



VERLINDE

Ex Technology

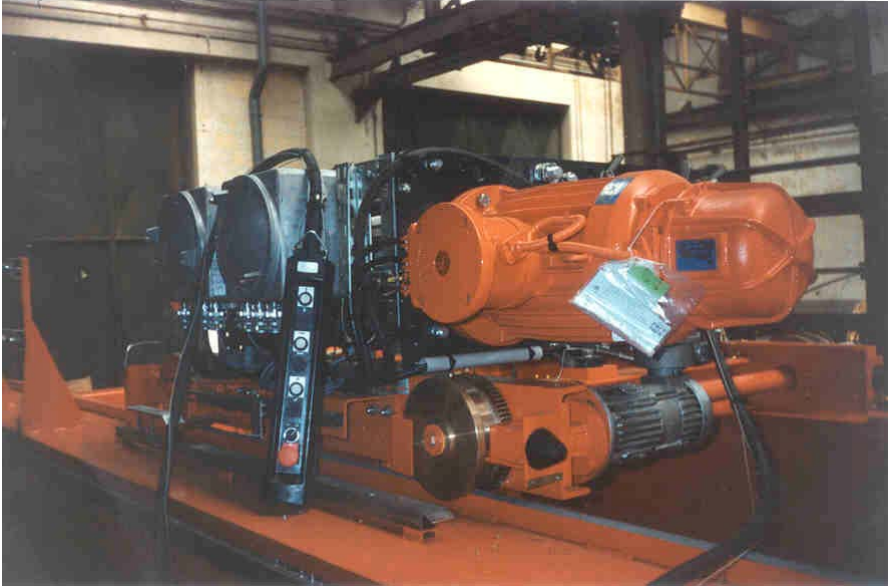


VERLINDE Ex

Components and cranes

- ✓ VERLINDE has bought assets of technology company ECA Levage (Etudes Constructions Appareils Levage)
- ✓ Ideal business combination with ECA's explosionproof and Verlinde crane technology





ECA Levage's customers:

*Elf, Atochem, SOFREGAZ, Gaz de France, Ingérop,
Technip...*



Protection type	Applicable standards		
	Europ	IEC	USA
Flameproof enclosure 'd'	EN 50018	IEC 79-1	UL 698(ANSI C33-30) UL 698 (ANSI C33-27)
Increased safety 'e'	EN 50019	IEC 79-7	Not considered
Intrinsic safety 'i'	EN 50020 EN 50039	IEC 79-11	NFPA 493 UL 913 ANSI 4913 FM 3610
Oil immersion 'o'	EN 50015	IEC 79-6	UL 698 Part II
Pressurised apparatus 'p'	EN 50016	IEC 79-2 IEC 79-13	NFPA 496 (ANSI C106.1) ISA S 12.4
Powder filling 'q'	EN 50017	IEC 79-5	Not considered



Classification of hazardous zones GAZ (EN 11 127)

- **ZONE 0 / Zone 20** Permanent presence

- **ZONE 1 / Zone 21** Occasional presence
(under normal working conditions)

- **ZONE 2 / Zone 22** Rare presence
(under normal working conditions)



THE 4 BASIC PROTECTION PRINCIPLES

Explosive mixtures can penetrate inside of the equipment and ignite therein, but explosion will not be transmitted to the surrounding atmosphere :

Flameproof enclosure **d**

Powder filling **q**

The electrical equipment incorporates a principle preventing from penetration and/or contact of explosive gas with internal flame sources :

Pressurised apparatus **p**

Oil immersion **o**

Moulding **m**



THE 4 BASIC PROTECTION PRINCIPLES

The explosive mixtures can penetrate inside of the electric cubicle, but should not take fire. Electric arcs, sparks, and high temperature possibilities are eliminated :

