

Orientation

SIMOTICS XP 1MB1 Explosion-Proof Motors

Overview



In many industrial and public sectors, explosion protection or explosion hazards are ever-present, e.g. in the chemicals industry, in refineries, on drilling platforms, at petrol stations, in feed manufacturing and in sewage treatment plants.

The risk of explosion is always present when gases, fumes, mist or dust are mixed with oxygen in the air in an explosive ratio close to sources of ignition that are able to release the so-called minimum ignition energy.

In the chemical and petrochemical industries in particular, when crude oil and natural gas are transported, or in mining, milling (e.g. grain and granular solids), this can result in serious injury to persons and damage to equipment.

To ensure maximum safety in these areas, legislators in most countries have implemented appropriate stipulations in the form of laws and regulations based on national and international standards.

Explosion-protected equipment is designed such that an explosion can be prevented when it is used properly.

The explosion-protected equipment can be designed in accordance with various types of protection.

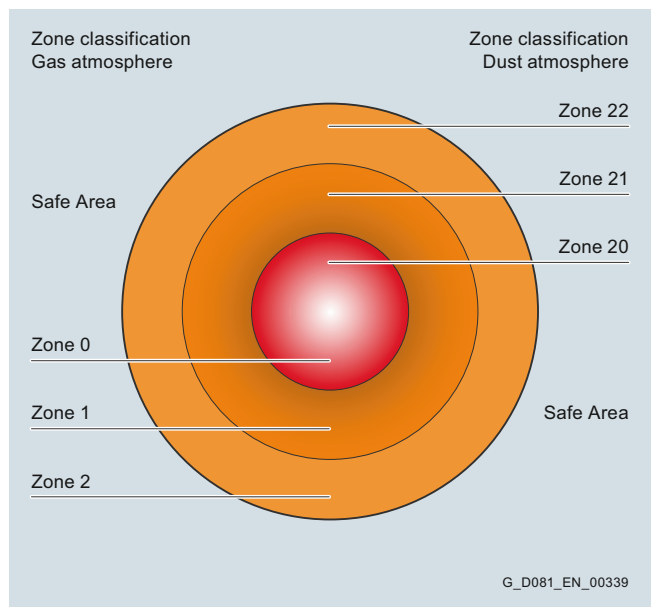
The local conditions must be subdivided into specified zones by the user with the assistance of the responsible authorities in accordance with the frequency of occurrence of an explosion hazard. Device (equipment) categories are assigned to these zones. The zones are then subdivided into possible types of protection and therefore into possible equipment (product) types.

Classification of zones

Areas subject to explosion hazard are divided into zones. Division into zones depends on the chronological and geographical probability of the presence of a hazardous, potentially explosive atmosphere. Information and specifications for classification of the zones are laid down in the following standards:

- IEC/EN 60079-10-1 for gas atmospheres
- IEC/EN 60079-10-2 for dust atmospheres

Further, a distinction is made between various explosion groups as well as temperature classes and these are included in the hazard assessment.



Depending on the particular zone and therefore the associated hazard, operating equipment must comply with defined minimum requirements regarding the type of protection. The different types of protection require corresponding measures to prevent ignition that should be implemented at the motor in order to prevent that a surrounding explosive atmosphere is ignited.

Zone	Gas	Dust	Zone definition acc. to IEC/EN 60079-10-1 for gas atmospheres IEC/EN 60079-10-2 for dust atmospheres	Assigned types of protection	Category according to 94/9/EC	Equipment protection level acc. to IEC/EN 60079-0
0	–	–	An area in which there is an explosive gas atmosphere constantly, over a long period or frequently .	Low voltage motors not permitted	1	Ga
1	–	–	An area in which it is expected that an explosive gas atmosphere will occur occasionally during normal operation.	Ex e Ex de Ex d	2	Gb
2	–	–	An area in which in normal operation it is expected that an explosive gas atmosphere will occur only rarely and then only briefly .	Ex nA	3	Gc
–	20	–	An area in which there is an explosive gas atmosphere comprising a dust-air mixture constantly, over a long period or frequently .	Low voltage motors not permitted	1	Da
–	21	–	An area in which it is expected that an explosive gas atmosphere comprising a dust-air mixture will occur occasionally during normal operation.	Ex tb	2	Db
–	22	–	An area in which in normal operation it is expected that an explosive gas atmosphere in the form of a cloud of flammable dust in air will occur only rarely and then only briefly .	Ex tc ³⁾	3	Dc

¹⁾ Motors of
 – Zone 1 can also be used in Zone 2
 – Zone 21 can also be used in Zone 22

²⁾ Motors which are certified for gas or dust protection must not be used in hybrid mixtures! Hybrid mixtures: when explosive gas and dust atmospheres occur simultaneously.

