



3 Explosion protection to ATEX

3.1 Drive engineering to EU Directive 94/9/EC (ATEX 100a)

Why explosion protection?

Explosion protection for electrical and mechanical machinery is an important precaution for safeguarding people and all kinds of production, storage and distribution equipment whenever potentially explosive mixtures of combustible gases or dust and air may occur.

What does explosion protection achieve?

Explosion protection can mean preventing an explosive mixture from ever occurring at all. Explosion protection can also be achieved by preventing possible sources of ignition, e.g. hot surfaces and sparking, through designing components with a suitable size and by having constant monitoring in operation. Alternatively, suitable measures can be taken to prevent explosions being caused by existing sources of ignition (e.g. flameproof enclosure).

Harmonized European design provisions

EU directive 94/9/EC provides binding minimum requirements to be applied within the European Union to equipment intended for use in potentially explosive atmospheres. In relation to drives, the directive covers motors as well as all other electrical and mechanical components such as gear units, mechanical variable speed gear units, brakes, forced cooling fans, integrated frequency inverters, sensors, actuators, and more.

Directive 94/9/EC defines the minimum requirements for units and divides the units into categories.

The requirements for production plants, division into zones and the assignment of equipment categories to zones are defined in EU Directive 1999/92/EC (ATEX 137).

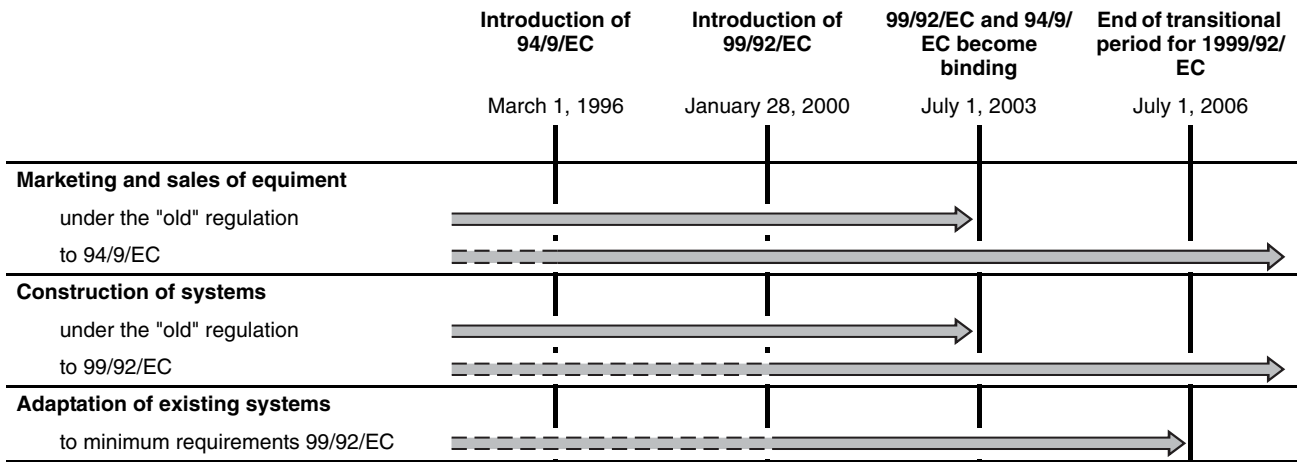
Transitional periods

Since July 1, 2003, only directives 94/9/EC and 1999/92/EC have been mandatory in the EU. This comprehensive harmonization of explosion protection throughout the EU means that all remaining trade barriers between EU member states in this area will be removed.

A transition period up to June 30, 2006 has been granted for any equipment that came into use before June 30, 2003 and that did not yet comply with the new Directive 1999/92/EC at that time.



Transitional periods 94/9/EC and 1999/92/EC



Naturally, EU Directive 94/9/EC also applies to all products which are manufactured outside the EU and imported into the EU. To indicate compliance with EU Directive 94/9/EC, explosion-proof devices will now also bear the CE mark on their nameplates.

In contrast to the regulations which also apply in parallel during the transitional period, explosion protection according to 94/9/EC applies to both electrical and mechanical equipment, and defines equipment categories for the first time.

1999/92/EC redefines the assignment of equipment categories to hazard zones.

