SAFETY. EVERYWHERE.

Electrical equipment

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

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

Ex-marking also available as an app:

Equipment category and equipment protection level (EPL)

According to EU directive 2014/34/EU (ATEX)		According to IEC and CENELEC		
Group	Equipment category	EPL		Suffi cient safety
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

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

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	fibres/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			Equipment marking	
	NEC 500	CENELEC/ IEC/NEC 505		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	
Dust: indication of the max. surface temperature in °C.			100°C	T5	T5
			85°C	T6	T6

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	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 *old identification for Zone 1: e*	IEC 60079-7 EN 60079-7 UL 60079-7
flameproof enclosures	da db dc	0 1 2		switchgears, control stations, indicating equipment, control systems, motors, transformers, heating equipment, light fittings *old identification for Zone 1: d*	IEC 60079-1 EN 60079-1 UL 60079-1
pressurized enclosure	pxb pyb pzc	1 21 1 21 2 22		switchgear and control cabinets, analysers, large motors *old identification for dust: pD21, pD22*	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 *old identification for dust:* *iaD = for use in Zone 20, 21, 22* *ibD = for use in Zone 21, 22*	IEC 60079-11 EN 60079-11 UL 60079-11
				intrinsically safe systems	IEC 60079-25 EN 60079-25 UL 60079-25
liquid immersion	ob oc	1 2		transformers, starting resistors *old identification for Zone 1: o*	IEC 60079-6 EN 60079-6 UL 60079-6
powder filling	q	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 *old identification for dust:* *maD = for use in Zone 20, 21, 22* *mbD = for use in Zone 21, 22*	IEC 60079-18 EN 60079-18 UL 60079-18
type of protection “n”	nC nR	2 2		all electrical equipment for Zone 2 *nA = non-sparking devices (old identification)* 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 UL 60079-28
protection by enclosure	ta tb tc	20 21 22		switchgear, control stations, junction boxes, control boxes, motors, light fittings *old identification:* *tD A21 = under procedure A for Zone 21* *tD B21 = under procedure B for Zone 21*	IEC 60079-31 EN 60079-31 UL 60079-31 *IEC 61241-1* *EN 61241-1* *ISA 61241-1*

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 *old marking according to EN 13463-5: c*	ISO 80079-37 EN ISO 80079-37
control of ignition sources “b”	h		pumps, belt drives *old marking according to EN 13463-6: b*	ISO 80079-37 EN ISO 80079-37
liquid immersion “k”	h		gears *old marking according to EN 13463-8: k*	ISO 80079-37 EN ISO 80079-37
flameproof enclosures “d”	h		brakes, couplings *old marking according to EN 13463-3: d*	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

Explosion protection by R. STAHL is always state of the art – and guarantees the safety of people, machines and the environment in hazardous areas all over the world.

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