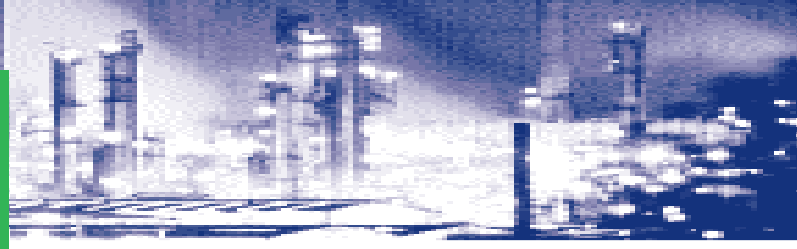


Electrical equipment for potentially explosive atmospheres.

Understanding the marking of an equipment intended for use in hazardous areas is often difficult. INERIS gives here some keys to compare marking issued from international, north american and european standards in the field of explosion protection.

Ex marking

IEC

Explosion protected
I.S. output
Group
Gas group
Ex d [ia] IIC T5
Method of protection
Temperature class

US (NEC 505)

Permitted class
American national standard
Method of protection
Group
Gas group
Class I, Zone I, AEx d [ia] IIC T5
Permitted zone
Explosion protected
I.S. output
Temperature class

US (NEC 500)

Method of protection *(optional except for I.S.)*
Permitted class
Explosionproof with I.S. Outputs, Class I, Division I, Groups A,B,C,D,T5
Permitted gas group
Permitted division *(optional except for division 2)*
Temperature class *(T5 & T6 optional)*

CENELEC

European standard
Method of protection
Group
EEx d [ia] IIC T5
I.S. output
Gas group
Explosion protected
Temperature class

Area classification

IEC CENELEC	Flammable material Present continuously	Flammable material Present intermittently	Flammable material Present abnormally
	Zone 0 *(Zone 20 - Dust)*	Zone 1 *(Zone 21 - Dust)*	Zone 2 *(Zone 22 - Dust)*
US NEC 505	Zone 0	Zone 1	Zone 2
NEC 500	Division 1		Division 2

Training

INERIS technical courses:

- Provide you the essential knowledges about the ATEX European compliance in order to obtain the CE marking.
- Analyse the key elements of the other new approach directives as Electromagnetic Compatibility or Machinery directives.

(Training on your site or at INERIS).

Marking

According to the ATEX directive

Equipment group II (other than mines)

Category 1 (for zone 0 or 20)
2 (for zone 1 or 21)
3 (for zone 2 or 22)

G for gases, vapours and mist

D for dusts

Equipment group I

Category M1 and M2

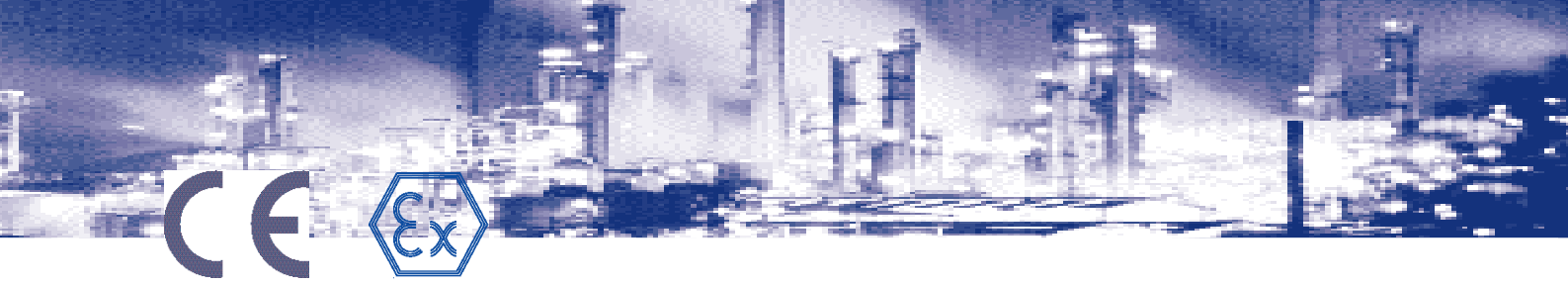
INERIS notified body

INERIS (*) is one of the notified bodies in European Union approved to carry out the conformity assessment procedures for equipment in hazardous areas.
It can assist designers, manufacturers and users of such equipment.
INERIS can also assume tests in order to obtain an overseas certification (Factory Mutual in States or CANMET in Canada, ...).

