

Always on the safe side:  
Reliable plant operation

**Explosion-proof gear units,  
motors and gearmotors**



## Gear units and motors from SEW-EURODRIVE face any danger

Operating systems and machines in areas with potentially explosive air-gas or air-dust mixtures requires special measures. If the formation of these mixtures cannot be avoided, specially protected drives must be used. The corresponding regulations and standards regulate the operating potentials of the equipment within the existing danger zones. They also specify the quality requirements that must be met by the drive manufacturer.



Gearmotors from SEW-EURODRIVE meet all defined requirements of equipment for use in potentially explosive atmospheres in accordance with the EU directive 94/9/EC (ATEX 95). This is also the first time that the EU directive includes non-electrical equipment in explosion protection.

Drive engineering by SEW-EURODRIVE is characterized by the cooperation in establishing the standard, continuous quality control and innovative in-house research and development. The result: increased safety, increased reliability and increased efficiency of every equipment component, especially in the danger zones.

Helical geared motor with  
extended bearing housing  
(agitator drive)

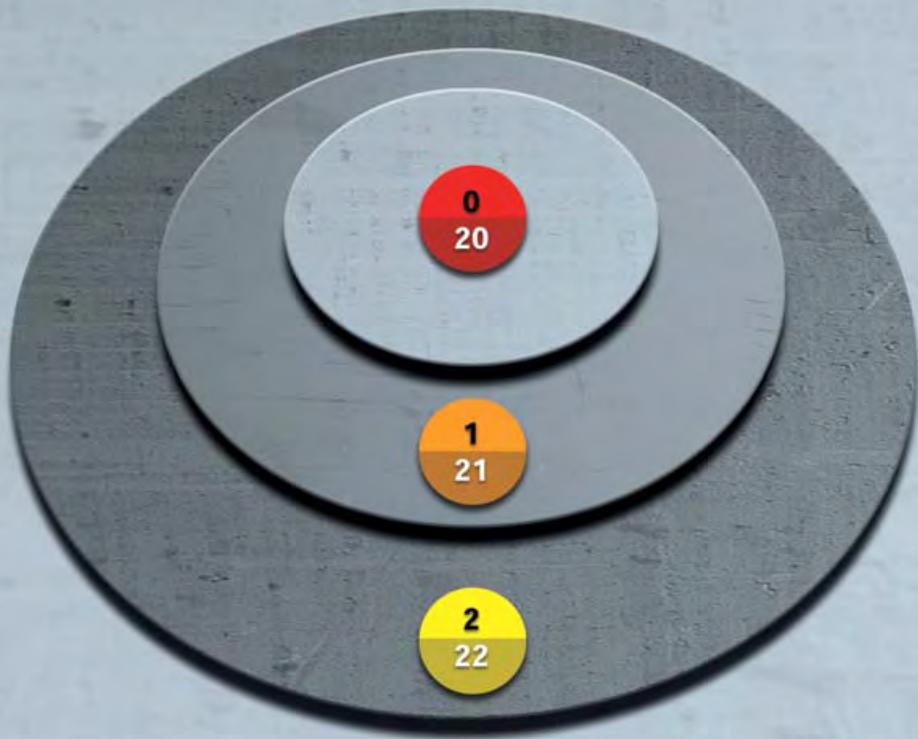


## Tested safety in every zone

The zone definition takes into account the operating status of the equipment as well as the time period in which the equipment is exposed to the potentially explosive mixture. The plant operator, in conjunction with the approval authority, deter-

mines which zone must be taken into account for any given plant component. The decisive factor is the EU directive 99/92/EC (ATEX 137a). Another important factor is whether the mixture is formed by air plus gas or dust.

Frequency of occurrence of a potentially explosive mixture	Zone designation of the air mixture with			
	Gases (G)		Dusts (D)	
– Permanent and sustained	0		20	
– During standard operation	1		21	
– Not relevant in standard operation (or only briefly)	2		22	

## Gearmotors from SEW-EURODRIVE conforming to EU directive 94/9/EC (ATEX 95)

Gearmotors from SEW-EURODRIVE have proven themselves over decades in all types of potentially explosive environments. SEW-EURODRIVE passes on this experience gained from practical applications, integrates it into new and ongoing developments and plays a significant role in drawing up applicable drive engineering standards.

