

Marking electrical	Type of protection electrical equipment, Gas
Ex d*	Flameproof enclosures with equipment level of protection a, b or c
Ex e*	Increased safety with equipment level of protection b or c
Ex i*	Intrinsic safety with equipment level of protection a, b or c
Ex m*	Encapsulation with equipment level of protection a, b or c
Ex n	Non-incendive "nA" non-sparking "nC" (hermetically) sealed or non-incendive "nR" restricted breathing
Ex o	Liquid immersion
Ex op	Optical radiation "op is" inherently safe "op pr" protected "op sh" with interlock
Ex p	Pressurized enclosure "pxb", "pyb" of "pzc"
Ex q	Powder filling

Marking electrical	Type of protection electrical equipment, Dust
Ex i*	Intrinsic safety with equipment level of protection a, b or c
Ex m*	Encapsulation with equipment level of protection a, b or c
Ex op	Optical radiation "op is" inherent safe "op pr" protected "op sh" with interlock
Ex p	Pressurized enclosure "pxb", "pyb" of "pzc"
Ex t*	Protection by enclosure with equipment level of protection a, b or c

Marking non-electrical	Type of protection non-electrical G and/or D
Ex d*	Flameproof enclosures (only for gas/vapour G) with equipment level of protection b or c
Ex h	Ignition Hazard Assessment acc. to EN-ISO 80079-36 with possible type of protection acc. to EN-ISO 80079-37 in user manual: "b": control of ignition sources "c": constructional safety "k": liquid immersion
Ex p	Pressurized enclosure "pxb", "pyb" of "pzc"
Ex t*	Protection by enclosure (only for dust D) with equipment level of protection a, b or c

* Type of protections are nowadays supplemented with the equipment level of protection, for example Ex ia for use in zone 0, or Ex ib or Ex db for use in zone 1, or Ex mc or Ex ec for use in zone 2.

Commonly used ATEX relevant guidelines and standards	
2014/34/EU	ATEX 114 Equipment directive
1999/92/EG	ATEX 153 Workplace directive
EN-IEC 60079-10-1	International standard for hazardous area classification gas
EN-IEC 60079-10-2	International standard for hazardous area classification dust
NPR 7910-1	Dutch practical guideline for hazardous area classification gas
NPR 7910-2	Dutch practical guideline for hazardous area classification dust
EN 15281	Guidance on inerting
EN 1127-1 (above ground) EN 1127-2 (mining)	Explosion prevention and protection, basic concepts and methodology
EN-IEC 60079-14	Electrical installation design, selection and installation of equipment, including initial inspection
EN-IEC 60079-17	Electrical installations inspection and maintenance
EN-IEC 60079-19	Equipment repair, overhaul and reclamation
EN 60079 series of standards See the European Commission website for a list of harmonized standards (official journal)	Electrical equipment intended for use in potentially explosive atmospheres
EN-ISO 80079-36	Non-electrical equipment for explosive atmospheres, basics and requirements
EN-ISO 80079-37	Non-electrical equipment for explosive atmospheres - Non-electrical type of protection constructional safety "c", control of ignition sources "b", liquid immersion "k"
IEC/TS 60079-32-1	Electrostatic hazards, guidance
IEC/TS 60079-46	Equipment assemblies
NTA 7914	Temporary use of non-ATEX equipment in hazardous areas (Dutch requirements)

Examples of ATEX markings	
Ex II 2(1) G Ex db [ia Ga] IIC T6 Gb	Flameproof control panel, suitable for use in zone 1 or 2, gas group IIC, T6 with built-in associated apparatus with intrinsically safe input or output from or to zone 0, 1 or 2
Ex II (2) G	Motor protection switch, not explosion safe itself, suitable for protecting motors in zone 1 or 2
Ex II 2/3 D Ex h IIB T85°C Db/Dc	Fan, mechanically explosion safe, internally suitable for zone 21 or 22, externally for zone 22 in case of non-conductive dust IIB, T85°C
Ex II (1) G [Ex ia Ga] IIC	Intrinsically safe barrier or isolator, not suitable for use in a zone itself, but suitable for protecting an intrinsically safe instrument in zone 0, 1 or 2
Ex II 1/2 G Ex ia IIB T6 Ga/Gb	Intrinsically safe sensor, sensor part suitable for use in zone 0, 1, 2 and connection compartment suitable for zone 1 and 2, gas group IIB, T6
Ex II 2 G Ex h IIB T4 Gb Ex II 2 D Ex h IIC T130°C Db	Non-electrical equipment, suitable for use in zone 1, 2, gas group IIB, T-class T4 and suitable for use in zone 21 and 22, all dust groups, max. surface temperature 130°C

