qb	powder filling		prevention of sparks	zone 1		IEC60079-5 EN60079-5 UL60079-5
Ex d, da db dc	flameproof enclosures		spreading prevention	zone 0 zone 1 zone 2		IEC60079-1 EN60079-1 UL60079-1
Ex e, eb ec	increased safety		prevention of sparks	zone 1 zone 2		IEC60079-7 EN60079-7 UL60079-7
Ex m, ma mb mc	compound-filled encapsulation		exclusion of explosive atmosphere	zone 0 zone 1 zone 2	zone 20 zone 21 zone 22	IEC60079-18 EN60079-18 UL60079-18
Ex p, pxb pyb pzc	over-pressure encapsulation		exclusion of explosive atmosphere	zone 1 zone 1 zone 2	zone 21 zone 21 zone 22	IEC60079-2 EN60079-2 UL60079-2
Ex i, ia ib ic	intrinsic safety		ignition power limitation	zone 0 zone 1 zone 2	zone 20 zone 21 zone 22	IEC60079-11 EN60079-11 UL60079-11
Ex op, op is op pr op sh	inherently safe optical radiation protected optical radiation optical systems with interlock		avoid/limit energy transmission of optical radiation	zone 0 zone 1 zone 1	zone 20 zone 21 zone 21	IEC60079-28 EN60079-28
Ex n, nA nC nR nL nP	non-sparking equipment sparking equipment drift-proof housing energy limited simplified over-pressure encapsulation		comparable with Ex e partially Ex d/Ex m protected by enclosures comparable with Ex i comparable with Ex p	zone 2 zone 2 zone 2 zone 2		IEC60079-15 EN60079-15 UL60079-15
Ex t, ta tb tc	protected by enclosures		exclusion of explosive atmosphere		zone 20 zone 21 zone 22	IEC60079-31 EN60079-31 UL60079-31

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