

APPARATUS GROUPS & TEMPERATURE CLASSES FOR COMMON FLAMMABLE MATERIALS

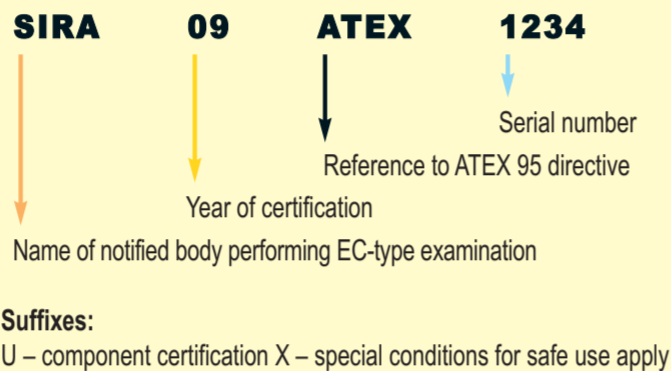
Gas/Vapour	Temperature class	Apparatus group	Dusts		Typical Ignition Temperature (°C)	
			Cloud	Layer	Cloud	Layer
Acetic acid	T1	IIA	Aluminium	590	>450	
Acetone	T1	IIA	Coal dust (lignite)	380	225	
Acetylene	T2	IIC	Flour	490	340	
Ammonia	T1	IIA	Grain dust	510	300	
Butane	T2	IIA	Methyl cellulose	420	320	
Cyclohexane	T3	IIA	Phenolic resin	530	>450	
Di-ethyl ether	T4	IIB	Polythene	420	(melts)	
Ethanol (ethyl alcohol)	T2	IIA	PVC	700	>450	
Ethylene	T2	IIB	Soot	810	570	
Gasoline (petrol)	T3	IIA	Starch	460	435	
Hydrogen	T1	IIC	Sugar	490	460	
Kerosene	T3	IIA				
Methane (natural gas) (non-mining)	T1	IIA				
Methanol (methyl alcohol)	T2	IIA				
Methyl ethyl ketone (MEK)	T2	IIB				
Propane	T1	IIA				
Propan-1-ol (n-propyl alcohol)	T2	IIB				
Propan-2-ol (iso-propyl alcohol)	T2	IIA				
Toluene	T1	IIA				
Xylene	T1	IIA				

SIRA TRAINING

Need training on Ex disciplines?

Sira offers courses covering all aspects of 'hazardous area' requirements. For more details, log on to www.siracertification.com