Designations

The term **ATEX (Atmosphères Explosibles)** has become common usage for the new directives. **ATEX 95** regulates all requirements for the characteristics of explosion-proof equipment, while **ATEX 137** is a directive for the protection of personnel potentially at risk during installation, operation and maintenance of equipment in hazardous areas.

Explosion-proof drives from SEW-EURODRIVE

Drives from SEW-EURODRIVE for potentially explosive atmospheres have the following characteristics:

- Included are all product areas from mains operated AC gearmotors and MOVIMOT® gearmotors with integrated frequency inverters through to controlled drives for particularly exacting applications.
- All components can be combined with one another according to the rules of the SEW-EURODRIVE modular concept.
- All drives satisfy typical market requirements in terms of their power range and functions.



3.2 Regulations

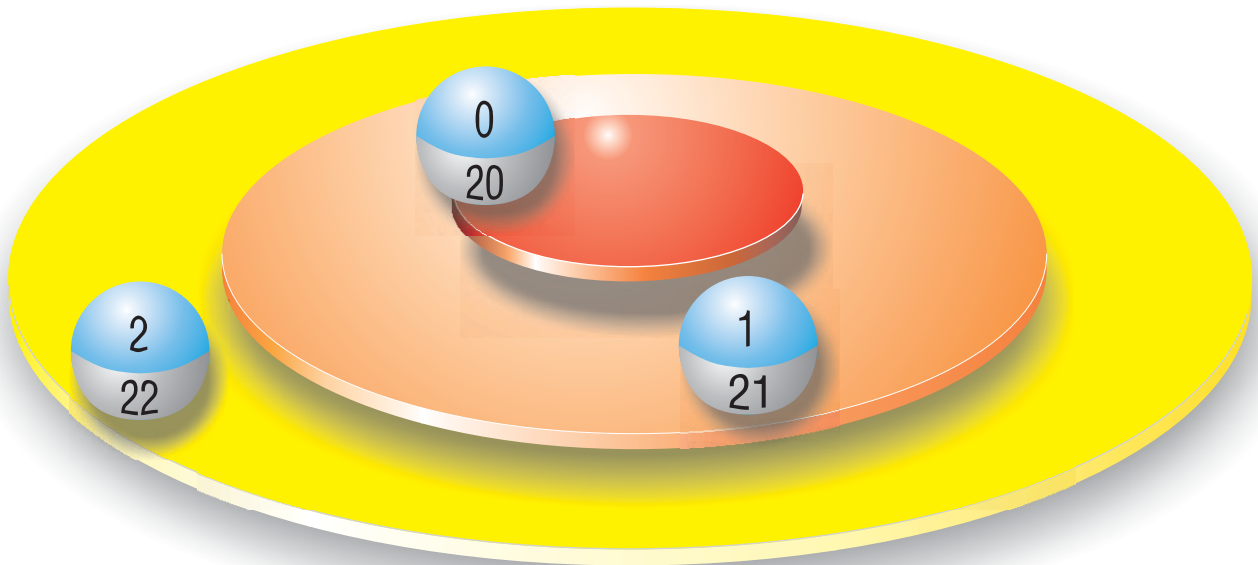
Zones in a potentially explosive atmosphere

According to EU Directive 99/92/EC (ATEX 137), the owner of the machine must divide potentially explosive atmospheres into zones.

Zone ¹⁾		Probability of a potentially explosive atmosphere occurring
Gas	Dust	
0 ²⁾	20 ²⁾	Continuous, long-term, frequent, predominant in time
1	21	Occasional, in normal operation
2	22	Seldom, short-term

1) Only the gray boxes are relevant to drives from SEW-EURODRIVE.

2) Not relevant for electric drives.



03535AXX



Division of explosion-proof equipment into categories

According to EU Directive 94/9/EC, explosion-proof equipment is divided into categories. The category specifies the protection level of the equipment, describes the operating conditions and makes it easier to assign permitted equipment to a zone. In addition to the degree of protection of enclosures (normal, high, very high), the directive distinguishes between G (gas) and D (dust) explosive atmospheres.