(*) INERIS steaming from CERCHAR

ATMOSPHERES EXPLOSIVES – ORGANISME NOTIFIÉ – INERIS – NOTIFIED BODY – EXPLOSIVE ATMOSPHERES

INERIS
INSTITUT NATIONAL DE L'ENVIRONNEMENT INDUSTRIEL ET DES RISQUES



The following figures inform you about relations between international applicable standards concerning protection methods and their applications according to hazardous areas classification.

Class I, Zone 0, 1 and 2 Protection Methods

Area	Protection Methods	Applicable Certification Standards				
		UL	FM	CSA	IEC	CENELEC
Zone 0	▪ Intrinsically safe, “ia” ▪ Class I, Div. 1 Intrinsically safe method	UL 2279, Pt.11 ANSI/UL 913	---------- FM 3610	CSA-E79-11 CSA-157	IEC 79-11 ----------	EN 50020 ----------
Zone 1	▪ Encapsulation “m” ▪ Flameproof “d” ▪ Increased safety “e” ▪ Intrinsically safe “ib” ▪ Oil immersion “o” ▪ Powder filling “q” ▪ Purged/pressurized “p” ▪ Any Class I, Zone 0 method ▪ Any Class I, Div. I method	UL 2279, Pt.18 UL 2279, Pt.1 UL 2279, Pt.7 UL 2279, Pt.11 UL 2279, Pt.6 UL 2279, Pt.5 UL 2279, Pt.2 ---------- ----------	FM 3614 FM 3618 FM 3619 FM 3610 FM 3621 FM 3622 FM 3620 ---------- ----------	CSA-E79-18 CSA-E79-1 CSA-E79-7 CSA-E79-11 CSA-E79-6 CSA-E79-5 CSA-E79-2 ---------- ----------	IEC 79-18 IEC 79-1 IEC 79-7 IEC 79-11 IEC 79-6 IEC 79-5 IEC 79-2 ---------- ----------	EN 50028 EN 50018 EN 50019 EN 50020 EN 50015 EN 50017 EN 50016 ---------- ----------
Zone 2	▪ Nonincendive “NI” ▪ Non-sparking device “nA” ▪ Restricted breathing “nR” ▪ Hermetically sealed “nC” ▪ Any Class I, Zone 0 or 1 method ▪ Any Class I, Div. 1 or 2 method	UL 2279, Pt.15 UL 2279, Pt.15 UL 2279, Pt.15 UL 2279, Pt.15 ---------- ----------	FM 3611 ---------- ---------- ---------- ---------- ----------	CSA-E79-15 CSA-E79-15 CSA-E79-15 CSA-E79-15 ---------- ----------	IEC 79-15 IEC 79-15 IEC 79-15 IEC 79-15 ---------- ----------	EN 50021 EN 50021 EN 50021 EN 50021 ---------- ----------

