



### AREA CLASSIFICATION

Guideline figures	Flammable atmosphere present continuously >1000hrs/annum*	Flammable atmosphere present intermittently >10<1000hrs/annum*	Flammable atmosphere present abnormally <10hrs/annum*	Standard
<b>IEC/CENELEC/EUROPE</b>				
Gas, vapour, mist	Zone 0	Zone 1	Zone 2	IEC 60079-10-1
Dust	Zone 20	Zone 21	Zone 22	IEC 60079-10-2
<b>NORTH AMERICA</b>				
500 Gas, Dust, Fibres & Flyings	Division 1 Hazard Present Continuously		Division 2	Listed in NEC® Article 500-3(c)
505 Gas	Zone 0	Zone 1	Zone 2	Listed in NEC® Article 505
506 Dust, Fibres & Flyings	Zone 20	Zone 21	Zone 22	Listed in NEC® Article 506

\*Note: Guideline numbers only. These numbers do not appear in standards but can be found in various resources from IChemE, RoSPA, ISA

### APPARATUS/GAS GROUPS

Typical gas hazard	IEC 60079-0 IEC CENELEC	North America NEC Article 500 (Class I)	Minimum ignition energy (microjoules)
ACETYLENE	IIC	A	20
HYDROGEN	IIC	B	20
ETHYLENE	IIB	C	60
PROPANE	IIA	D	180

### ATEX EQUIPMENT GROUPS & CATEGORIES

Equipment Group	Equipment Category	Protection Level	Hazard		Use
			Gas	Dust	
I Mining	M1	Very high	-	-	Operable in Ex atmosphere
	M2	High	-	-	De-energised in Ex atmosphere
II Surface Industries	1	Very high	Ga	Da	Zones 0, 1, 2
			Gb	Db	Zones 1, 2
	2	High	Gc	Dc	Zone 2
3	Normal				Zone 22

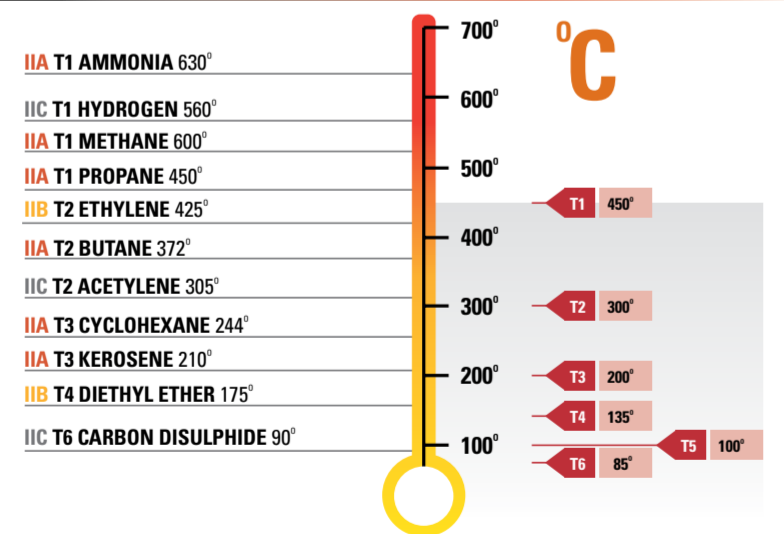
### INGRESS PROTECTION (IP) CODES (IEC/EN 60529)

FIRST NUMERICAL	SECOND NUMERICAL
Protection against solid bodies	Protection against liquid
NO PROTECTION	NO PROTECTION
OBJECTS GREATER THAN 50mm	1 VERTICALLY DRIPPING WATER
OBJECTS GREATER THAN 12mm	2 ANGLED DRIPPING WATER -75° TO 90°
OBJECTS GREATER THAN 2.5mm	3 SPRAYED WATER
OBJECTS GREATER THAN 1.0mm	4 SPLASHED WATER
DUST PROTECTED	5 WATER JETS
DUST TIGHT	6 HEAVY SEAS
EXAMPLE IP65	7 EFFECTS OF IMMERSION
Equipment is dust-tight and protected against water jets.	8 INDEFINITE IMMERSION