³⁾ Motors are not approved for operation in environments containing conductive dust.

Overview (continued)**Types of protection**

Type of protection "Increased safety" **Ex e** acc. to IEC/EN 60079-7

Additional measures are taken to prevent the possibility of high temperatures and to prevent sparks or arcs from occurring on the inside and on external components of the motor.

Motors of the 1MA6 and 1MA7 series are designed with "Increased safety" – see Catalog D 81.1 · January 2012.

Type of protection "Explosion-proof enclosure" **Ex d** acc. to IEC/EN 60079-1

The components that can ignite an explosive atmosphere are located in an enclosure that is not damaged by an internal explosion and flameproof joints prevent flames from escaping to the explosive atmosphere on the outside.

The motors in series 1MD5 and 1PS5 are designed with "Explosion-proof enclosure" **Ex d** – see Catalog D 83.1.

Type of protection "Non-sparking" **Ex nA** acc. to IEC/EN 60079-15

The type of protection **Ex nA** ensures that a motor in normal operation as well as when operated under deviating conditions as specified in the standard is not in a position to ignite a surrounding explosive gas atmosphere.

1MB103, 1MB153 and 1MB163 motors are available in the **Ex nA** version. For motors of the 1LA7/9, 1LA6 and 1LG series, see Catalog D 81.1 · January 2012.

Type of protection "Dust explosion protection" **Ex tb, Ex tc** acc. to IEC/EN 60079-31

This type of protection applies for electrical equipment protected using an enclosure and with limited surface temperature for use in areas in which combustible dust can occur in concentration levels that could cause a fire or an explosion.

The following motor series are available with type of protection Ex tb or Ex tc:

- 1MB101, 1MB151 and 1MB161 with type of protection **Ex tb**
- 1MB102, 1MB152 and 1MB162 with type of protection **Ex tc**

For motors of the 1LA7/9, 1LA6 and 1LG series, see Catalog D 81.1 · January 2012.

Explosion-proof motors for converter operation

Principally, explosion-proof motors (except for Ex e) can be fed from converters. Particular attention must be paid to the interaction between the motor and converter system, especially with regard to the following aspects:

- The harmonic content of the supply voltage raises the motor temperature, so the motor output must be reduced
- Less cooling of the motor at speeds below the rated speed
- Voltage stress on the motor winding
- Bearing currents

Certification

IEC motors for use in hazardous zones are certified according to the EU Directive 94/9/EC (ATEX) and are marked according to the following schematic:

Example "Non-sparking":

	CE	0158	Ⓔ	II	3	G	Ex	nA	IIC	T3	Gc
CE marking											
Number of the certifying "notified" body (0158 = EXAM)											
Explosion protection marking											
Device group:											
Category:											
Ex atmosphere											
Explosion protected equipment											
Type of protection nA, d, de, e, tb or tc (de = Ex d motor enclosure with Ex e terminal box)											
Explosion group and explosion subgroup											
Temperature class with max. surface temperature											
Equipment protection level (G = Gas; D = Dust):											

Additional information on the subject of explosion protection, types of protection and zones is provided in the Siemens brochure "Explosion Protection".

Orientation

SIMOTICS XP 1MB1 Explosion-Proof Motors

Overview (continued)

Overview of SIMOTICS XP 1MA/1MB1/1MJ/1LA/1LG/1PQ8 explosion-proof motors

The table below contains a complete overview of our products, their types of protection and the assignment of motor types to categories. It is important to note that depending on whether the

motor is used for converter operation or line operation, different order codes are required for unique selection of the required product.

