

Protection modes

There is several protection modes recognised by the IEC.

A modification has been done on Zone 2 which is subdivided in nA and nR for the most widely used equipment.

Protection modes	Identification letters
Flameproof	d
Intrinsically safe (zone 0)	ia
Intrinsically safe (zone 1)	ib
Internal over-pressure	p
Increased safety	e
Immersed in oil	o
Filled with powder	q
Encapsulated	m
Zone 2 :	n
- Non sparking equipment	n A
- Equipment glittering sparks but contacts protected by enclosure other than nR, nL or nZ	n C
- Equipment with limited energy	n L
- Enclosure with restricted breathing	n R
- Enclosure with simple internal over-pressure	n Z
Special protection	s

STANDARDS AND PROTECTION MODES CENELEC AND IEC

CENELEC Standards European Cat. Nos	IEC Standards	Protection modes
EN 50014	IEC 60079-0	General rules
EN 50015	IEC 60079-6	Immersion in oil
EN 50016	IEC 60079-2	Internal over-pressure
EN 50017	IEC 60079-5	Powder filling
EN 50018	IEC 60079-1	Flameproof enclosure
EN 50019	IEC 60079-7	Increased safety
EN 50020	IEC 60079-11	Intrinsic safety
EN 50021	IEC 60079-15	Zone 2
EN 50028	IEC 60079-18	Encapsulation

Increased safety «e» electrical equipment

Definition

Method of protection applicable to electrical equipment such as light fittings, sockets, switches, etc, which consists of preventing the occurrence of any accidental ignition. The construction principles for increased safety “e” equipment are as follows :

- Use of high-quality insulation materials
- Specially dimensioned air line leakage distance and creepage distance
- Electrical connection which cannot become loose
- Minimum IP54 weatherproof protection of the enclosure
- Respect of the temperature classes
- Conformity of cable entries
- Labelling.

Use

All increased safety «e» equipment is designed such that it does not cause arcs or excessive temperatures capable of likely to ignite an explosive atmosphere. It is therefore suitable for all gas groups (A, B and C). These groups do not appear on the equipment labelling.

Temperature class

For increased safety «e» equipment, the temperature to be taken into account is that of the hottest point of the equipment as a whole, and not the external temperature. There are six temperatures classes: T1, T2, T3, T4, T5, T6 (see “Marking”).

Marking

The marking of increased safety « e » equipment must bear information stipulated by the 94/9 CE ATEX Directive for Europe and IEC 60079-0 for the rest of the world.

Examples for this information are :

II2G EEx e II T6

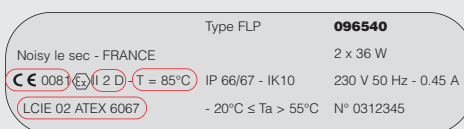
- II** Surface industry
- 2** Equipement category 2 corresponding to zone 1
- G** Gas
- EEx** Equipment designed to operate in an explosive atmosphere. (Products certified ATEX are marked EEx and marked Ex for the products certified IEC).

e This letter refers to the increased safety protection mode .

II This is the electrical equipment group according to its destination.

There are two groups :

- Group I
 - Electrical equipment intended for underground work in mines with explosive atmospheres
- Group II
 - Electrical equipment intended for surface work with explosive atmospheres



Example : marking for a product conforming to European Directive 94/9/CE, compulsory starting from July 1st, 2003.

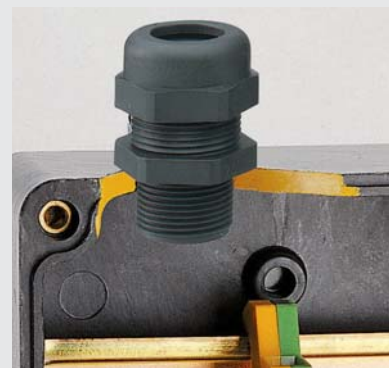
T6 It is the temperature class of the equipment. It indicates the maximum temperature during operation (while respecting a safety margin in the event of an accident involving the air-conditioning or ventilation).

There are six temperature classes in this table :

Temperature class	Maximum temperature
T1	+ 450 °C
T2	+ 300 °C
T3	+ 200 °C
T4	+ 135 °C
T5	+ 100 °C
T6	+ 85 °C

Cable entries

These are created by screwing the cable gland directly onto the enclosure or, for untapped holes, by fixing with a locknut. Holes which are not used for cable entries must be blanked using the appropriate blanking plugs.



Cable entry by screwing directly onto enclosure.

Weatherproof seal

The equipment has a protection index of at least IP 54 ; it is therefore important to ensure that the weatherproof seal is in good condition when the product is installed.