SEW-EURODRIVE is one of the first suppliers of drive engineering components to offer non-electrical equipment conforming to EU directive 94/9/EC.

Explosion-proof gear units, motors and Gearmotors are subject to more demanding requirements because even unit malfunctions must not trigger an explosion. For this reason, explosion-proof gear units and motors from SEW-EURODRIVE were improved even further to EU directive 94/9/EC (ATEX 95) and are manufactured using special components with special consideration given to quality assurance:

- IP54 enclosure, optionally higher, for motors in gas environments
- IP65 enclosure for motors in dust environments
- Standard-conforming, impact-resistant fan guards
- Protection cowl for vertical mounting positions with motor at top
- External protective conductor connection on the terminal box
- Terminal box seals with high temperature resistance
- Terminal box made of gray-cast iron
- Metric threads in terminal box walls for cable screw fittings
- Openings on the terminal box that are not in use are closed with components conforming to ATEX 95
- Clamping straps additionally secure the rubber sealing collars at the brakes
- Standard-conforming, impact-resistant covers as shrink disc cover at the gear unit
- All screws are additionally secured against inherent loosening
- Each assembly group (motor/gear unit) has a separate nameplate
- High-grade oil seals at gear unit
- High temperature resistance of the lubricant in the gear unit

Hood cover for explosion-proof gear unit



## Safety requirements and unit categories

All equipment is divided into three categories with respect to safety requirements. The unit manufacturer determines the category to which equipment must be assigned. The main criteria are usability and safety in case of a malfunction. The assignment of categories to the zones is regulated in the EU directive 99/92/EC. The drives from SEW-EURODRIVE meet all re-

quirements with respect to unit safety according to the criteria of the categories. Possible error sources that can or may occur during plant operation are examined and taken into account in the assignment of the approval category for the equipment.

Units of lower categories may be used in higher categories.

Category	Possible malfunction source	Prerequisite
1	Guaranteeing unit safety in standard operation and even in the event of rare unit malfunctions (two independent faults at the same time)	Gear units and motors in this category <ul style="list-style-type: none"> <li>– 1G (gas) for operation in zones 0, 1 and 2</li> <li>– 1D (dust) for operation in zones 20, 21 and 22</li> </ul>
<b>SEW-EURODRIVE does not offer units of category 1 for zones 0 or 20.</b>		
2	Guaranteeing unit safety in standard operation and additionally in case of expected unit malfunctions (one fault)	Gear units and motors in this category <ul style="list-style-type: none"> <li>– 2G (gas) for operation in zones 1 and 2</li> <li>– 2D (dust) for operation in zones 21 and 22</li> <li>– 2GD (gas/dust) for operation in zones 1, 2 and 21, 22</li> </ul>
3	Guaranteeing unit safety in standard operation	Gear units and motors in this category <ul style="list-style-type: none"> <li>– 3G (gas) for operation in zone 2</li> <li>– 3D (dust) for operation in zone 22</li> <li>– 3GD (gas/dust) for operation in zones 2 and 22</li> </ul>

Terminal box with  
external grounding screw



The combined gas/dust approvals 2GD (gas/dust) and 3GD (gas/dust) simplify selection of the respective drive components, reduce the number of available versions and permit operation in combined gas-dust zones, such as enameling lines or in the wood processing industry.

## Gear units conforming to 94/9/EC; for gas and dust: Sturdy, powerful and reliable—as always

The EN 13463 (Part 1) standard serves as the basis for the approval of mechanical units for the use in an environment with explosive mixtures. Based on part 1, additional parts of the standard define the required measures to prevent an ignition of air-gas or air-dust mixtures (protection types). In addition, the EN 1127 standard facilitates the risk analysis.

SEW-EURODRIVE was one of the first drive manufacturers to apply for approval of gear units in category 2. No distinction is made for gear units of the 7 Series and SPIROPLAN® gear units for the use in a gas or dust environment.