SIRA ATEX CERTIFICATE NUMBER

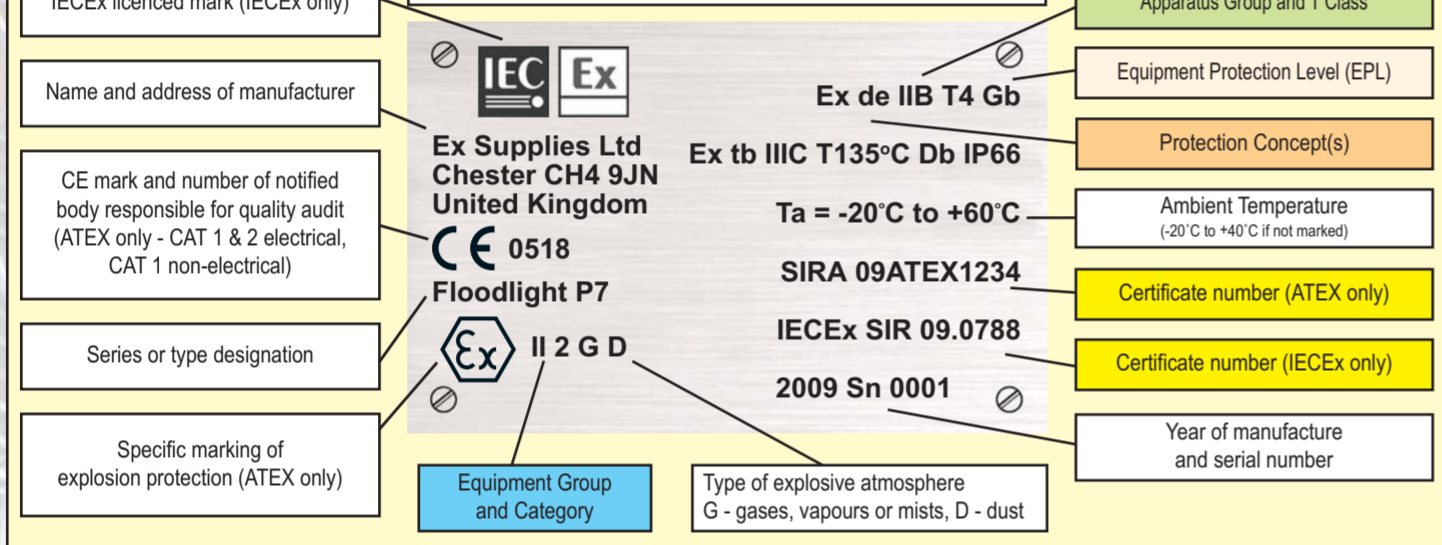


TEMPERATURE CLASS (GROUP II)

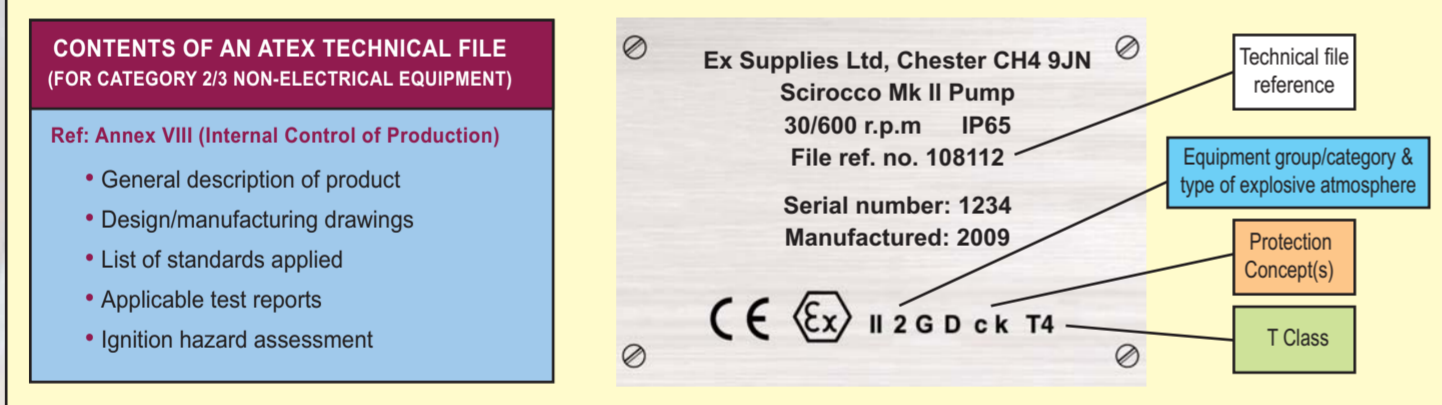
Maximum surface temperature	T Class
450°C	T1
300°C	T2
200°C	T3
135°C	T4
100°C	T5
85°C	T6

N.B. For Group I applications, apparatus has rigid 150°C (coal dust) and 450°C (methane) limits rather than T classes.