Réf. **948 05**
 N° : 03123457
 Noisy le sec - France Type FLd
 LCIE 97 ATEX 6012 230 v 50 Hz 0.45 A
 II 2 G - EEx d II B T6 Ta = 20°C / + 55°C
 II 2 D - T 85°C (T6)
 Ex d II B T6 LCIE N° 386 343
 DELAI D'ATTENTE AVANT OUVERTURE
 TIME BEFORE OPENING 30 min
 TIEMPO DE ESPERA ANTES DE LA APERTURA
 NE PAS OUVRIR SOUS TENSION
 DO NOT OPEN WHEN ENERGIZED
 IP 66/67 NO ABRIR BAJO TENSION
 2 LAMPES A CULOT G13 / 2 G13 SOCKET LAMPS / 2 CASQUILLOS G13
 (CEI 61 - 1) - 2 X 36 W DIP.B 21/22 TB = T6
 LCIE n° 405 685 DIP.A 21/22 TA = T6

Example : marking for a product conform to European directive 94/9/CE, compulsory starting from July 1st, 2003.

sheets need to be followed.



Lighting

In lighting equipment use only lamps of the type and power specified for that equipment.

Lubrication of flamepath

The equipment is supplied with the joint flanges lubricated. When the equipment is installed, the path must be lubricated to keep them in good condition. Use a non-hardening, anti-corrosive grease.

- For the flange and spigot path on boxes and enclosures : multi-purpose grease, for use at temperatures - 30 to +130°C, such as Antar multi-purpose, ELF multi, ELF epexelf, Loctite GR 125.

- For the flange and spigot path on the luminaires : silicone paste, for use at temperatures - 40 to + 200°C, such as Rhône-Poulenc Rhodorsil 408 etc.

-For threaded path : graphitic mineral grease, for use at temperatures - 30 to +150°C, such as : Loctite GR 135, Molydal M 03.

ATX advice

- Always read the installation and user's instructions provided with the equipment before starting installation work.
- Always use ATX original spare parts for repair work, in order to keep the equipment in good working condition and to maintain the protection mode.
- For a good maintenance, keep the technical data sheets and the EC declarations of conformity.

Recommendations for assembly

In order to successfully retain the flameproof character of the equipment :

- Care must be taken before starting up to ensure that all the screws for closing the covers and cable entries are firmly tightened.
- Modification of the original predrilled holes is prohibited.



Cable entries

These are created by screwing the cable gland directly onto the enclosure. It is necessary to lubricate the thread and to ensure that at least 5 threads are engaged.

Holes which are not used for cable entries must be blanked using the appropriate blanking plugs.



Connection terminals

The certificate of conformity does not stipulate the type of terminals to be used in a flameproof enclosure. Only the connection precautions given in the technical data

Maintenance (in France)

Extract from article 4 in the December 20, 1988 order, modified by the January 10, 1999 order : « Interval between inspections is fixed at one year in rooms and work positions at which there are risks of degradationn fire or explosion, etc...»

<ul style="list-style-type: none"> - Limites antiéclats de sécurité mécaniques et testées en zone - Flammeproof emergency lighting fitting, with recovers and testing on site - Deschützte Leuchtörper für Störstrom-Warnung und Zonenart - Luminaire antiéclats de sécurité mécaniquement testés en zone - Luminaire antiéclats de sécurité, mécaniquement testé en zone 949 58/58-56 - 949 69/76 (avec enveloppe polycarbonate) 		ATX 100 0000 1.3.2011	
Gas - Gaz - Gas - Gas Poissières - Dust - Silhoue - Polvere - Pulvert		CE 00818 ELED T 85°C Zone: 21 + 22	
Ad. bis 60°C - 40 Min - 100 - 100 - 100 - 100 Max. 100 000 - 100 - 100 - 100 - 100		949 58/56 1.3.2011	
• Zone d'encastrement et de fixation • Dimensions aux bornes • Câbles admissibles • Câble de terre • Câble de terre • Câble de terre		• Câble admissibles • Câble admissibles • Câble admissibles • Câble admissibles • Câble admissibles	
• Câble admissibles • Câble admissibles • Câble admissibles • Câble admissibles		• Câble admissibles • Câble admissibles • Câble admissibles • Câble admissibles	
• Câble admissibles • Câble admissibles • Câble admissibles • Câble admissibles		• Câble admissibles • Câble admissibles • Câble admissibles • Câble admissibles	

Flameproof «d» equipment

Definition

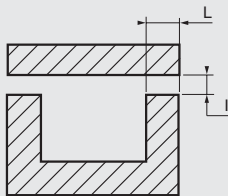
A flameproof enclosure must be able to fulfil three criteria :

- Contain an internal explosion without permanent distortion.
- Guarantee that the explosion cannot be transmitted to the surrounding atmosphere.
- Exhibit a temperature at all points on the surface which is lower than the spontaneous ignition temperature of the surrounding gases or vapours.

Explosion group of a flameproof enclosure

Experimental studies of explosions has shown that there are values for the flange width (L) and for the gap (i) which make it impossible for an explosion to spread outside an enclosure which is not perfectly tight.