### DUST GROUPS

Typical material	IEC 60079-0	North America NEC Article 500
METAL DUST	IIIC	CLASS II, GROUP E
CARBON DUST	IIIC	CLASS II, GROUP F
FLOUR, GRAIN	IIIB	CLASS II, GROUP G
FIBRES AND FLYING	IIIA	CLASS III

### CLASSIFICATION OF MAXIMUM SURFACE TEMPERATURES FOR GROUP II ELECTRICAL EQUIPMENT (T CLASS)



### Mechanical Impacts (IK) Code EN50102

IK code	IK00	IK01	IK02	IK03	IK04	IK05	IK06	IK07	IK08	IK09	IK10
Impact energy (Joules)	*	0.14	0.2	0.35	0.5	0.7	1	2	5	10	20

Degrees of protection provided by enclosures for electrical equipment against mechanical impacts

### US ENCLOSURE RATINGS

NEMA, UL & CSA type rating	Approximate IEC/IP classification	Abbreviated protection description
1	IP20	Indoor, from contact with contents
2	IP22	Indoor, limited, falling dirt & water
3	IP55	Outdoor, from rain, sleet windblown dust & ice damage
3R	IP24	Outdoor, from rain, sleet & ice damage
4	IP66	Indoor & outdoor, from windblown dust, rain, splashing & hose directed water & ice damage
4X	IP66	Indoor & outdoor, from corrosion, windblown dust, rain, splashing & hose directed water & ice damage
6	IP67	Indoor & outdoor, from hose directed water, water entry during sub-mersion & ice damage
12	IP54	Indoor, from dust, falling dirt & dripping non-corrosive liquids
13	IP54	Indoor, from dust, spraying water, oil & non-corrosive liquids

NEMA 7 TO 10 ENCLOSURES ARE DESIGNED FOR HAZARDOUS AREA USE REFERENCE NEMA PUBLICATION NOV 2005

### Group II Electrical Apparatus for gas atmospheres 'G' and combustible dusts 'D'

Protection Method	IEC/EN	Permitted Zone			Permitted Zone			REMARKS	
		ATEX category	ATEX category	ATEX category	ATEX category	ATEX category	ATEX category		
IEC Equipment Protection Level (EPL)		Ga	Gb	Gc	Da	Db	Dc		
General requirements	60079-0							Equipment - General requirements	
Two independent methods	60079-26							Permits combined methods of protection (marking shows symbols for the 2 types of protection joined by '+')	
Oil immersion	60079-6		o	o				Protection by gas exclusion e.g. Transformers	
Pressurised	60079-2		pX, pY	pZ		p	p	Protection by gas exclusion e.g. Analysers	
Powder filling	60079-5		q	q				Protection by exclusion e.g. Weighing machines	
Encapsulation	60079-18		ma	mb	mc	ma	mb	mc	Protection by exclusion e.g. High power electronics
Increased safety	60079-7		e'	e'				Prevention by design e.g. Junction boxes & terminals	
Type of protection 'n'	60079-15			nA, nC, nB				Prevention by design e.g. Luminaires	
Flameproof	60079-1		da	db	dc			Prevention of propagation of internal explosion e.g. DC motors	
Intrinsic safety	60079-11		ia	ib	ic	ia	ib	ic	Low energy equipment e.g. Instrumentation. Includes Fieldbus Intrinsically safe concept
Intrinsically safe electrical system	60079-25							Considers combinations of intrinsically safe apparatus includes Fieldbus Intrinsically safe concept	
Optical radiation	60079-28		op ib, op pc, op sb	op ic, op pt, op sb	op is, op pt, op sb			Equipment and transmission systems using optical radiation (EPL is determined by type of protection employed)	
Protection by enclosure	60079-31					ta	tb	tc	Protected by enclosure and temperature limitation

\*Edition 5 of IEC60079-7 will include levels of protection eb (for Zone 1/Category 2) and ec (for Zone 2/Category 3)