Increased safety **e**

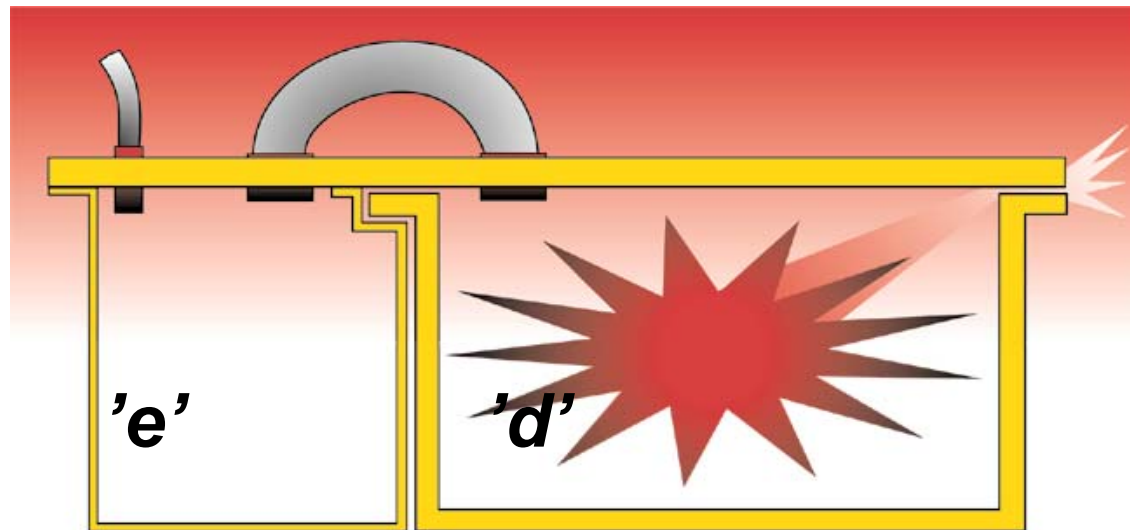
The explosive mixtures can penetrate inside of the electric cubicle, but should not take fire. The energy produced by the sparks or thermal effects is not sufficient to cause ignition :

Intrinsic safety **i**



TYPE OF PROTECTION (used on our products)

- d:** Flameproof enclosure (contactors, transformers etc...)
- e:** Increased safety (terminal box)



GAZ GROUP

CENELEC/CEI groups	Canada et USA groups and classes	representative gases
I	Mines	Methane
IIA	I - D	Propane
IIB	I - C	Ethylene
IIC	I - B I - A	Hydrogen Acetylene