Application	Equipment group according to 2014/34/EU	Atmosphere	Gas/vapour or dust subdivision	Zone	Allowable equipment category	Allowable equipment EPL
Underground parts of mines	I	Mine gas and dust	I	-	M1	Ma
				-	M2	Mb
Above ground installations	II	Gas, vapour or mist	IIA, IIB or IIC	0	1G	Ga
				1	1G, 2G	Ga, Gb
				2	1G, 2G, 3G	Ga, Gb, Gc
		Dust	IIIA, IIIB or IIIC	20	1D	Da
				21	1D, 2D	Da, Db
				22	1D, 2D, 3D	Da, Db, Dc

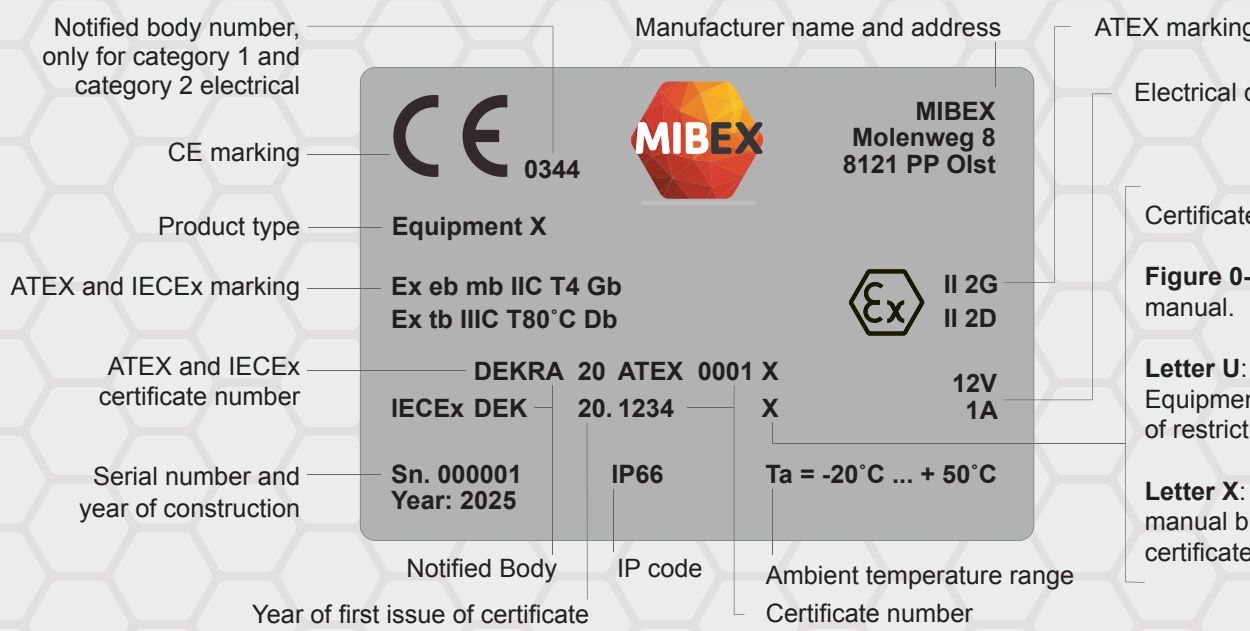


Ex eb mb IIC T4 Gb
Ex tb IIIC T80°C Db

Temperature class hazardous area	Ignition temperature of gas or vapour	Maximum surface temperature equipment	Allowable temperature classes of Ex Equipment
T1	> 450°C	< 450°C	T1, T2, T3, T4, T5, T6
T2	> 300°C	< 300°C	T2, T3, T4, T5, T6
T3	> 200°C	< 200°C	T3, T4, T5, T6
T4	> 135°C	< 135°C	T4, T5, T6
T5	> 100°C	< 100°C	T5, T6
T6	> 85°C	< 85°C	T6

Determination of maximum allowable surface temperature in dust atmospheres			
Type	Safety margin	Example wood dust	Max. allowable
Dust cloud	Tmax = 2/3 x MOT (in °C)	Tmax = 2/3 x 400 = 267°C	T225°C
Dust layer	Tmax = T _{sim} - 75 (in °C)	Tmax = 300-75 = 225°C	

Group hazardous area	Allowable equipment group
IIA	II, IIA, IIB, IIC
IIB	II, IIB, IIC
IIC	II, IIC
IIC (only H2)	II, IIB+H2, IIC
IIIA	IIIA, IIIB, IIIC
IIIB	IIIB, IIIC
IIIC	IIIC



Certificates ending with:

Figure 0-9: Ex Equipment (full) certificate. Install according to manual.

Letter U: Ex Component (incomplete) certificate. Use only in Ex Equipment by Ex Equipment manufacturer in compliance with list of restrictions (Schedule of Limitations).