### Explosion Protection - Europe

	CEN	REMARKS
Explosion prevention & protection	EN 1127-1:2011	Part 1 - Basic concepts & methodology for all industries except mining
Explosion prevention & protection	EN 1127-2:2014	Part 2 - Basic concepts & methodology for mining

### INTRINSIC SAFETY

#### Thermal ignition compliance

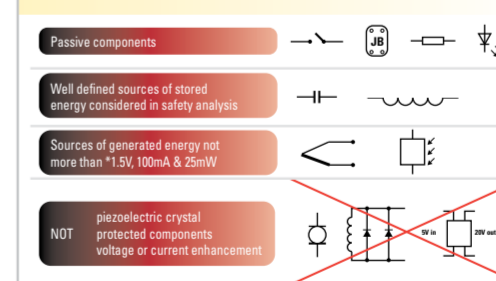
Small component relaxation for Group II T4 temperature classification

SURFACE AREA	GROUP II T4 MAXIMUM SURFACE TEMPERATURE °C
<20mm²	275
>20mm² <10cm²	200
>10cm²	135

Variation of matched power dissipation with ambient temperature For Group II components of surface area not less than 20mm²

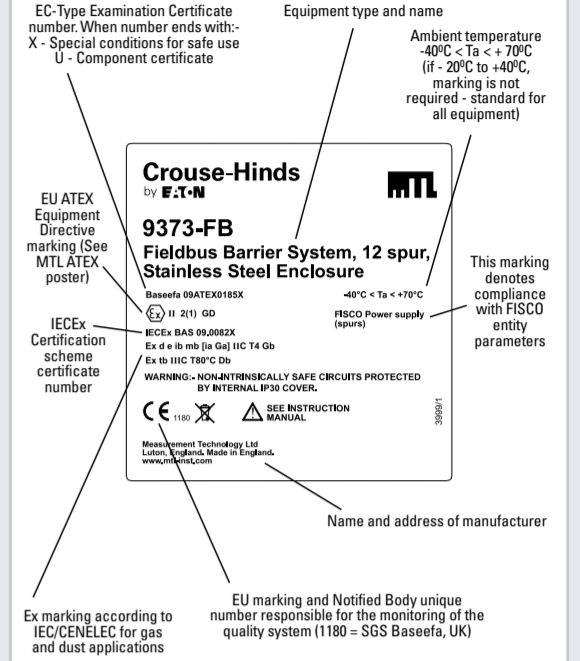
Max Ambient Temperature °C	40	50	60	70	80
Max Power Dissipation W	1.3	1.25	1.2	1.1	1.0

#### Simple Apparatus



\*Note: North America still uses 1.2V and 20 microjoules

### Typical Certification Marking



### What is a 'dust'

Combustible dust is defined as finely divided solid particles, 500µm or less in nominal size  
Conductive or non-conductive (IEC 60079-0 Section 3.11.1)

Combustible flyings are defined as solid particles or fibres greater than 500µm in nominal size

(IEC 60079-0 Section 3.11.2)

### Functional Safety

IEC 61508 (2nd Edition Published)

Safety Instrumented systems are widely used in industrial process plants where there is threat to life or environment should something go wrong. The IEC 61508 set of standards 'Functional safety of electrical/ electronic/ programmable electronic safety-related systems' are now considered industry 'good practice' for both manufacturers and users designing products and systems for safety related applications.

MTL are accredited as a Functional Safety Management (FSM) company.

Request a copy of the **Functional Safety poster** now or visit [www.mtl-inst.com/fsm](http://www.mtl-inst.com/fsm)

The MTL Application Note **AN9025** provides an introduction to the subject. **MTL Instruments are members of 'The 61508 Association'**

IEC 61508:2010

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The 61508 Association

http://www.61508.org/

FSM FUNCTIONAL SAFETY MANAGEMENT

IEC 61508:2010



International (IEC) standards [www.iec.ch](http://www.iec.ch)  
International (IECEx) explosive atmosphere standards [www.iecex.com](http://www.iecex.com)  
European (CENELEC) standards [www.cenelec.eu](http://www.cenelec.eu)  
National Electrical Codes (NEC®) [www.nfpa.org](http://www.nfpa.org)