TEMPERATURE CLASS

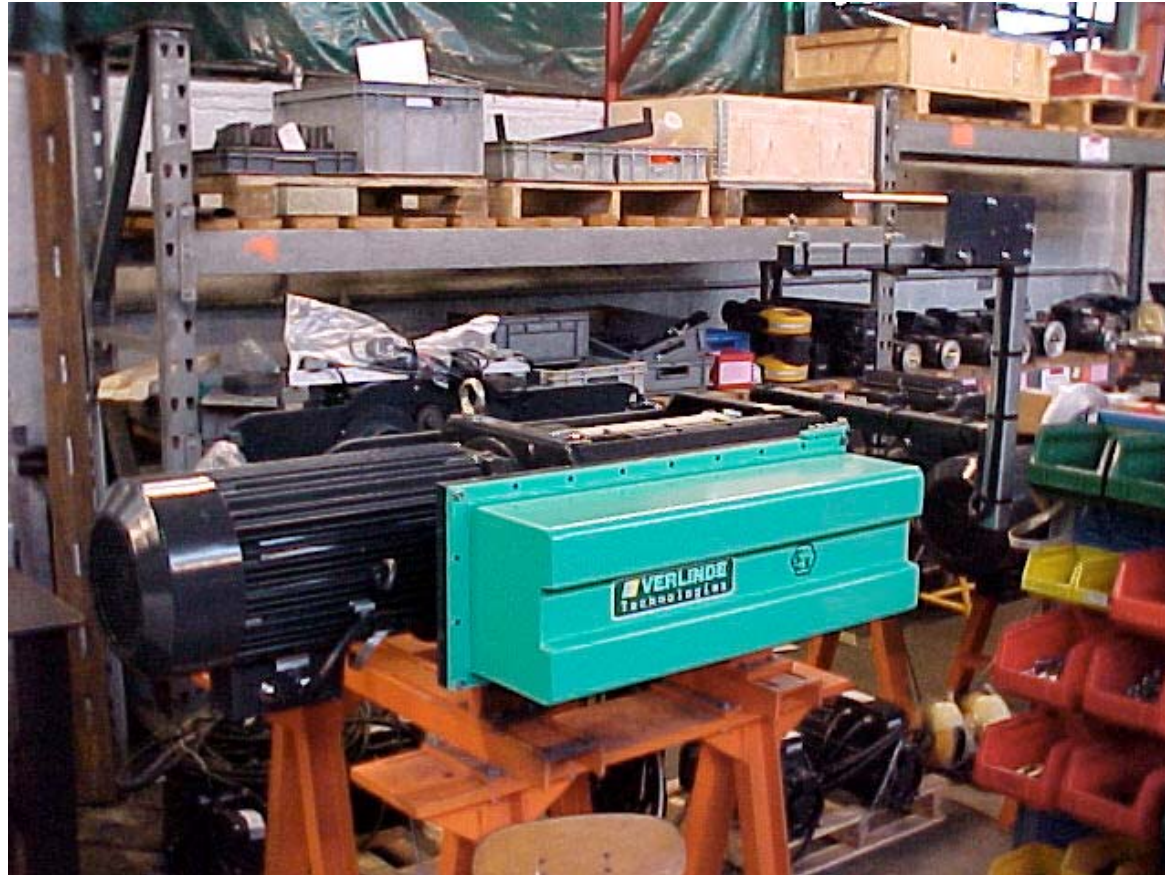
Temperature class		Max. Surface Temperature	
USA	Europ	USA	Europ
T1	T1	450°C	450°C
T2	T2	300°C	300°C
T2A		280°C	
T2B		260°C	
T2C		230°C	
T2D		215°C	
T3	T3	200°C	200°C
T3A		180°C	
T3B		165°C	
T3C		160°C	
T4	T4	135°C	135°C
T4A		120°C	
T5	T5	100°C	100°C
T6	T6	85°C	85°C