INERIS resources and facilities

Agreement, certification and evaluation

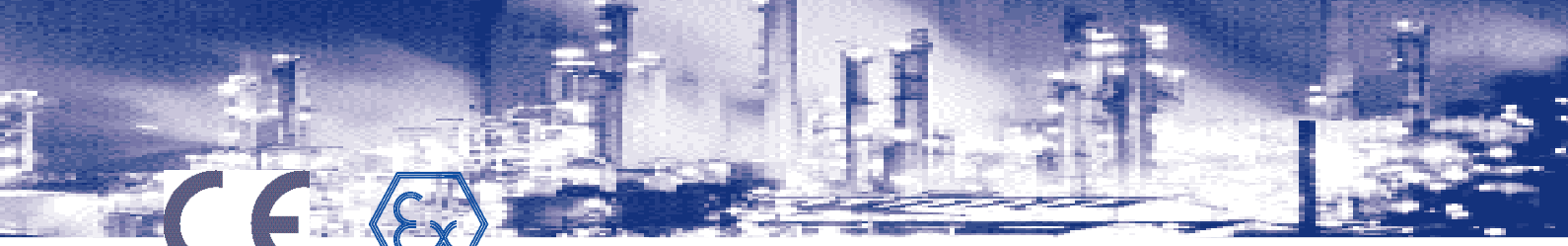
- Equipment and protective systems intended for use in potentially explosive atmospheres.
- Equipment used in underground part of mines.
- Safety components.
- Protective personal equipment.
- Explosives of civil uses.
- Machines for the manufacture of pyrotechnics.
- Explosive products and fireworks.
- Opacity sensors metrology.

Other services

- Risks due to electrostatic effects and lightning.
- Routine tests according to international certification standards (IEC,...) and others requirements.
- Training.
- Assistance to users: risks analysis, area classification,...

Full scale laboratory trials

- Testing equipment assuming temperatures until -50°C.
- Ingress protection test chamber until 8m³.
- Type tests of electrical and non-electrical equipment for use in explosion-hazardous areas (intrinsic safety, protection by enclosures,...).
- Large scale facilities: fire test cell, explosive firing ranges, dust explosion cells, fire development chambers, anechoic chamber.



Class 1
Flammable gases, vapors or liquids

Area classification

Division 1 and Zone 0
Where ignitable concentrations of flammable gases, vapors or liquids can exist all of the time or some of the time under normal operating conditions.

Zone 1
Where ignitable concentrations of flammable gases, vapors or liquids can exist some of the time under normal operating conditions.

Division 2 and Zone 2
Where ignitable concentrations of flammable gases, vapors or liquids are not likely to exist under normal operating conditions.

Groups

Division 1 and 2

- **A** (Acetylene)
- **B** (Hydrogen)
- **C** (Ethylene)
- **D** (Propane)

Zone 0, 1 and 2

- **IIC** (Acetylene & Hydrogen)
- **IIB** (Ethylene)
- **IIA** (Propane)

Class 2
Combustible dusts

Area classification

Division 1
Where ignitable concentrations of combustible dusts can exist all of the time or some of the time under normal operating conditions.

Division 2
Where ignitable concentrations of combustible dusts are not likely to exist under normal operating conditions.

Groups

Division 1 and 2

- **E** (Metals)
- **F** (Coal)
- **G** (Grain)

Class 3
Ignitable fibers & flyings

Area classification

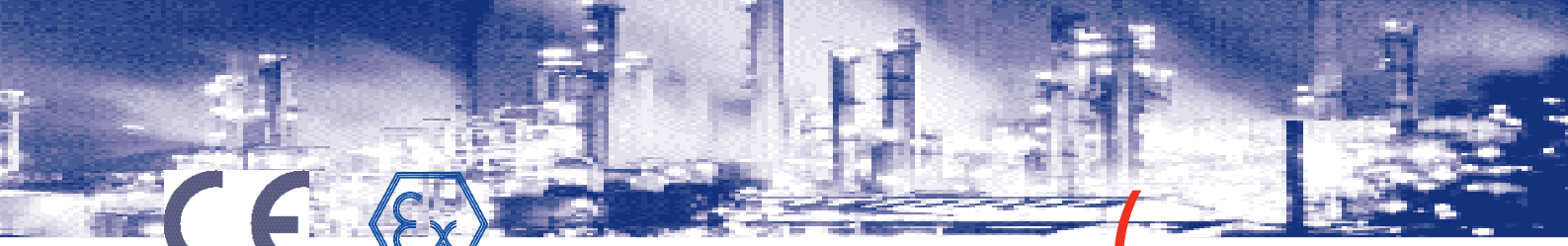
Division 1
Where ignitable concentrations of ignitable fibers and flyings can exist all of the time or some of the time under normal operating conditions.