Letter X: Ex Equipment (full) certificate. Install according to manual but now with Specific Conditions of Use, see manual or certificate.

Selection of equipment		
Step	Gas atmosphere	Dust atmosphere
1	Check category with zone	
2	Check gas group equipment with gas group zone	Check dust group equipment with dust group zone
3	Check T-class equipment with T-class zone	Check maximum surface temperature of equipment with maximum allowable temperature in zone
4	Check ambient temperature range and environmental influences	
5	Check Specific Conditions of Use (X)	
6	Check for additional ignition sources through assembly with other equipment	

Equipment category	Ignition sources avoided during	Allowable in zone
1G	Normal operation, expected malfunctions and rare malfunctions (2 faults)	0, 1 and 2
2G	Normal operation and expected malfunctions (1 fault)	1 and 2
3G	Normal operation	2
1D	Normal operation, expected malfunctions and rare malfunctions (2 faults)	20, 21 and 22
2D	Normal operation and expected malfunctions (1 fault)	21 and 22
3D	Normal operation	22

Ambient temperature marking on equipment (Ta)	Allowable ambient temperature range	Remark
Not present	-20°C ≤ Ta ≤ +40°C	Standard range of -20°C to +40°C did not have to be marked up to and including EN-IEC 60079-0:2018, but with the arrival of IEC 60079-0:2025 this becomes mandatory
-10°C ≤ Ta ≤ +50°C	-10°C ≤ Ta ≤ +50°C	
-20°C ... +45°C	-20°C ≤ Ta ≤ +45°C	

Gas group area	Representative gases or vapors
IIA	Propane, butane, methane, gasoline, etc
IIB	Ethanol, ethylene, carbon monoxide, etc
IIC	Hydrogen, acetylene and carbon disulphide
Dust group area	Representative dust
IIIA	Fibres and flakes > 0.5 mm, e.g. tobacco
IIIB	Non-conductive dust ≤ 0.5 mm, e.g. wood dust
IIIC	Conductive dust ≤ 0.5 mm, e.g. aluminium powder

Conformity procedures				
Category	Zone	Equipment	Procedure	Supplied with Equipment
1	0/20	Electrical and non-electrical	EU-Type Certification by Notified Body + audited manufacturing location	Mandatory: EU-Declaration of Conformity and User manual
			Or Unit Verification	
2	1/21	Electrical	EU-Type Certification by Notified Body + audited manufacturing location	Preferably also: EU-Type certificate
			Or Unit Verification	
3	2/22	Electrical and non-electrical	Self assessment + internal production control + technical construction file storage at Notified Body	Mandatory: EU-Declaration of Conformity and User manual
			If necessary Type certificate or Unit Verification (on voluntary basis)	
3	2/22	Electrical and non-electrical	Self assessment + internal production control	Optional: Voluntary (Type) certificate
			Optional Type certificate or Unit Verification (on voluntary basis)	

IP Code	
1st figure: Protection against foreign objects	2nd figure: Protection against water
0 No protection provided	0 No protection provided
1 Objects ≥ 50 mm	1 Vertical dripping
2 Objects ≥ 12,5 mm	2 Dripping (15° tilted)
3 Objects ≥ 2,5 mm	3 Spraying
4 Objects ≥ 1 mm	4 Splashing
5 Dust-protected	5 Jetting
6 Dust-tight	6 Powerfull jetting
	7 Temporary immersion
	8 Continues immersion
	9 High-pressure water jets

Hazardous area classification				
Presence of explosive atmosphere			Zone	
Duration	Hours criterion	Percentage of operating time	Gas	Dust
Continuously, long or repeatedly	> 1000 hours per year	> 10 %	0	20
Probably occasionally during normal operation	10 to 1000 hours per year	0,1 to 10 %	1	21
Not likely or of very short duration during normal operation	< 10 hours per year	< 0,1 %	2	22

Possible sources of ignition	
1	Hot surfaces
2	Flames and hot gases (including hot particles)
3	Mechanically generated impact, friction and abrasion
4	Electrical equipment and components
5	Stray electric currents, cathodic corrosion protection
6	Static electricity
7	Lightning
8	Radio frequency (RF) electromagnetic waves from 10 ⁴ Hz to 3x10 ¹¹ Hz
9	Electromagnetic waves from 3x10 ¹¹ Hz to 3x10 ¹⁵ Hz
10	Ionizing radiation
11	Ultrasonic waves
12	Adiabatic compression and shock waves
13	Exothermic reactions, including self-ignition of dusts



Valuable knowledge in service of safety

Training and consultancy for electrical explosion protection
From Ex Component to Ex Equipment
Design of Ex installations
Selection, installation and inspection of Ex Equipment