BARTEC

Marking of electrical equipment for use in potentially explosive atmospheres

Conditions and subdivisions

Conditions and subdivisions			Required marking on the usable operating equipment			
Flammable materials	**Temporary behaviour** of explosive atmosphere	**Classification** of hazardous areas	**Group** as defined in directive 94/9/EC	**Equipment category** as defined in directive 94/9/EC	**Equipment group** as defined in EN 60079-0	**Equipment protection level** (EPL) as defined in EN 60079-0
gases vapours	is present continuously or for long periods or frequently	zone 0	II	1G	II	Ga
	arises in normal operation occasionally	zone 1	II	2G or 1G	II	Gb or Ga
	is not likely toarise in normal operation, or if it does, will persist for a short time only	zone 2	II	3G or 2G or 1G	II	Gc or Gb or Ga
dusts	is present in the form of a cloud continuously, or for long periods or frequently	zone 20	II	1D	III	Da
	occasionally develops into a cloud during normal operation	zone 21	II	2D or 1D	III	Db or Da
	is not likely to develop into a cloud during normal operation, or if it does, for a short time only	zone 22	II	3D or 2D or 1D	III	Dc or Db or Da
methane carbon dust	operation where there is a risk of explosion	-	I	M1	I	Ma
	disconnection where there is a risk of explosion	-	I	M2 or M1	I	Mb or Ma

Subdivisions of gases and vapours

Gases and vapours			Assignment of gases and vapours accordance to the ignition temperature	Temperature class	Maximum surface temperature of equipment	Permissible temperature classes of equipment
ammonia, methane, ethane, propane	town gas, acrylnitril	hydrogen	> 450 °C	T1	450 °C	T1 to T6
ethyl alcohol, cyclohexane, n-butane	ethylene, ethylene oxide	ethine (acetylene)	> 300 °C ... ≤ 450 °C	T2	300 °C	T2 to T6
gasoline, n-hexane	ethylene glycol hydrogen sulphide		> 200 °C ... ≤ 300 °C	T3	200 °C	T3 to T6
acetaldehyde	ethyl-ether		> 135 °C ... ≤ 200 °C	T4	135 °C	T4 to T6
			> 100 °C ... ≤ 135 °C	T5	100 °C	T5 to T6
		sulphide of carbon	> 85 °C ... ≤ 100 °C	T6	85 °C	T6

Official notified bodies

Code number	Notified bodies	Country
0589	BAM	Germany
0158	DEKRA EXAM	Germany
0600	EECS (BASEEFA)	UK
0637	IBExU	Germany
0344	KEMA	Netherlands
0081	LCIE	France
0102	PTB	Germany
0518	SIRA	UK
0044	TÜV (NORD CERT)	Germany

Explosion groups

IIA	IIB	IIC
Permissible equipment groups		
IIA, IIB, IIC	IIB, IIC	IIC

Gas CE 0044 Ex II 2G Ex de IIB T4 Gb NB 11 ATEX 1234 X

Dust CE 0044 Ex II 2D Ex tb IIIB T120 °C Db NB 11 ATEX 1234 X

Protection principle/types of protection

Applications	Flammable materials	Protection principle	Type of protection	Symbol	Marking in accordance with the equipment protection level			Norm
					a = very high level of protection	b = high level of protection	c = enhanced level of protection	
all applications	gases, vapours and dusts	-	general requirements		-	-	-	IEC EN 60079-0
control stations, motors, fuses, switchgear, power electronics	gases and vapours (G)	propagation of an explosion inside to the outside is excluded	flameproof enclosure		-	Ex d Ex db*	-	IEC EN 60079-1
junction and connection boxes, enclosures, motors, lights, terminals	gases and vapours (G)	avoidance of arcs, sparks and excessive temperature	increased safety		-	Ex e Ex eb*	-	IEC EN 60079-7
junction and connection boxes, enclosures, motors, lights, switch and control cabinets, plugs	dusts (D)	explosive dust atmosphere keep at a distance from the ignition source	protection by enclosure	IPXX	Ex ta	Ex tb	Ex tc	IEC EN 61241-1 IEC EN 60079-31
measurement and control technology, automation technology, sensors, actuators	gases and vapours (G)	limitation of energy as well as arcs and temperature	intrinsic safety		Ex ia	Ex ib	Ex ic	IEC EN 60079-11 IEC EN 60079-25** IEC EN 60079-27***
	dusts (D)				Ex ia	Ex ib	Ex ic	IEC EN 61241-11
switch and control stations, motors, analyzers, computers	gases and vapours (G)	explosive atmosphere keep at a distance from the ignition source	pressurization		-	Ex px | Ex pxb* Ex py | Ex pyb*	Ex pz | Ex pzc*	IEC EN 60079-2
	dusts (D)					Ex pb	Ex pc	IEC EN 61241-4
coils of motors or relays, solenoid valves, connection systems	gases and vapours (G)	explosive atmosphere keep at a distance from the ignition source	encapsulation		Ex ma	Ex mb	-	IEC EN 60079-18
	dusts (D)				Ex ma	Ex mb	-	IEC EN 61241-18
transformers, relays, control stations, magnetic contactors	gases and vapours (G)	explosive atmosphere keep at a distance from the ignition source	oil immersion		-	Ex o Ex ob*	-	IEC EN 60079-6
capacitors, transformers, relays	gases and vapours (G)	an propagation of an explosion inside to the outside is excluded	powder filling		-	Ex q Ex qb*	-	IEC EN 60079-5
all applications for zone 2	gases and vapours (G)	all protection principles for zone 2	"n" type of protection		-	-	Ex nA | Ex nAc* Ex nC | Ex nCc* Ex nR | Ex nRc* Ex nL | Ex nLc*	IEC EN 60079-15

Application in hazardous area

Zone 0, zone 20	Zone 1, zone 21	Zone 2, zone 22

Groups of dust

Marking	Dusts	Permissible equipment group
IIIA	combustible flyings	IIIA, IIIB, IIIC
IIIB	non-conductive dust	IIIB, IIIC
IIIC	conductive dust	IIIC

Ignition temperature of dust

permissible temperature of the **layer**	$T_{perm.\ layer} = T_{5\ mm\ layer} - 75\ K$
permissible temperature of the **cloud**	$T_{perm.\ cloud} = 2/3\ T_{cloud}$
max. permissible **surface temperature of the equipment**	$T_{perm.\ layer} \geq T_{perm.} \leq T_{perm.\ cloud}$

Use of the operating equipment

Marking	Conditions
without	operating equipment can be used without restriction
X	special conditions of use
U	operating equipment with partial certificate, CE-conformity is certified when it is installed into a complete item of operating apparatus

Marking according directive 94/9/EC
according norm EN 60079-0 ff

* Alternative Ex protection type
** Intrinsically safe systems
*** FISCO intrinsically safe field bus systems

BARTEC GmbH Max-Eyth-Straße 16 97980 Bad Mergentheim Phone: +49 7931 597-0 info@bartec.de www.bartec-group.com

BARTEC Werbe Agentur 06/11