



Explosion protection

Equipment category and equipment protection level (EPL)

Acc. to EU directive 2014/34/EU (ATEX)		Acc. to IEC and CENELEC	
Equipment group	Equipment category	EPL	Adequate safety
Underground parts of mines likely to be endangered by firedamp			
I	M1	Ma	With rare errors
I	M2	Mb	Until the device is turned off
Explosive gas atmospheres			
II	1G	Ga	Zone 0 With rare errors
II	2G	Gb	Zone 1 With foreseeable errors
II	3G	Gc	Zone 2 In normal operation
Atmospheres with combustible dust			
II	1D	Da	Zone 20 With rare errors
II	2D	Db	Zone 21 With foreseeable errors
II	3D	Dc	Zone 22 In normal operation

(1)G Related electrical equipment – installation in the safe area

Temperature classification

Maximum surface temperature	Gas temperature classes		Maximum surface temperature	Gas temperature classes	
	Device marking			Device marking	
	NEC 500	CENELEC / IEC / NEC 505		NEC 500	CENELEC / IEC / NEC 505
450°C	T1	T1	200°C	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	
Dust: maximum surface temperature specified in °C			100°C	T5	T5
			85°C	T6	T6

Zones

Hazardous explosive atmosphere		Continuously, frequently or long-term	Occasionally	Rarely and briefly
Gas	CENELEC / IEC / NEC 505	Zone 0	Zone 1	Zone 2
	NEC 506 (Class I)	Division 1		Division 2
Dust	CENELEC / IEC / NEC 505	Zone 20	Zone 21	Zone 22
	NEC 500 (Class II, III)	Division 1		Division 2

Groups

IEC / CENELEC / NEC 505 / NEC 506		NEC 500	
Group I	Underground parts of mines likely to be endangered by firedamp	-	
	Methane		
Group II	Explosive gas atmospheres:	Class I	
Subgroups	Typical gas	Subgroups	
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	Atmospheres with combustible dust	Class II / III	
Subgroups	Type of dust	Subgroups	
III A	Combustible lint	Fibers and lint	Class III
III B	Non-conductive dust	Non-conductive dust	Class II Group G
III C	Conductive dust	Carbonaceous dust	Class II Group F
		Combustible metal dust	Class II Group E

ATEX		Electronic devices				
ATEX	II (1) 2G	Ex	d [ia Ga]	IIC	T4	Gb*
IECEX		Ex	d [ia Ga]	IIC	T4	Gb*
NEC 500						
NEC 505	I (1) 1A	Ex	d [ia]	IIC	T4	
NEC 506						

*If the alternative symbols are used, the EPL can be omitted.

Types of protection for electrical equipment in explosive atmospheres

Degree of protection	Symbol Standard, Alternative	Zone	Depiction (image)	Main application	Standard
General requirements					IEC 60079-0 EN 60079-0 UL 60079-0
Increased safety	e, eb, ec	1 2		Terminals and junction boxes, control cabinets for installation of Ex components (which have a different type of protection), cage rotor motors, light fittings	IEC 60079-7 EN 60079-7 UL 60079-7
Flameproof enclosure	da, db, dc	0 1 2		Switchgears, switch devices and systems, control stations, display devices, indicating equipment, control systems, motors, transformers, heating devices, light fittings	IEC 60079-1 EN 60079-1 UL 60079-1
Pressurization	px, pxb, py, pxb, pz, pzc	1 21 1 21 2 22		Switching and control cabinets, analysis devices, large motors	IEC 60079-2 EN 60079-2
Intrinsic safety	ia, ib, ic	0 1 2		Measurement and regulation systems, fieldbus systems, sensors, actuators [Ex ib] = Related electrical equipment – installation in the safe area	IEC 60079-11 EN 60079-11 UL 60079-11
				Intrinsically safe systems	IEC 60079-25 EN 60079-25 UL 60079-25
Oil immersion	o, ob, oc	1 2		Transformers, starting resistors	IEC 60079-6 EN 60079-6 UL 60079-6
Powder filling	q, qb	1		Sensors, indicators, electronic ballasts, transmitters	IEC 60079-5 EN 60079-5 UL 60079-5
Encapsulation	ma, mb, mc	0 20 1 21 2 22		Switch devices for low output levels, command and signaling devices, indicators, sensors	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 equipment nC = sparking equipment in which the contacts are protected in some suitable way nR = restricted breathing enclosures	IEC 60079-15 EN 60079-15 UL 60079-15
Optical radiation	op, op_a, op_b, op_c	0 20 1 21 2 22		op is = intrinsically safe optical radiation op pr = protected optical radiation op sh = shielded optical radiation	IEC 60079-28 EN 60079-28
Protection by enclosure	ta, tb, tc	20 21 22		Switch devices and systems, control cabinets, junction and terminal boxes, motors, lights	IEC 60079-31 EN 60079-31 UL 60079-31

