

◆ NEC 500

◆ NEC 505
IEC
CENELEC

Class I, Division 1, Groups A, B, C, D, T6

Class I, Zone 1, A Ex de IIC T6

marking according to ATEX

Ex II 2 G

Ex de IIC T6
Ex de IIC T6



◆ 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 AREA 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℃ | T1 |
| 300℃ | T2 |
| 280℃ | T2A |
| 260℃ | T2B |
| 230℃ | T2C |
| 215℃ | T2D |
| 200℃ | T3 |
| 180℃ | T3A |
| 165℃ | T3B |
| 160℃ | T3C |
| 135℃ | T4 |
| 120℃ | T4A |
| 100℃ | T5 |
| 85℃ | T6 |

Dust: indication of the max. surface temperature in ℃

◆ ZONES

| Dangerous explosive atmosphere | Gas acc. CENELEC/ IEC/NEC 505 | Dust acc. IEC/ CENELEC |
|---|-------------------------------|------------------------|
| continuously or long term 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 |
| II A | Propane |
| II B | Ethylene |
| II C | Hydrogen |

◆ TEMPERATURE CLASSIFICATION ACC.IEC,CENELEC AND NEC 505

| Maximum surface temperature | Temperature classes for gases |
|-----------------------------|-------------------------------|
| 450℃ | T1 |
| 300℃ | T2 |
| 200℃ | T3 |
| 135℃ | T4 |
| 100℃ | T5 |
| 85℃ | T6 |

Dust: indication of the max. surface temperature in ℃

◆ TYPES OF PROTECTION FOR ELECTRICAL APPARATUS IN HAZARDOUS AREAS

| Type of protection | Diagram | Main application | Standard |
|------------------------|---------|--|--|
| Flameproof enclosure | d | Switchgears, control stations, indicating equipments, control systems, motors, transformers, heating equipments, light fittings | EN 60079-1 IEC 60079-1 UL 60079-1 FM 3600 |
| Increased safety | e | Terminal and junction boxes, control boxes for installing Ex-components(with different type of protection), squirrel-cage motors, light fittings | EN 60079-7 IEC 60079-7 UL 60079-7 FM 3600 |
| Pressurized enclosures | p | Switchgears 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 60079-2 IEC 60079-2 NFPA 496 FM 3620 |
| Powder filling | q | Sensors, display units, electronic ballasts, transmitters | EN 60079-5 IEC 60079-5 UL 60079-5 FM 3600 |
| 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 | EN 60079-11 IEC 60079-11 UL 60079-11 FM 3610 |
| | | Intrinsically safe systems | EN 60079-25 IEC 60079-25 |
| | | 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 EN 60079-27 IEC 60079-27 |
| Oil immersion | o | Transformers, starting resistors | EN 60079-6 IEC 60079-6 UL 60079-6 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 60079-18 IEC 60079-18 UL 60079-18 FM 3600 |
| Type of protection | n_ | All electrical apparatus for Zone 2 nA=non-sparking apparatus nC=sparkng 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 60079-15 IEC 60079-15 UL 60079-15 FM 3600 |
| Optical radiation | op_ | op is =inherently safe optical radiation op pr=protected optical radiation op sh=optical radiation interlock | EN 60079-28 IEC 60079-28 |

◆ TYPES OF PROTECTION FOR ELECTRICAL APPARATUS IN AREAS WITH COMBUSTIBLE DUST

| Type of protection | Diagram | Main application | Standard |
|--------------------------|---------|--|-----------------------------|
| Protection by enclosures | tD | Switchgears and control stations, 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 61241-1 IEC 61241-1 |
| Pressurization | pD | Switchgears and control cabinets, motors | EN 61241-4 IEC 61241-4 |
| 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 61241-11 IEC 61241-11 |
| Encapsulation | mD | Switchgears 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 61241-18 IEC 61241-18 |