Category ¹⁾	Protection level	Guaranteed protection	Operating conditions
M1	Very high	With two independent preventive measures; two faults are allowed to occur independently of one another	Equipment continues to operate in the presence of a potentially explosive atmosphere
1	Very high	With two independent preventive measures; two faults are allowed to occur independently of one another	Equipment continues to operate in the presence of a potentially explosive atmosphere
M2	High	Suitable for normal operation and harsh operating conditions	Equipment is switched off in the presence of a potentially explosive atmosphere
2	High	One preventive measure; suitable for normal operation with the likelihood of frequent malfunctions, one fault is allowed to occur	Equipment continues to operate in the presence of a potentially explosive atmosphere
3	standard	Suitable for standard operation	Equipment continues to operate in the presence of a potentially explosive atmosphere

1) Only the gray boxes are relevant to drives from SEW-EURODRIVE.

Overview of explosion-proof equipment

Category	Equipment group I Mines, firedamp		Equipment group II Other areas with potentially explosive atmospheres due to gas or dust					
	M1	M2	1		2		3	
Ex atmosphere ¹⁾			G	D	G	D	G	D
Zone			0	20	1	21	2	22
Protection type Motor Gear unit ²⁾					d, e, i, p ... (c, k ...)	(c, k ...)	n(A)	

1) G = Gas atmosphere, D = Dust atmosphere

2) Standardization of protection types for gear units has not yet been completed.



All gear units and motors offered by SEW-EURODRIVE for potentially explosive atmospheres are equipment group II units. SEW-EURODRIVE does not supply any drives for use in equipment group I (mining).

Potentially explosive atmospheres

Potentially explosive atmospheres are divided into gas and dust. The atmosphere is abbreviated as G (gas) or D (dust) in the type identification.



Protection types

Unit type	Type of protection ¹⁾	Norm	Description
Motors (electrical units)	d	EN 50014 + EN 50018	Flameproof enclosure
	e	EN 50014 + EN 50019	Increased safety
	i	EN 50014 + EN 50020	Intrinsic safety
	n / nA	EN 50014 + EN 50021	Non-sparking
	m	EN 50014 + EN 50028	Encapsulation
	o	EN 50014 + EN 50015	Oil immersion
	p	EN 50014 + EN 50016	Pressurized enclosure
	q	EN 50014 + EN 50017	Sand filling
Gear units (mechanical units) ³⁾	²⁾	EN 50014 + EN 50281	Dust explosion protection
	b	EN 13463 parts 1 and 6	Protection by monitoring sources of ignition
	c	EN 13463 parts 1 and 5	Constructional safety
	d	EN 13463 parts 1 and 3	Flameproof enclosure
	fr	EN 13463 parts 1 and 2	Restricted breathing
	g	EN 13463 parts 1 and 4	Intrinsic safety
	k	EN 13463 parts 1 and 8	Liquid immersion
p	EN 13463 parts 1 and 7	Pressurized enclosure	

1) Only the gray boxes are relevant to drives from SEW-EURODRIVE.

2) No explicit protection types are defined for dust explosion protection.

3) Standardization of protection types for gear units (mechanical units) has not yet been completed.

Validity of the statement of conformance



The statement of conformance is a statement for demonstrating that a device complies with Directive 94/9/EC. The validity of this statement of conformance is bindingly linked to compliance with the operating instructions supplied with the explosion-proof unit (in particular maintenance and servicing measures and permitted ambient conditions, e.g. ambient temperature, unit heating from other customer's equipment). This is necessary for adequate risk minimization. The statement of conformance will be invalidated if the ambient conditions described in the operating instructions are not present.

The validity of the statement of conformance exclusively refers to the gear unit and motor types listed in the catalog. For customer-specific types, it is essential that you contact SEW-EURODRIVE!



3.3 Categories and protection types

Category 1 – Particularly high safety

SEW-EURODRIVE does not provide category 1 gear units and electric motors. Consequently, drives from SEW-EURODRIVE cannot be used for electrical drives in zone 0 and 20 within which potentially explosive atmospheres are to be expected on a continuous and long-term basis.

Category 2 – High safety

Units in category 2 are safe in terms of the expected unit malfunctions and are predominantly designed for zone 1 and 21 in which a potentially explosive mixture may occur. It goes without saying that they can also be used for zone 2 / 22.