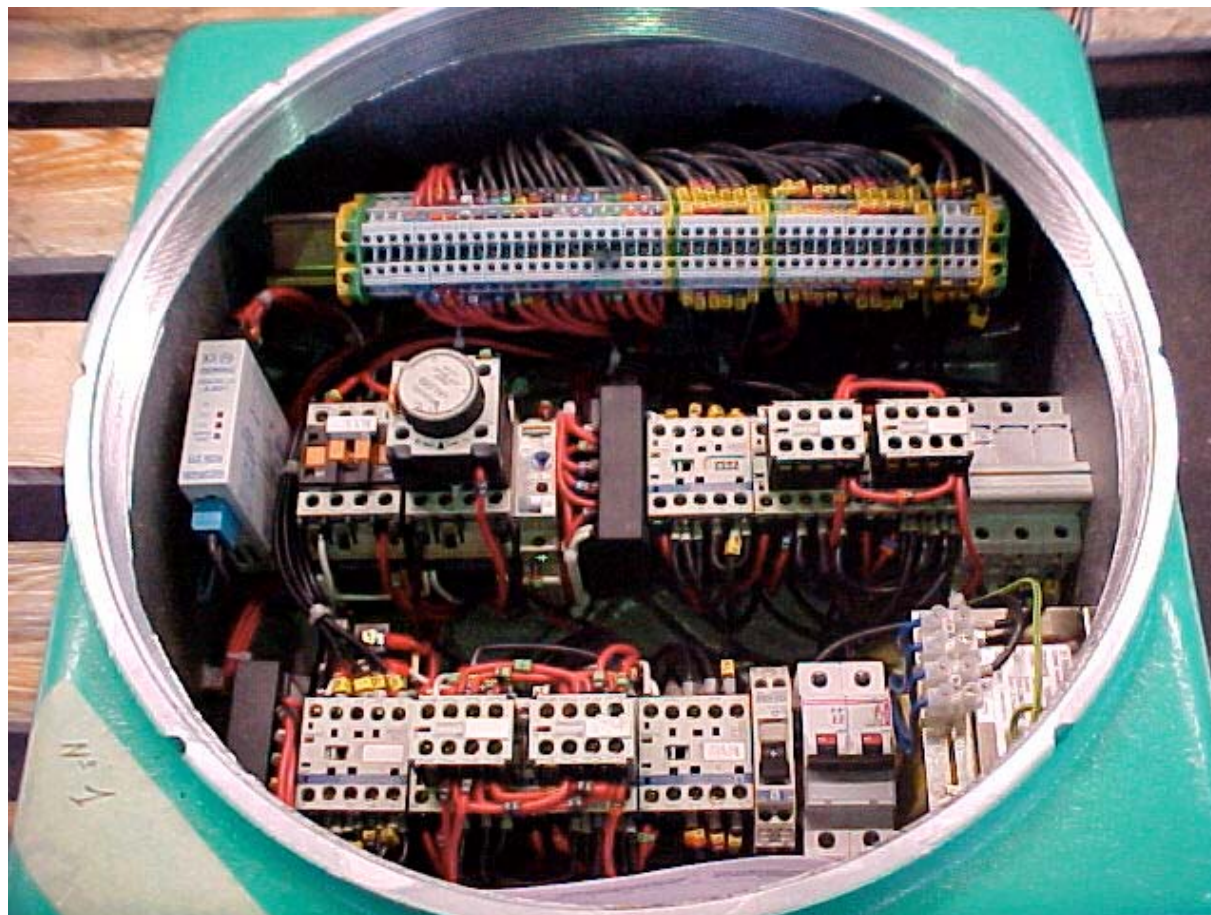
	IIA	IIB	IIC
T1	Methane Carbon monoxide Ammonia Acetone Toluene	Cyclopropane Cyanhydric acid	Hydrogen
T2	Propane Butane	Ethylene Butadiene	Ethane
T3	Gas	Diethyl ether	Acetylene
T4	Acetaldehyde		
T5			Carbon disulphide Ethyl nitrite



