

Potentially explosive areas							Subdivisions and classification of gases and vapours						
Conditions and Zone classification			Required marking on the equipment				Gases and vapours			Assignment of gases and vapours according to the ignition temperature	Temperature class	Maximum surface temperature (equipment)	Permitted Temperature classes (equipment)
Flammable materials	Temporary behaviour of explosive atmosphere	Classification of hazardous areas	Group as defined in directive 2014/34/EU	Equipment category as defined in directive 2014/34/EU	Equipment group as defined in EN IEC 60079-0	Equipment protection level (EPL) as defined in EN IEC 60079-0							
Gases Vapours	is present continuously or for long periods or frequently	Zone 0	II	1G	II	Ga	Ammonia, methane, ethane, propane	Town gas, acrylnitril	Hydrogen	> 450 °C	T1	450 °C	T1 to T6
	arises in normal operation occasionally	Zone 1	II	2G or 1G	II	Gb or Ga	Ethyl alcohol, cyclohexane, n-butane	Ethylene, ethylene oxide	Ethine (Acetylene)	> 300 °C ... ≤ 450 °C	T2	300 °C	T2 to T6
	is not likely to arise 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	Gasoline, n-hexane	Ethylene glycol, hydrogen sulphide		> 200 °C ... ≤ 300 °C	T3	200 °C	T3 to T6
Dusts	is present in the form of a cloud continuously, or for long periods or frequently	Zone 20	II	1D	III	Da	Acetaldehyde	Ethyl ether		> 135 °C ... ≤ 200 °C	T4	135 °C	T4 to T6
	occasionally develops into a cloud during normal operation	Zone 21	II	2D or 1D	III	Db or Da			Sulphide of carbon	> 100 °C ... ≤ 135 °C	T5	100 °C	T5 to T6
	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				> 85 °C ... ≤ 100 °C	T6	85 °C	T6
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							

## ATEX

Gases/Vapours	CE NB <sup>1)</sup>	Ex	II	2G	Ex db eb	IIC	T6	Gb	NB <sup>2)</sup> 18 ATEX 1234	X
Dusts	CE NB <sup>1)</sup>	Ex	II	2D	Ex tb	IIIC	T120 °C	Db	NB <sup>2)</sup> 18 ATEX 1234	X

## IECEx

Gases/Vapours					Ex db eb	IIB	T4	Gb	IECEx ExCB <sup>3)</sup> 11.1234	X
Dusts					Ex tc	IIIB	T120 °C	Dc	IECEx ExCB <sup>3)</sup> 11.1234	X

Applications	Flammable materials	Protection principle	Type of protection	Marking in accordance with the equipment protection level			Standards
				very high level of protection	high level of protection	enhanced level of protection	
All applications	Gases, vapours (G) and dusts (D)	-	General requirements	+	+	+	EN IEC 60079-0
Control stations, motors, fuses, switchgear, power electronics, *catalytic gas detectors only	Gases and vapours (G)	Propagation of an explosion inside to the outside is excluded	Flameproof enclosure	Ex da*	Ex db	Ex dc	EN IEC 60079-1
Junction and connection boxes, enclosures, motors, luminaires, terminals	Gases and vapours (G)	Avoidance of arcs, sparks and excessive temperature	Increased safety	-	Ex eb	Ex ec	EN IEC 60079-7
Junction and connection boxes, enclosures, motors, luminaires, switch and control cabinets, plugs	Dusts (D)	Explosive dust atmosphere keep at a distance from the ignition source	Protection by enclosure	Ex ta	Ex tb	Ex tc	EN IEC 60079-31
Measurement and control technology, automation technology, sensors, actuators	Gases, vapours (G) and dusts (D)	Limitation of energy as well as arcs and temperature	Intrinsic safety	Ex ia	Ex ib	Ex ic	EN IEC 60079-11 EN IEC 60079-25
Switch and control stations, motors, analyzers, computers	Gases, vapours (G) and dusts (D)	Explosive atmosphere keep at a distance from the ignition source	Pressurization	-	Ex pxb, Ex pyb	Ex pzc	EN IEC 60079-2
Coils of motors or relays, solenoid valves, connection systems	Gases, vapours (G) and dusts (D)	Explosive atmosphere keep at a distance from the ignition source	Encapsulation	Ex ma	Ex mb	Ex mc	EN IEC 60079-18
Transformers, relays, control stations, magnetic contactors	Gases and vapours (G)	Explosive atmosphere keep at a distance from the ignition source	Liquid immersion	-	Ex ob	Ex oc	EN IEC 60079-6
Capacitors, transformers, relays	Gases and vapours (G)	A propagation of an explosion inside to the outside is excluded	Powder filling	-	Ex q	-	EN IEC 60079-5
Applications for zone 2	Gases and vapours (G)	Protection principles adapted for zone 2	Enclosed construction Restricted breathing	-	-	Ex nC Ex nR	EN IEC 60079-15
Optical devices, laser scanners, light barriers, fibre-optic systems	Gases, vapours (G) and dusts (D)	Limitation of optical energy radiating in the explosive atmosphere	Inherent safe optical radiation	Ex op is	-	-	EN IEC 60079-28
Fibre-optic systems	Gases, vapours (G) and dusts (D)	Ex atmosphere is kept distant from the ignition source	Protected optical radiation	-	Ex op pr	-	EN IEC 60079-28
Fibre-optic systems	Gases, vapours (G) and dusts (D)	Ex atmosphere is kept distant from the ignition source	Optical system with interlocking	-	Ex op sh	-	EN IEC 60079-28

Use of the operating equipment	
Marking	Conditions
without X or U	Equipment can be operated without restrictions
with X	Specific conditions of use of the equipment
with U	Component certificate (uncompleted), conformity is certified when used in an overall equipment

Max. permissible surface temperature of the equipment	
Temperature limitation because of dust layer	$T_{max} \leq T_{5mm} - 75^\circ C$
$T_{5mm}$ : Minimum ignition temperature of 5 mm layer of dust	
Temperature limitation because of dust cloud	$T_{max} \leq 2/3 T_{cl}$
$T_{cl}$ : Minimum ignition temperature of the cloud of dust	
<b>Max. permissible surface temperature of the equipment:</b>	lowest outcome of the $T_{max}$ - values

Subdivision of dusts		
Permitted Equipment groups	Dust groups	Dusts
IIIA, IIIB, IIIC	IIIA	combustible flyings
IIIB, IIIC	IIIB	non-conductive
IIIC	IIIC	conductive

- 1) Identification number of the Notified Body responsible for the surveillance of the manufacturer's quality system (Cat. 1 and 2).
- 2) Notified Body (NB) that has tested and certified the product (Cat. 1 and 2).
- 3) Certification Body (CB) that has tested and certified the product (EPL a, b and c).

ATEX is in the European Union a mandatory and IECEx a voluntary certification procedure. For the correct application of the certification procedures, please follow the corresponding regulations guidelines and standards.

Application area (equipment)		
Zone 0/20 Zone 1/21 Zone 2/22	Zone 1/21 Zone 2/22	Zone 2/22