Motors

Typical electrical drives of the II2G type for zone 1 are motors with the following protection types:

Protection type d – Flameproof enclosure

The housing is able to withstand the pressure even if an explosion occurs inside the motor. Gas which may escape is sufficiently cooled so it will not ignite a potentially explosive atmosphere outside the motor.

The units have ignition gaps to dissipate the pressure arising from an explosion. These ignition gaps are designed in such a way that escaping hot gases are sufficiently cooled by the time they emerge so they will not ignite a potentially explosive atmosphere outside the motor.

Protection type e – Increased safety

No source of ignition is present in normal operation and in the event of a foreseeable malfunction. This safety is achieved by design measures such as higher quality insulation systems or larger clearances. Normal operation is referred to as operation with the usual unit malfunctions.

**Category 3 – Normal safety**

Category 3 equipment is only intended for zone 2 or 22 where there is a low probability of potentially explosive atmospheres occurring.

Protection type n

Typical electrical drives of the II3G type for zone 2 (gas) are motors with protection type nA – non-sparking. The requirements of protection type n largely correspond to the requirements of protection type e, but for operation without malfunctions.

Gear units

Compliance with DIN EN 13463-1 must be guaranteed for gear units. In this category, no particular type of protection is required for gear units.



For more detailed information, please refer to the current "Explosion-Proof Drives" catalog.



3.4 Requirements for operating variable speed gear units in potentially explosive atmospheres

The following basically applies to all explosion-protected variable speed gear units:

- Permitted ambient temperature from -20 °C to +40 °C

3.5 VARIBLOC® in explosion-proof design

Approval basically only without

- Front adjustment
- Mounted BMG disc brake
- Adapter with torque limiting coupling and slip monitoring

3

Category	for zone	VARIBLOC® in Ex atmosphere
2G	1	<ul style="list-style-type: none"> • Sizes VU/VZ01 - VU/VZ41, VU51 (not VU6) • Operation basically with speed monitor • Starting compensation maximum 5 seconds • Switch-off when speed drops 10 % below minimum • Temperature class T3 • Control range 1:6
2D	21	<ul style="list-style-type: none"> • Sizes VU/VZ01 B - VU/VZ41B non-ventilated (not VU51 and VU6) • Operation basically with speed monitor • Starting compensation maximum 5 seconds • Switch-off when speed drops 10 % below minimum • Maximum surface temperature 200 °C • Control range 1:6 • 6-pole and 8-pole SEW motors have not yet been approved. Operation only possible with 6-pole or 8-pole non-SEW motors in category 2D.
3G	2	<ul style="list-style-type: none"> • Sizes VU/VZ01 - VU/VZ41, VU51 (not VU6) • Operation also permitted without speed monitor • Temperature class T4 • Control range 1:6
3D	22	<ul style="list-style-type: none"> • Sizes VU/VZ01 - VU/VZ41, VU51 (not VU6) • Operation also permitted without speed monitor • Maximum surface temperature 135 °C • Control range 1:6



If overloading of the VARIBLOC® unit in category 3G or 3D may occur in normal operation, then a VARIBLOC® with activated speed monitor must be used!



3.6 VARIMOT® in explosion-proof design

Design for D16 - D46 in the various categories:

Category	for zone	VARIMOT® in Ex atmosphere
2G	1	<ul style="list-style-type: none"> • Operation basically with speed monitor • Starting compensation maximum 3 seconds • Switch-off when speed drops 10 % below minimum • Temperature class T3
2D	21	<ul style="list-style-type: none"> • Safe operation not possible, no approval
3G	2	<ul style="list-style-type: none"> • Operation also permitted without speed monitor • Temperature class T3
3D	22	<ul style="list-style-type: none"> • Operation also permitted without speed monitor • Maximum surface temperature 135 °C



If overloading of the VARIMOT® unit in category 3G or 3D may occur in normal operation, then a VARIMOT® with activated speed monitor must be used.

3.7 Drive selection for explosion protected designs

Unlike the "Explosion-Proof Drives" catalog, this catalog does not provide an overview of approved gearmotor combinations. If you require variable speed gear units in explosion-proof design, please contact SEW-EURODRIVE.