IIB



IIC



**TABLEAU DE CARACTERISATION
DES PRINCIPAUX MILIEUX
EXPLOSIBLES**

MILIEUX / ENVIRONNEMENTS

	Group	°C Temp. Class.	°C Temp. Inflam.
ACETALDEHYDE / ACETALDEHYDE	IIA	T4	140
ACETATE D'AMYLE / AMYL ACETATE	IIA	T2	375
ACETATE D'ETHYLE / ETHYL ACETATE	IIA	T1	480
ACETATE DE BUTYLE / BUTYL ACETATE	IIA	T2	370
ACETATE DE METHYLE / METHYL ACETATE	IIA	T1	475
ACETONE / ACETONE	IIA	T1	535
ACETYLACETATE DE METHYLE / METHYLACETYLACETATE	IIA	T3	280
ACETYLACETONE / ACETYLACETON	IIA	T2	340
ACETYLENE / ACETYLENE	IIIC	T2	305
ACIDE ACETIQUE / ACETIC ACID	IIA	T1	485
ACRYLATE D'ETHYLE / ETHYL ACRYLATE	IIIB	-	-
ACRYONITRILE / ACRYONITRILE	IIIB	T1	480
ALCOOL DIACETONE / DIACETONE ALCOHOL	IIA	T1	640
ALCOOL TETRAHYDROFURFURYLIQUE / TETRAHYDROFURFURYL ALCOHOL	IIIB	T3	280
ALLYLENE / ALLYLENE	IIIB	-	-
AMMONIAQUE / AMMONIA	IIA	T1	630
BENZALDEHYDE / BENZALDEHYDE	IIA	T4	190
BENZENE / BENZENE	IIA	T1	560
BISULPHURE DE CARBON / CARBON DISULPHIDE	IIIC	T6	95
BROMOBUTANE / BROMBUTANE	IIA	T3	285
BROMOETHANE / BROMOETHANE	IIA	T1	510
BUTADIENE / BUTADIENE	IIIB	T2	430
BUTANE / BUTANE	IIA	T2	385
BUTANOL / BUTANOL	IIA	T2	340
BUTENE / BUTENE	IIIB	T2	440
CHLOROETHANOL / CHLOROETHANOL	IIA	T2	425
CHLOROETHYLENE / CHLOROETHYLENE	IIA	T1	470
CHLOROBENZENE / CHLOROBENZENE	IIA	T1	637
CHLOROBUTANE / CHLOROBUTANE	IIA	T1	460
CHLOROETHANE / CHLOROETHANE	IIA	T1	510
CHLOROMETHANE / CHLOROMETHANE	IIA	T1	625
CHLOROPROPANE / CHLOROPROPANE	IIA	T1	520
CHLORURE D'ACETYLE / ACETYL CHLORIDE	IIA	T2	390
CHLORURE D'ALLYLE / ALLYL CHLORIDE	IIA	T1	485
CHLORURE DE BENZYLE / BENZYL CHLORIDE	IIA	T1	585
CRESOL / CRESOL	IIA	T1	555
CYCLOBUTANE / CYCLOBUTANE	IIA	-	-
CYCLOHEXANE / CYCLOHEXANE	IIA	T3	259
CYCLOHEXANOL / CYCLOHEXANOL	IIA	T2	300
CYCLOHEXANONE / CYCLOHEXANONE	IIA	T2	419
CYCLOHEXILAMINE / CYCLOHEXILAMINE	IIA	T3	290
CYCLOHEXONE / CYCLOHEXONE	IIA	T2	310
CYCLOPROPANE / CYCLOPROPANE	IIIB	T1	495
DECAHYDRONAPHTALENE / DECAHYDRONAPHTALENE	IIA	T3	260
DI-ISOBUTYLENE / DI-ISOBUTYLENE	IIA	T2	305
DIAMINOETHANE / DIAMINOETHANE	IIA	T2	385
DIAMYLETHER / DIAMYLETHER	IIA	T4	170
DIBUTYLETHER / DIBUTYLETHER	IIIB	T4	185
DICHLOROETHYLENE / DICHLOROETHYLENE	IIA	T2	440
DICHLOROBENZENE / DICHLOROBENZENE	IIA	T1	640
DICHLOROETHANE / DICHLOROETHANE	IIA	T2	440
DICHLOROPROPANE / DICHLOROPROPANE	IIA	T1	555
DIETHYLAMINE / DIETHYLAMINE	IIA	T3	310
DIETHYLAMINOETHANOL / DIETHYLAMINOETHANOL	IIA	-	-
DIETHYLETHER / DIETHYLETHER	IIIB	T4	170
DIHEXYLETHER / DIHEXYLETHER	IIIB	T4	185
DIMETHYLAMINE / DIMETHYLAMINE	IIA	T2	400
DIOXANE / DIOXANE	IIA	T2	379
EPOXYPROPANE / EPOXYPROPANE	IIIB	T2	430
ESSENCE / PETROL	IIA	T3	220