TYPICAL EQUIPMENT MARKING (ELECTRICAL EQUIPMENT)



TYPICAL EQUIPMENT MARKING (NON-ELECTRICAL EQUIPMENT)



COMPLIANCE ROUTES AND EQUIPMENT SELECTION

Zone	Gas	Dust	Equipment Category	Relevant ATEX Annexes for Compliance	Group	Hazardous Area Characteristics	Notes
0	20	1	1	III and IV or V	II	Explosive atmosphere present continuously or long periods or frequently (>1000 hours/year)	* Electrical equipment and internal combustion engines only
1	21	2*	2*	III and VII or VI	II	Explosive atmosphere is likely to occur in normal operation occasionally (>10 <1000 hours/year)	** Non-electrical equipment only
1	21	2**	2**	VIII#	II	Explosive atmosphere is not likely to occur in normal operation or infrequently and for short periods (<10 hours/year)	# and communicate the technical file to a notified body
2	22	3	3	VIII	II	Explosive atmosphere is not likely to occur in normal operation or infrequently and for short periods (<10 hours/year)	# and communicate the technical file to a notified body
Mining	Any	Any	M1	III and IV or V	I	If explosive atmosphere present, equipment remains energised	≠ Alternative route for any product
			M2*	III and VII or VI	I	If explosive atmosphere present, equipment de-energised	
			M2**	VIII#	I	If explosive atmosphere present, equipment de-energised	
Any	Any	Any	Any	IX#	Any	-	

NORTH AMERICAN APPROVAL MARKING

NORTH AMERICAN / EUROPEAN AREA CLASSIFICATION EQUIVALENTS - GAS			
IEC / EU	Flammable Material Present Continuously	Flammable Material Present Intermittently	Flammable Material Present Abnormally
US NEC 505	Zone 0	Zone 1	Zone 2
US NEC 500	Zone 0	Zone 1	Zone 2
CA CEC Section 18	Zone 0	Zone 1	Zone 2
CEC Annex	Zone 0	Zone 1	Zone 2

NORTH AMERICAN / EUROPEAN AREA EQUIPMENT GROUPING EQUIVALENTS - GAS			
Typical gas	US (NEC 505) CA (CEC Section 18) IEC	US (NEC 500) CA (CEC Annex J)	US (NEC 500) CA (CEC Section 18)
Acetylene	Group IIC	Class I / Group A	Class I / Group A
Hydrogen	(Group IIB + H ₂)	Class I / Group B	Class I / Group B
Ethylene	Group IIB	Class I / Group C	Class I / Group C
Propane	Group IIIA	Class I / Group D	Class I / Group D
Methane	Group I*	Mining*	Mining*

NORTH AMERICAN / EUROPEAN AREA CLASSIFICATION EQUIVALENTS - DUST			
IEC / EU	Combustible Dust Present Continuously	Combustible Dust Present Intermittently	Combustible Dust Present Abnormally
US NEC 506	Zone 20	Zone 21	Zone 22
US NEC 500	Zone 20	Zone 21	Zone 22
CA CEC Section 18	Zone 20	Zone 21	Zone 22

NORTH AMERICAN / EUROPEAN AREA EQUIPMENT GROUPING EQUIVALENTS - DUST			
Typical material	EU (60079-0) IEC (60079-0)	US (NEC 506)	IEC (61241-0) US (IEC 500) CA (CEC Section 18)
Metal dusts	IIC	N/A	D
Carbonaceous dusts	IIB	D	D
Non-conductive dusts	IIB	D	D
Fibres and flyings	IIIA	D	D