Sector	Cate- gory	Zone	Frequency of occurrence of the Ex atmosphere	Type of protection	Tempera- ture class	Equip- ment protec- tion level	Degree of pro- tection	Motor type and if applicable order code	Operation	Order code	Utilization according to tem- perature class	Standard
Gases and vapors (G)	1G	0	constantly or long-term	Not admissible with low-voltage motors								
	2G	1	occasionally	Ex de IIC ¹⁾ (explosion-proof enclosure)	T1 – T4	Gb	IP55	1MD5, 1PS5	Line Converter	– A15 A16	130 (B) 155 (F)	IEC/EN 60079-0 IEC/EN 60079-1 IEC/EN 60079-7
				Ex e IIC ¹⁾ (increased safety)	T1 – T3	Gb	IP55	1MA6, 1MA7	Line	–	130 (B)/ 155 (F) ³⁾	IEC/EN 60079-0 IEC/EN 60079-7
	3G	2	rarely or briefly	Ex nA IIC ¹⁾ (non- sparking)	T1 – T3	Gc	IP55	1LA6, 1LA7, 1LA8, 1PQ8 ²⁾ , 1LA9, 1LG4/6	Line Converter	M72 M73	130 (B)	IEC/EN 60079-0 IEC/EN 60079-15
								1MB103, 1MB153, 1MB163	Line			
Dust (D)	1D	20	constantly or long-term	Not admissible with low-voltage motors								
	2D	21	occasionally	Ex tb IIIC ¹⁾ : conductive and non-conductive dust	Max. enclo- sure tem- perature T125 °C ⁶⁾	Db	IP65	1LA5, 1LA6, 1LA7, 1LA8 ⁴⁾ , 1PQ8 ²⁾ , 1LA9, 1LG4/6	Line Converter	M34 M38	130 (B)	IEC/EN 60079-0 IEC/EN 60079-31
	3D	22	rarely or briefly	Ex tc IIIB ¹⁾ : non-conductive dust		Dc	IP55		Line Converter	M35 M39		
								1MB101/2, 1MB151/2, 1MB161/2	Line			
Gases and vapors (G) and dusts (D) ⁵⁾	2G 2D	1 or 21	occasionally	Ex de IIC ¹⁾ (explosion-proof enclosure)/ Ex tb IIIC ¹⁾ : conductive and non-conductive dust	T1 – T4/ Max. enclo- sure tem- perature T 135 °C	Gb Db	IP65	1MD5, 1PS5	Line Converter	M76 M77	130 (B) 155 (F)	IEC/EN 60079-0 IEC/EN 60079-1 IEC/EN 60079-31
	3G 3D	2 or 22	rarely or briefly	Ex nA IIC ¹⁾ (non-sparking)/ Ex tc IIIB: non-conductive dust	T1 – T3/ Max. enclo- sure tem- perature T 125 °C ⁶⁾	Gc Dc	IP55	1LA6, 1LA7, 1LA9, 1LG4/6	Line Converter	M74 M75	130 (B)	IEC/EN 60079-0 IEC/EN 60079-15 IEC/EN 60079-31
								1MB103 +B30 1MB153 +B30 1MB163 +B30	Line			

¹⁾ Highest explosion group IIC includes IIB and IIA.
IIIA stands for lint, IIIB for non-conductive dust and IIIC for conductive dust. 1MJ optionally with Ex d terminal box (order code **K53**).

²⁾ 1PQ8 is not possible for Zone 21. Zone 2 and 22 for 1PQ8 available on request. Utilization according to temperature class 155 (F).

³⁾ See EC type-examination certificate.

⁴⁾ 1LA8 only available for Zone 22 (order codes **M35**, **M39**).
Converter: utilization as standard according to temperature class 155 (F)

⁵⁾ The Ex motor is not admissible in an explosive atmosphere of dust and air (hybrid). A standard is not currently available that describes the product requirements for a hybrid mixture.

⁶⁾ For 1MB1 IE1: T140 °C
IE2: T120 °C (except T130 °C for 1MB1.11-1AD5,
1MB1.11-3AD6, 1MB1.21-1AD5 and 1MB1.21-3AD6)
IE3: T120 °C