**MAIN CHARACTERISTICS
OF EXPLOSIVE ENVIRONMENTS**

MILIEUX / ENVIRONNEMENTS

	Group	°C Temp. Class.	°C Temp. Inflam.
ETHANE / ETHANE	IIA	T1	515
ETHANOL / ETHANOL	IIA	T2	425
ETHANOLAMINE / ETHANOLAMINE	IIA	-	-
ETHER ETHYLIQUE / ETHYLIC ETHER	IIIB	T4	180
ETHOXYETHANOL / ETHOXYETHANOL	IIIB	T3	235
ETHYLBENZENE / ETHYLBENZENE	IIA	T2	431
ETHYLENE / ETHYLENE	IIIB	T2	425
ETHYLMETHYLKETONE / ETHYLMETHYLKETONE	IIA	T1	505
ETHYLMETHYLETHER / ETHYLMETHYLETHER	IIIB	T4	190
FORMALDEHYDE / FORMALDEHYDE	IIIB	T2	424
FORMATE D'ETHYLE / ETHYL FORMATE	IIA	T2	440
FORMIATE DE METHYLE / METHYL FORMIATE	IIA	T1	450
FUEL EL.L.M.S DIN 51603	IIA	T3	220
FUEL EL.L.M.S DIN 51603	IIA	T3	220
GAZ DE HAUT FOURNEAU / COKE OVEN GAS	IIIB	-	-
GAZ DE VILLE / TOWN GAS	IIIB	T1	560
GAZOLE DIN 51601 / GAZOLE DIN 51601	IIA	T3	220
HEPTANE / HEPTANE	IIA	T3	315
HEXANE / HEXANE	IIA	T3	233
HEXANOL / HEXANOL	IIA	-	-
HYDROGENE / HYDROGEN	IIIC	T1	560
HYDROGENE SULFURE / HYDROGEN SULFIDE	IIIB	T3	270
KEROSEN / KEROSENE	IIA	T3	210
METHALDEHYDE / METHALDEHYDE	IIA	-	-
METHANE / METHANE	IIA	T1	595
METHANOL / METHANOL	IIA	T1	455
METHOXYETHANOL / METHOXYETHANOL	IIIB	T3	285
METHYLACRYLATE / METHYLACRYLATE	IIIB	-	420
METHYLAMINE / METHYLAMINE	IIA	T2	430
METHYLCYCLOHEXANE / METHYLCYCLOHEXANE	IIA	T3	260
METHYLCYCLOHEXANOL / METHYLCYCLOHEXANOL	IIA	T3	295
MONOXIDE DE CARBONE / CARBON MONOXIDE	IIIB	T1	805
NAPHTALENE / NAPHTALENE	IIA	T1	588
NAPHTE / NAPHTA	IIA	T3	290
NAPHTE DE PETROLE / PETROLEUM	IIA	-	288
NITRATE D'ISOPROPYL / ISOPROPYLNITRATE	IIIB	T4	175
NITROBENZENE / NITROBENZENE	IIA	T1	480
NITROETHANE / NITROETHANE	IIIB	T2	410
NITROMETHANE / NITROMETHANE	IIA	T2	415
NITROPROPANE / NITROPROPANE	IIIB	T2	420
OXYDE D'ETHYLENE / ETHYLENE OXYDE	IIIB	T2	440
PARAFORMALDEHYDE / PARAFORMALDEHYDE	IIIB	T2	300
PARALDEHYDE / PARALDEHYDE	IIA	T3	235
PENTANE / PENTANE	IIA	T3	285
PENTANOL / PENTANOL	IIA	T2	300
PHENOL / PHENOL	IIA	T1	605
PROPANE / PROPANE	IIA	T1	470
PROPYLAMINE / PROPYLAMINE	IIA	T2	320
PROPYLENE / PROPYLENE	IIA	T1	505
PROPYLMETHYLKETONE / PROPYLMETHYLKETONE	IIA	T1	505
PYRIDINE / PYRIDINE	IIA	T1	550
STYRENE / STYRENE	IIIB	T3	260
TETRAHYDROFURANE / TETRAHYDROFURAN	IIIB	T3	260
TETRALINE / TETRALINE	IIIB	T2	425
TOLUENE / TOLUENE	IIA	T1	535
TOLUIDINE / TOLUIDINE	IIA	T1	480
TRIETHYLAMINE / TRIETHYLAMINE	IIA	T4	190
TRIMETHYLAMINE / TRIMETHYLAMINE	IIA	T1	470
TRIOXANE / TRIOXANE	IIIB	T2	410
TURPENTINE / TURPENTINE	IIA	T3	254
XYLENE / XYLENE	IIA	T1	464



Ex CLASSIFICATION

EEx de IIB T4

Symbol for apparatus constructed in accordance with European norms.

Temperature Class

Explosion Group

Type of protection

Verlinde Technologies products meet the requirements of EEx de IIB T4 as standard and EEx de IIC T4 as option.