ATEX 100a
Directive 94/9/EC



ATEX 137
99/92/EC & DSEAR



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PROTECTION CONCEPTS

Electrical	Symbol	Typical IEC EPL	Typical Zone(s)	IEC Standard (status at August 2009)	Basic concept of protection
Optical Radiation	Op pr Op sh Op is	Ga Gb Gc	0,1,2 0,1,2 0,1,2	IEC 60079-28 IEC 60079-28 IEC 60079-28	Inherently safe protected. Protected by shutdown
Increased safety Type 'n' (non-sparking)	e nA	Gb Gc	1,2 2	IEC 60079-7 IEC 60079-15	No arcs, sparks or hot surfaces. Enclosure IP54 or better
Flameproof Type 'n' (enclosed break)	d nC	Gb Gc	1,2 2	IEC 60079-1 IEC 60079-15	Contain the explosion, quench the flame
Quartz/sand filled	q	Gb	1,2	IEC 60079-5	Quench the flame
Intrinsic safety Intrinsic safety Intrinsic safety Type 'n' (energy limitation)	ia ib ic nL	Ga Gb Gc Gc	0,1,2 1,2 2 2	IEC 60079-11 IEC 60079-11 IEC 60079-11 IEC 60079-15	Limit the energy of sparks and surface temperatures
Pressurised (up to 2007) Pressurised Pressurised Pressurised Type 'n' (sealing & hemetic sealing) Type 'n' (restricted breathing) Type 'n' (simple pressurised) Encapsulation Encapsulation Oil immersion	p px py pz nC nR nZ ma mb o	Gb Gb Gb Gc Gc Gc Gc Ga Gb Gb	1,2 1,2 1,2 2 2 2 2 0,1,2 1,2 1,2	IEC 60079-2 IEC 60079-2 IEC 60079-2 IEC 60079-2 IEC 60079-15 IEC 60079-15 IEC 60079-15 IEC 60079-18 IEC 60079-18 IEC 60079-6	Keep the flammable gas out
Dust Protection (Electrical)	Symbol	Typical IEC EPL	Typical Zone(s)	IEC Standard (status at August 2009)	Basic concept of protection
Enclosure	t		20, 21, 22	IEC 61241-1	Standard protection for dusts, rugged tight enclosure
Intrinsic safety	i	Da Db Dc	21, 22	IEC 61241-11	Similar to t, but with some relaxations if circuit inside is intrinsically safe
Encapsulation	m		22	IEC 61241-18	Protection by encapsulation of incandive parts
Pressurised	p	Db Dc	21, 22 22	IEC 61241-2	Protection by pressurisation of enclosure
Non-electrical	Symbol	Typical IEC EPL	Possible Zone(s)	EN Standard (status at August 2009)	Basic concept of protection
General	-	-	0,1,2	EN 13463-1	Low potential energy
Flow restricted enclosure Flameproof enclosure	fr d	-	2 1,2	EN 13463-2 EN 13463-3	Relies on tight seals, closely matched joints and tough enclosures to restrict the breathing of the enclosure
Constructional safety	c	-	0,1,2	EN 13463-5	Ignition hazards eliminated by good engineering methods
Control of ignition sources	b	-	0,1,2	EN 13463-6	Control equipment fitted to detect malfunctions
Pressurisation	p	-	1,2	EN 13463-7	Enclosure is purged and pressurised to prevent ignition sources from arising
Liquid immersion	k	-	0,1,2	EN 13463-8	Enclosure uses liquid to prevent contact with explosive atmosphere

INGRESS PROTECTION (IP) CODE BS EN 60529 (IEC 60529)

FIRST NUMERAL	SECOND NUMERAL
Protection against solid objects	Protection against water
0 - No special protection	0 - No special protection
1 - Objects > 50 mm diameter (e.g. part of a hand)	1 - Vertically dripping water
2 - Objects > 12.5 mm diameter (e.g. finger)	2 - Vertically dripping water, when enclosure tilted by 15°
3 - Objects > 2.5 mm diameter (e.g. tool)	3 - Sprayed water up to 60° from the vertical
4 - Objects > 1.00 mm diameter (e.g. wire)	4 - Sprayed water from all directions
5 - Dust protected	5 - Water jets
6 - Dust tight	6 - Powerful water jets
	7 - Temporary submersion to a depth of 1m
	8 - Extended submersion to a depth > 1m

NEMA TESTING APPROXIMATE EQUIVALENT TO IPXX

NEMA TYPE	IP
NEMA 1	IP10
NEMA 2	IP11
NEMA 3	IP54
NEMA 3R	IP14
NEMA 3S	IP54
NEMA 4 and 4X	IP55
NEMA 5	IP52
NEMA 6 and 6P	IP67
NEMA 12 and 12K	IP52
NEMA 13	IP54

This table cannot be used to convert IP codes to NEMA ratings



Looking for Ex Equipment?

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- Training and Competence
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