Division 2
Where ignitable concentrations of ignitable fibers and flyings are not likely to exist under normal operating conditions.

Groups

Division 1 and 2

None



Ingress Protection (IP)

	FIRST NUMBER Protection against solid bodies	SECOND NUMBER Protection against liquid
0	No protection	No protection
1	Objects greater than 50 mm	Vertically dripping water
2	Objects greater than 12 mm	75° to 90° dripping water
3	Objects greater than 2,5 mm	Sprayed water
4	Objects greater than 1 mm	Splashed water
5	Dust-protected	Water jets
6	Dust-tight	Powerfull water jets
7		Temporary immersion
8		Continuous immersion

APPROXIMATE US ENCLOSURE TYPE EQUIVALENT TO IPXX

Type ➤	IP	Type ➤	IP	Type ➤	IP
1	10	3S	54	6 & 6P	67
2	11	4 & 4X	55	12 & 12K	52
3	54	5	52	13	54
3R	14				

Apparatus Grouping

TYPICAL GAS	US (NEC 505) IEC CENELEC	US (NEC 500)
Acetylene	Group IIC	Class I / Group A
Hydrogen	(Group IIB + H_2)	Class I / Group B
Ethylene	Group IIB	Class I / Group C
Propane	Group IIA	Class I / Group D
Methane	Group I	Gassy mines

Maximum surface Temperature	US (NEC 505) IEC CENELEC	US (NEC 500)
450°C	T1	T1
300°C	T2	T2
280°C		T2A
260°C		T2B
230°C		T2C
215°C		T2D
200°C	T3	T3
180°C		T3A
165°C		T3B
160°C		T3C
135°C	T4	T4
120°C		T4A
100°C	T5	T5
85°C	T6	T6

Reciprocal agreements

FMRC
(Factory Mutual Research Corporation)
1151 Boston-Providence Turnpike
P.O. Box 9102
Nordwood MA 02062-9102
U.S.A.
Tel: 781 255 4840
Fax: 781 762 9375
e.mail:
Approvals@factory-mutual.com

CANMET - CERL
(Canada Center for Mineral and Energy Technology)
Natural Resources, Canada
Canadian Explosives Research Laboratory
c/o 555 Booth street
OTTAWA, ONTARIO. CANADA
K1A 0G1
Tel: 613 996 1902
Fax: 613 996 2597
e.mail: mcote@rncan.gc.ca

B.K.I.
(Budapest Mikoviny Samuel)
u.2-4 H1037
PF 115
H.1300 Budapest . HUNGARY
Tel /Fax: 36 1 250 17 20
e.mail: bkiex@elender.hu

G.I.G.
(Glowny Instytute Gornictwa)
Central Mining Institute
Plac Gwarkow n°1
40166 Katovice . POLAND
Tel: 48 32 581 631
Fax: 48 32 596 533
e.mail:
gig@boruta.gig.katovice.pi

who to contact

André Mallet
Tel: +33 (0)3 44 55 65 43
e-mail: Andre.Mallet@ineris.fr

Bernard Piquette
Tel: +33 (0)3 44 55 65 44
e-mail: Bernard.Piquette@ineris.fr

Alain Czyz
Tel: +33 (0)3 44 55 65 42
e-mail: Alain.Czyz@ineris.fr

Service Communication 1999. Photos : INERIS. Fiche n° 06/01, réalisée sur papier écologique blanchi sans chlore. Conception : L.A.O. CONSEIL INTERNATIONAL . Tél : 01 49 08 94 58 .

Parc technologique ALATA B.P.2 . 60550 Verneuil-en-Halatte . France
Tél : +33 (0)3 44 55 66 77 ▮ Fax : +33 (0)3 44 55 66 99
Internet : http://www.ineris.fr ▮ e-mail : ineris@ineris.fr

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INSTITUT NATIONAL DE L'ENVIRONNEMENT INDUSTRIEL ET DES RISQUES