SAFETY. EVERYWHERE.

	Electrical equipment						Non-electrical equipment			
ATEX	Ex II (1)2 G	Ex	db [ia Ga]	IIC	T4	Gb	Ex II 2 G	c k	IIC	T6
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		AEx	tb	IIIC	T90°C	Db				
NEC 500	Class I, Division 1			Group C,D	T4					

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

Ex labelling also available as an app:

Equipment category and Equipment protection level (EPL)

acc. to EU-directive 2014/34/EU (ATEX)		acc. to IEC and CENELEC		
Group	Equipment category	EPL		Sufficient security
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		Continously, longterm 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	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

* acc. to IEC (2007) and CENELEC (2009)

Temperature classification

Maximum surface temperature	Gas Temperature Classes: Equipment marking NEC 500	Gas Temperature Classes: Equipment marking CENELEC/IEC/NEC 505	Maximum surface temperature	Gas Temperature Classes: Equipment marking NEC 500	Gas Temperature Classes: Equipment marking 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

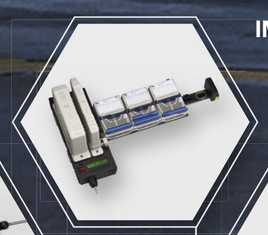
Type of protection	Symbol	Zone	Diagram	Main application	Standard
general requirements					IEC 60079-0 EN 60079-0 UL 60079-0
increased safety	e, eb e, ec	1 2		junction boxes, control stations for installing Ex-components (with a different type of protection), squirrel-cage motors, light fittings	IEC 60079-7 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 enclosures	px, pxb py, pyb pz, pzc	1 21 1 21 2 22		switchgear and control cabinets, analysers, large motors	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: iaD = Einsatz in Zone 20, 21, 22 ibD = Einsatz 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	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: maD = Einsatz in Zone 20, 21, 22 mbD = Einsatz in Zone 21, 22	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 device nC = sparking devices and components nR = restricted breathing enclosures	IEC 60079-15 EN 60079-15 UL 60079-15
optical radiation	op_, op_a op_, op_b op_, op_c	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 enclosures	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		Diagram	Main application	Standard
basics method and requirements				EN 13463-1
constructional safety	c		couplings, pumps, gear drives, chain drives, belt drives	EN 13463-5
flameproof enclosures	d		brakes, couplings	EN 13463-3
pressurisation pumps	p		pumps	EN 60079-2
control of ignition sources	b		pumps, beld drives	EN 13463-6
liquid immersion k	k		submerged pumps, gears	EN 13463-8
flow restricting enclosure	fr		equipment only for Zone 2 or Zone 22	EN 13463-2

LIGHTING AND SIGNALLING

AUTOMATION



INSTALLATION AND CONTROLS

OPERATING AND MONITORING

SYSTEM AND INTEGRATED SOLUTIONS

MARINE OFFSHORE

SEMINARS

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.

ID 103361 | 2016-02 / EN-07 | printed in Germany

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