These values are directly linked to the explosive capacity of the atmosphere in question, and are classed in 4 groups : I, II A, II B or II C (see «Marking»).



- For example, the value of the gap «i» for a flange 12.5 mm long and for a volume < 100 cm³, dependent on the explosion group, is as follows :

- I : ≤ 0.4 mm (flanged path)
- II A : ≤ 0.3 mm (flanged path)
- II B : ≤ 0.2 mm (flanged path)
- II C : ≤ 0.15 mm (spigot path)

All the values for the gap «i» as a function of the seal «L» are given in the

CENELEC EN 50 018 standard.

Temperature class

The flameproof enclosure must not exhibit temperatures on its external surface which are capable of becoming sources of spontaneous ignition. Equipment is therefore classified according to their maximum external temperature. There are six temperature classes : T1, T2, T3, T4, T5, T6 (see «Marking»).

Marking

The marking of flameproof « d » must bear the information stipulated by the 94/9 CE ATEX Directive for Europe and CEI 60079-0 for the rest of the world.

II2G EEx d IIB T6

II Surface industry

2 Category 2 corresponding to zone 1

G Gas

EEx Equipment designed to operate in an explosive atmosphere .

(Products certified ATEX are marked EEx and marked Ex for the products certified IEC).

d This letter designates the mode of protection by flameproof enclosure.

The construction of this enclosure must be such that it withstands the pressure of a possible internal explosion and prevents it from spreading to the exterior. It is characterized in particular by the dimensions of its seals and gaps.

II This is the electrical equipment group according to its destination. There are two groups :

Group I

- Electrical equipment intended for underground work in mines with explosive atmospheres

Group II

- Electrical equipment intended for surface work.

B Subdivision of gases (see p. 30) taken into account for the dimensions of flamepath.

T6 It is the temperature class of the equipment. It indicates the maximum surface temperature during operation (while respecting a safety margin in the event of an accident involving the air-conditioning or ventilation).

There are six temperature classes:

Temperature class	Maximum surface temperature (MST)
T1	450 °C
T2	300 °C
T3	200 °C
T4	135 °C
T5	100 °C
T6	85 °C

Defective seals must be systematically replaced.



Weatherproof seal

Connection terminals

Each certificate of conformity indicates the type of terminals to be used in each type of junction box.

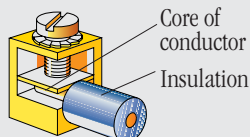
The connection must be performed according to current regulations and any additional instructions in the product documentation, such as :

- maximum current density
- maximum connection capacity

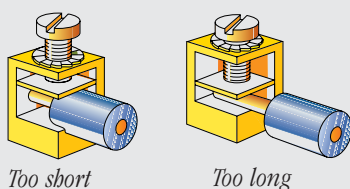
Stripping and connection

The conductors should only be stripped back to the edge of the metal part of the terminal connection, to ensure correct insulation.

Correct stripping

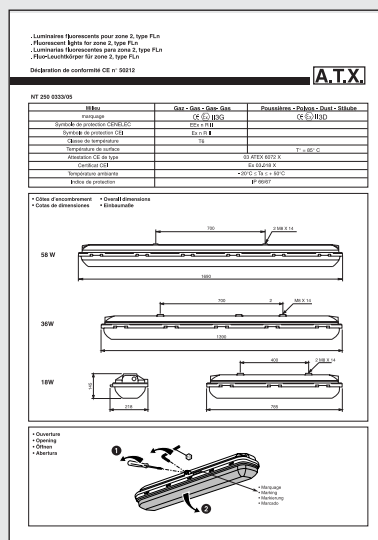


Incorrect stripping



Maintenance

Extract from article 4 in the december 20, 1988 order, modified by the jannary 10, 1992 order « Interval between inspections is fixed at one year in rooms and work positions at which there are risks of degradation fire or explosion, etc... »



Technical data : "e" luminaire

Appliances marked « ed » or « de »

Certain appliances such as power sockets, switches, etc, whose design creates arcs and sparks in normal operation, cannot be produced with protection mode "e" only.

Protection modes therefore have to be combined. "d" and "e" technologies are the most commonly used.

1) The part where the electric arc is produced is enclosed in a small flameproof chamber.

2) The connection terminals are "e" increased safety.

3) The assembly is mounted in an "e" increased safety enclosure and has a certificate of conformity with CENELEC standards (EN50 014/18/19).

4) Appliances marked "ed" or "de" demonstrate the subdivision of gases (A, B, or C) which is linked to the "d" part of the equipment.

ATX advice

- Always read the installation and user's instructions provided with the equipment before starting installation work.
- Always use ATX original spare parts for repair work, in order to keep the equipment in good working condition and to maintain the protection mode.
- For a good maintenance, keep the technical data sheets and the EC declarations of conformity.