NEW DIRECTIVE ATEX 94/09/CE

Applicable on the 1st of July 2003

	Category of the equipment	Inflammable substances	Comparison
Classification Group 1 (mines)	M1	Methane, dusts	Group 1
	M2	Methane, dusts	Group 1
Classification Group 2 (surface)	1	Gases, vapours, fogs, dusts	Group 2 Z 0 (gases) / Z 20 (dusts)
	2	Gases, vapours, fogs, dusts	Group 2 Z 1 (gases) / Z 21 (dusts)
	3	Gases, vapours, fogs, dusts	Group 2 Z 2 (gases) / Z 22 (dusts)



MARQUAGE

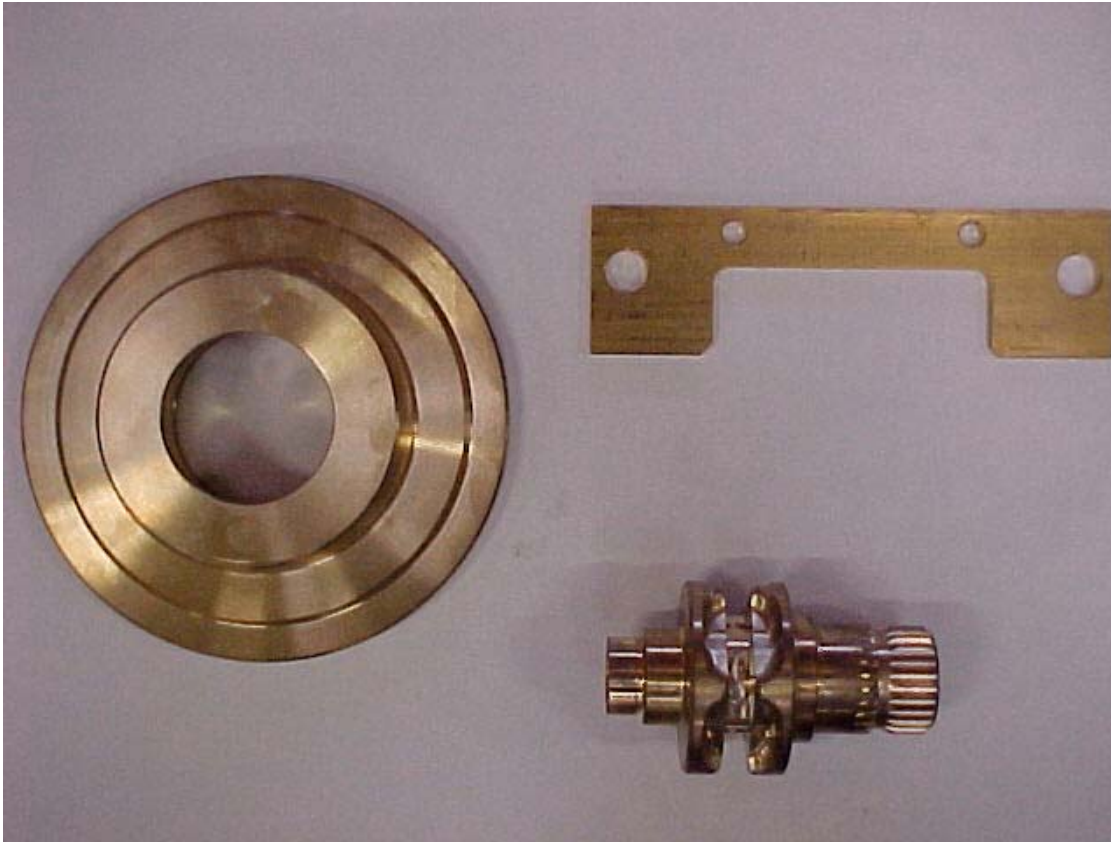
Example									
CE	...	Ex	II	2	G	and	D		
CE marking		Identification of the notified body		Utilisation in potentially explosive atmospheres		Group: surface equipment		Category: Zone 1	
					Gaz			Dust	



- Distinction Gases / Dusts (IP6X)
- Mechanic sparks risks taken into account (constructor responsibility)
- CE Marking



SPARK PROOF OPTION



- Bronze trolley wheels and anti-drop brackets devices
- Bronze load / return wheel
- Bronze coated hook