Given this approval, the design meets all requirements of category 3 for operation in a gas or dust environment.

The gear units are certified for protection types “c” and “k.”



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### Konformitätserklärung

#### Declaration of Conformity

(im Sinne der Richtlinie 94/9/EG, Anhang VIII)  
(according to EC Directive 94/9/EC, Appendix VIII)

#### SEW-EURODRIVE

erklärt in alleiniger Verantwortung, dass die R-, K-, F-, S- und W- Getriebemotoren der Kategorie 2G und 2D, auf die sich diese Erklärung bezieht, mit der

*declares in sole responsibility that the R-, K-, F-, S- and W-gear motors in category 2G and 2D that are subject to this declaration are meeting the requirements set forth in*

**Richtlinie 94/9/EG  
Directive 94/9/EC**

übereinstimmen.

#### Protection by constructional safety (design safety) EN 13463-5 (protection type “c”)

“Design safety” is an explosion protection type in which constructive measures are used in order to guarantee adequate protection against the possibility of ignition by moving parts, hot surfaces, sparks and adiabatic compression.

#### Protection by liquid immersion EN 13463-8 (protection type “k”)

“Protection by liquid immersion” is the protection type in which partial or complete immersion in a protective fluid or constant wetting of a potentially combustible surface with a protective fluid is used in order to deactivate the potential source of ignition or to provide separation from the potentially explosive atmosphere. Consequently, a potentially explosive atmosphere above the liquid or outside the unit housing cannot be ignited.

## Safety requirements and unit categories

### Conformity according to categories 2GD

**Prerequisite: Guaranteeing unit safety in the event of a unit malfunction that is to be expected (one fault).**

Gear units of category 2

GD (gas/dust) can be operated in zones 1, 2 and 21, 22

For gear units of category 2, SEW-EURODRIVE issues one declaration of conformity that applies to both gas and dust. It contains certifications of

- the conformity with standard EN 13463 (including all relevant sections),
- the risk analysis performed in accordance with the EN 1127 standard and
- the internal manufacturing control in accordance with the 94/9/EC EU directive (ATEX 95) with the product documentation deposited at a specified authority independent from SEW-EURODRIVE.

### Conformity according to categories 3GD

**Prerequisite: Guaranteeing unit safety in standard operation**

Gear units of category 3

GD (gas/dust) can be operated in zones 2 and 22

The certification for category 2 attests that all requirements for category 3 have been met and that no special declaration of conformity will be issued.

### Gear units of category 2 from SEW-EURODRIVE

**Mains operation:  
approved for 50 Hz power supply source,  
i.e. approx. 1500 1/min on the input side**

**Inverter operation:  
approved (depending on project) up to a speed of 3000 1/min on  
the gear unit input side**

2GD (gas/dust)

2GD (gas/dust)

- Helical gear units
- Parallel shaft helical gear units
- Helical-bevel gear units
- Helical-worm gear units
- SPIROPLAN® gear units <sup>1)</sup>
- Servo planetary gear units
- Servo helical-bevel gear units

- Helical gear units
- Parallel shaft helical gear units
- Helical-bevel gear units
- Helical-worm gear units
- SPIROPLAN® gear units <sup>1)</sup>
- Servo planetary gear units
- Servo helical-bevel gear units

<sup>1)</sup> ) Except for size W10

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## Motors conforming to 94/9/EC for gas respectively gas/dust: Dynamic and safe even at the inverter

The EN 50104 standard serves as the basis for the approval of electrical units for operation in an environment with explosive air-gas mixtures. Based on this standard, additional supplementary standards define the required measures to prevent an ignition of air-gas mixtures (protection types). SEW-EURODRIVE carried out the approval of motors for category 2 and 3 based on its long-standing experience. The motors are certified for protection types “d”, “e” and “nA.”

