



ELECTRICAL EQUIPMENT	
<p>NEC 500</p> <p>NEC 505</p> <p>IEC</p> <p>CENELEC</p>	<p>Class I, Division 1, Groups A, B, C, D, T6</p> <p>Class I, Zone 1, AEx</p> <p>marking according to ATEX</p> <p>Ex de IIC T6</p> <p>Ex* de IIC T6</p> <p>II 2 G</p> <p>ck IIC T6</p> <p>* Ex: from december 2004, EEx: until march 2007 (transition period)</p>

NON-ELECTRICAL EQUIPMENT	
CENELEC	<p>marking according to ATEX</p> <p>II 2 G</p> <p>ck IIC T6</p>

TYPES OF PROTECTION FOR NON-ELECTRICAL EQUIPMENT IN AREAS WITH COMBUSTIBLE DUST AND IN HAZARDOUS AREAS			
Type of protection	Diagram	Main application	Standard
constructional safety	c	couplings, pumps, gear drives, chain drives, belt drives	EN 13 463-5
flameproof enclosures	d	brakes, couplings	EN 13 463-3
pressurisation pumps	p	pumps	EN 13 463-7
control of ignition sources	b	pumps, belt drives	EN 13 463-6
liquid immersion	k	submerged pumps, gears	EN 13 463-8
flow restricting enclosure	fr	equipment only for Zone 2 or Zone 22	EN 13 463-2

TYPES OF PROTECTION FOR ELECTRICAL APPARATUS IN HAZARDOUS AREAS			
Type of protection	Diagram	Main application	Standard
increased safety	e	terminal and junction boxes, control boxes for installing Ex-components (with a different type of protection), squirrel-cage motors, light fittings	EN 60 079-7 IEC 60 079-7 UL 60 079-7 FM 3600
flameproof enclosures	d	switchgear and control station and indicating equipment, control systems, motors, transformers, heating equipment, light fittings	EN 60 079-1 IEC 60 079-1 UL 60 079-1 FM 3600
pressurized enclosures	p	switchgear and control cabinets, analysers, large motors px = for use in Zone 1, 2 py = for use in Zone 1, 2 pz = for use in Zone 2	EN 60 079-2 IEC 60 079-2 NFPA 496 FM 3620
intrinsic safety	i	instrumentation technology, fieldbus technology, sensors, actuators ia = for use in Zone 0, 1, 2 ib = for use in Zone 1, 2 [Ex ib] = associated electrical apparatus – installation in the safe area intrinsically safe systems	EN 60 079-11 IEC 60 079-11 UL 60 079-11 FM 3610
		FISCO Ex ia IIC T4 FNICO Ex n IIC T4	fieldbus intrinsically safe concept (FISCO) for Zone 1 fieldbus non-incentive concept (FNICO) for Zone 2
oil immersion	o	transformers, starting resistors	EN 60 079-6 IEC 60 079-6 UL 60 079-6 FM 3600
powder filling	q	sensors, display units, electronic ballasts, transmitters	EN 60 079-5 IEC 60 079-5 UL 60 079-5 FM 3600
encapsulation	m	switchgear with small capacity, control and signalling units, display units, sensors ma = for use in Zone 0, 1, 2 mb = for use in Zone 1, 2	EN 60 079-18 IEC 60 079-18 UL 60 079-18 FM 3600
type of protection	n	all electrical apparatus for Zone 2 nA = non-sparking apparatus nC = sparking apparatus, in which the contacts are protected in a suitable way nL = energy limited apparatus nR = restricted breathing enclosures nZ = apparatus with n-pressurization	EN 60 079-15 IEC 60 079-15 UL 60 079-15 FM 3600
optical radiation	op	op ls = inherently safe optical radiation op pr = protected optical radiation op sh = optical radiation interlock	EN 60 079-28 IEC 60 079-28

TYPES OF PROTECTION FOR ELECTRICAL APPARATUS IN AREAS WITH COMBUSTIBLE DUST			
Type of protection	Diagram	Main application	Standard
protection by enclosures	tD	switchgear and control station, terminal and connection boxes, control boxes, motors, light fittings tD A21 = under procedure A for Zone 21 tD B21 = under procedure B for Zone 21	EN 61 241-1 IEC 61 241-1
pressurization	pD	switchgear and control cabinets, motors	EN 61 241-4 IEC 61 241-4
intrinsic safety	iD	measurement and control technology, fieldbus technology, sensors, actuators iaD = for use in Zone 20, 21, 22 ibD = for use in Zone 21, 22 [Ex ibD] = associated electrical apparatus – installation in the safe area	EN 61 241-11 IEC 61 241-11
encapsulation	mD	switchgear with small capacity, control and signalling units, display units, sensors maD = for use in Zone 20, 21, 22 mbD = for use in Zone 21, 22	EN 61 241-18 IEC 61 241-18

EQUIPMENT GROUP I (MINING)			
Category	Sufficient safety		
Category M1	by means of 2 protective measures / 2 faults		
Category M2	the equipment is intended to be deenergized in the event of an explosive atmosphere		
EQUIPMENT GROUP II (OTHER HAZARDOUS AREAS)			
Category	Atmosphere G (Gas)	Atmosphere D (Dust)	Sufficient safety
Category 1	Zone 0	Zone 20	by means of 2 protective measures / 2 faults
Category 2	Zone 1	Zone 21	frequently occurring equipment faults / 1 fault
Category 3	Zone 2	Zone 22	during normal operation
Category [1], [2], [3] = associated electrical apparatus – installation in the safe area			

CLASSES AND GROUPS ACC. NEC 500			
Class	Substance	Group	
Class I (gas)	Acetylene	A	
	Hydrogen	B	
	Ethylene	C	
	Propane	D	
Mining	Methane		
	Class II (dust)	Metal dust	E
		Coal dust	F
Grain dust	G		
Class III (fibers)	Fibers		

HAZARDOUS A REA ACC. NEC 500	
Division 1	likely to/can exist under normal operating conditions
Division 2	abnormal condition

TEMPERATURE CLASSIFICATION ACC. NEC 500	
Maximum surface temperature	Temperature classes for gases
450°C	T1
300°C	T2
280°C	T2A
260°C	T2B
230°C	T2C
215°C	T2D
200°C	T3
180°C	T3A
165°C	T3B
160°C	T3C
135°C	T4
120°C	T4A
100°C	T5
85°C	T6

Dust: indication of the max. surface temperature in °C

ZONES		
Dangerous explosive atmosphere	Gas acc. CENELEC/IEC/NEC 505	Dust acc. IEC/CENELEC
continuously or longterm or frequently	Zone 0	Zone 20
likely to/can exist under normal operating conditions	Zone 1	Zone 21
not likely to occur or for short period	Zone 2	Zone 22

GAS GROUPS ACC. IEC, CENELEC AND NEC 505	
Explosion group	Typical gas
I	Methane
IIA	Propane
IIB	Ethylene
IIC	Hydrogen

TEMPERATURE CLASSIFICATION ACC. IEC, CENELEC AND NEC 505	
Maximum surface temperature	Temperature classes for gases
450°C	T1
300°C	T2
200°C	T3
135°C	T4
100°C	T5
85°C	T6

Dust: indication of the max. surface temperature in °C



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