### **Protection by flameproof enclosure EN 50018 (protection type “d”)**

With this protection type, the housing of the equipment must withstand the pressure created through an explosion inside the housing thus preventing the atmosphere outside the housing to be ignited. Using ignition gaps, a transfer of the explosion to the potentially explosive atmosphere surrounding the housing is avoided by

cooling the mixture to the point that it does not lead to an ignition in the environment. The gas/air mixtures are divided into explosion groups depending on their ignitability. Dimensioning of the ignitions gaps depends on the ignitability of the gas/air mixtures that occur. For this reason, the explosion group must also be mentioned in conjunction with the flameproof enclosure.

### **Protection by increased safety EN 50019 (protection type “e”)**

The basic idea behind this protection type is to avoid impermissible high surface temperatures. This is achieved by design measures, such as maintaining certain minimum ignition gap widths, observing clearances and creeping distances, special selection of enameled wire or careful selection of plastic and insulating materials. Elaborate measurements must be performed to prove the compliance with permitted surface temperatures. A malfunction must be observed when dimensioning the units and during subsequent test. All these measures ensure that the

ignition of air/gas mixtures is virtually impossible. Monitoring the potential source of ignition using motor protection switches or positive temperature coefficient thermistors ensures that no ignition temperatures are reached.

### **Protection by non-sparking EN 50021 (protection type “nA”)**

Requirements on design and dimensioning of protection type “nA” correspond to a large extent to those of protection type “e”. The main difference is that only operation without malfunctions need to be taken into account for protection type “nA”.



## Safety requirements and unit categories

Conformity with category 2G



and 2GD



**Prerequisite: Unit safety is guaranteed in the event of an expected unit malfunction (one fault)**

Motors in category 2

G (gas) can be used in zone 1 and GD (gas/dust) in zones 1 and 21

SEW-EURODRIVE has obtained an EC-approved declaration of the PTB applicable to gas and gas/dust for motors in category 2. It has audited and certified

- Conformance with the standards EN 50014 ... EN 50021 and EN 50281
- Quality assurance in production in accordance with EU directive 94/9/EC (ATEX 95).

### Category 2 motors from SEW-EURODRIVE

**Mains operation:  
for 50 Hz power supply, to a  
certain extent also for 60 Hz**

**Inverter operation**

**Drives in explosive atmospheres**

**Drive in PEA area and inverter  
in control cabinet outside the  
PEA area**

**Drive with integrated frequency  
inverter in PEA area**

2G (gas)

2G (gas)

2G (gas)

- Motors in protection type "e"  
Types eDT/eDV
- Motors in protection type "d"  
Types CD

- Motors in protection type "e"  
Types eDT/eDV
- Motors in protection type "d"  
Types CD with the inverters  
- MOVITRAC®  
- MOVIDRIVE®

- Motors in protection type "d"  
Types CD.../I

2GD (gas/dust)

2GD (gas/dust)

2GD (gas/dust)

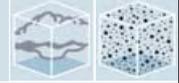
- Motors in protection type "e"  
Types eDT/eDV
- Motors in protection type "d"  
Types CD

- Motors in protection type "e"  
Types eDT/eDV
- Motors in protection type "d"  
Types CD with the inverters  
- MOVITRAC®  
- MOVIDRIVE®

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## Safety requirements and unit categories

### Conformity with category 3GD



#### Prerequisite: Guaranteeing unit safety during standard operation

Motors in category 3	GD (gas/dust) for use in zones 2 and 22
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SEW-EURODRIVE provides a declaration of conformity applicable to gas/dust for motors in category 3.

It audits and certifies

- Conformance with the standards EN 50021 and EN 50281
- Quality assurance in production in accordance with directive 94/9/EC (ATEX 95)

### Category 3 motors from SEW-EURODRIVE

#### Mains operation: for 50 Hz or 60 Hz power supply

#### Inverter operation

#### Drives in explosive atmospheres

#### Drive in PEA area and inverter in control cabinet outside the PEA area

#### Drive with integrated frequency inverter in PEA area

3GD (gas/dust)

3GD (gas/dust)

3GD (gas/dust)

- Motors in protection type “nA”  
Types DT/DV.../II3G

- Motors in protection type “nA”  
Types DT/DV.../II3GD with the  
inverters  
- MOVITRAC®  
- MOVIDRIVE®

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## Motors conforming to 94/9/EC for dust respectively gas/dust: Dynamic and tight even at the inverter

Unlike gas-explosion protection for electrical units, no different protection types are known for dust-explosion protection. The EN 50281-1 standard serves as basis for the approval of electrical units for operation in an environment with explosive air-dust mixtures.

A major criterion for designing units intended for use in explosive dust areas is, among others, the compliance with certain IP degrees of protection (protection against ingress of foreign particles according to EN 60259). Category 3 electrical units must comply with at least IP54, category 2 units at least with IP6x.

SEW-EURODRIVE carried out the approval of motors for category 2 and 3 according to the applicable standards and regulations based on its long-standing experience. The manufacturing process at SEW-EURODRIVE is audited and certified according to the EU directive ATEX 95.

### **IP protection "IP65": Dust-tight enclosure according to EN 50281-1-1**

For this protection type, the enclosure is designed in such a way that no dust can enter it. Sources of ignition inside the enclosure need not be taken into account since only the surface temperature of the enclosure can be a source of ignition. Efficient protection can only be achieved by permanently monitoring the temperature of the enclosure.

### **IP protection "IP54": Dust-proof enclosure according to EN 50281-1-1**

For this protection type, it is sufficient to design the enclosure in such a way that dust cannot enter the enclosure in damaging amounts. Sources of ignition inside the enclosure need not be taken into account since only the surface temperature of the enclosure can be a source of ignition. Efficient protection can only be achieved by permanently monitoring the temperature of the enclosure.



## Safety requirements and unit categories

Conformity with category 2D



and 2GD



**Prerequisite: Unit safety is guaranteed in the event of an expected unit malfunction (one fault)**

Motors in category 2

D (dust) can be used in zone 1 and GD (gas/dust) in zones 1 and 21

SEW-EURODRIVE has obtained an EC-approved declaration of the DMT applicable to dust and gas/dust for motors in category 2.

It has audited and certified

- Conformance with the standard EN 50281
- Quality assurance in production in accordance with EU directive 94/9/EC (ATEX 95).

### Category 2 motors from SEW-EURODRIVE

**Mains operation:  
for 50 Hz power supply**

**Inverter operation**

**Drives in explosive atmospheres**

**Drive in PEA area and inverter  
in control cabinet outside the  
PEA area**

**Drive with integrated frequency  
inverter in PEA area**

2D (dust)

2D (dust)

2D (dust)

- Motors in version //I2D  
Types eDT/eDV.../I2D

-

-

2GD (gas/dust)

2GD (gas/dust)

2GD (gas/dust)

- Motors in protection type "d"  
Types CD

- Motors in protection type "d"  
Types CD with the inverters  
- MOVITRAC®  
- MOVIDRIVE®

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## Safety requirements and unit categories

Conformity with category 3D



and 3GD



### Prerequisite: Guaranteeing unit safety during standard operation

Motors in category 3

D (dust) can be used in zone 22 and GD (gas/dust) in zones 2 and 22

SEW-EURODRIVE provides a declaration of conformity applicable to dust and gas/dust for motors in category 3.

It audits and certifies

- Conformance with the standards EN 50021 and EN 50281
- Quality assurance in production in accordance with EU directive 94/9/EC (ATEX 95).

### Category 3 motors from SEW-EURODRIVE

**Mains operation:  
for 50 Hz or 60 Hz power supply**

**Inverter operation**

**Drives in explosive atmospheres**

**Drive in PEA area and inverter  
in control cabinet outside the  
PEA area**

**Drive with integrated frequency  
inverter in PEA area**

3GD (gas/dust)

3GD (gas/dust)

3D (dust)

- Motors of version /I13GD  
Types DT/DV.../I13GD

- Motors of version /I13GD  
Types DT/DV.../I13GD with the  
inverters
- MOVITRAC®
- MOVIDRIVE®

- MOVIMOT® motors of version /I13D  
Types DT/DV.../MM.../I13D with the  
inverters MOVIMOT®