

# Certified drive and control products for explosion protection





## Occupational health and safety: Standards-compliant explosion protection

Gases, steam, solvent mist, or dust: Whenever technical operating resources are used in areas that pose a potential explosion hazard, legislators around the world require that special safety precautions be taken to protect both man and machine. Rexroth assists users, operators, and machine manufacturers alike by offering a wide variety of components and solutions that meet national and international explosion protection requirements.



An explosive atmosphere arises as a result of oxygen bonding with explosive substances in the form of gas, fog/mist, vapor, or dust. Ignition sources such as sparks and hot surfaces can trigger explosions in this environment and thus pose considerable risk. Ensuring the safety of personnel, the environment, and production machinery is the utmost priority in explosive atmospheres.

Explosion protection focuses on providing protection from the development of an explosion and its effects and is rooted in legal requirements such as ATEX Directive 94/9/EC in Europe, NEC in the USA, and CEC in Canada as well as other national regulations. The standards that are derived (e.g. IEC and EN) describe the specific requirements for machine manufacturers and operators and define zones and ignition protection types. It is in this context that Rexroth offers you an extensive portfolio of products and solutions.

**Rexroth products for use in areas that pose a potential explosion hazard meet the strict requirements of the relevant guidelines and standards:**

- ▶ They have successfully passed systematic risk analyses, conformity assessment procedures, and type testing routines.
- ▶ Quality assurance measures safeguard traceability.
- ▶ Delivery includes the declaration of conformity, a CE and EX label, and operating instructions in several languages.
- ▶ The design specifications are filed in designated areas.



- ▶ The nameplate references the respective product approval for use in areas that pose a potential explosion hazard.



# Recognizing hazards and categorizing them correctly

Legal directives such as 94/9/EC (ATEX) in Europe or NEC/CEC in the USA and Canada as well as other national and international regulations define the intended application of operating resources in areas that pose a potential explosion hazard. The place of use and zoning as well as the ignition protection type and equipment protection level determine the requirements for components, units and devices. To this end, Rexroth offers you a wide variety of certified hydraulic and electric drive products.



# Classification of operating resources using the ATEX directive as an example

## Zoning

The ATEX directive calls for a risk assessment to be conducted by the operator or a commissioned external party as the first step. The relevant standards differentiate between areas subject to gas explosions caused by solvents or other process vapors, for example, and areas subject to dust explosions as are found in the food and wood industries. The frequency with which these potentially explosive atmospheres arise defines the correlation with a standardized zone which, in turn, dictates the level of protection required. Every zone is assigned an equipment category.

## Equipment group and category

Our products are assigned to equipment groups and categories in line with the regulations specified by the ATEX directive and intended use applications. Underground operation (mining) and the above-ground installation are assigned equipment group I. All other areas with an explosion risk are assigned equipment group II. In addition to the equipment groups that fall under the ATEX directive, equipment is also assigned to a specific equipment category in line with the EN 60079 series of standards and the subsequent area of application.

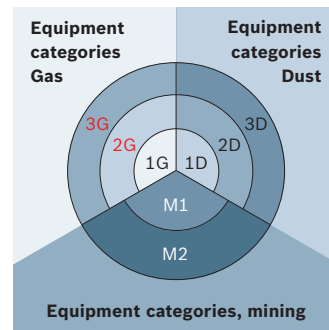
Equipment category 1 (1G/1D)–Very high level of protection

Equipment category 2 (2G/2D)–High level of protection

Equipment category 3 (3G/3D)–Normal level of protection

## Ignition protection types

Appropriate technical measures in accordance with assigning the area in question to a representative explosion category ensure that no ignition source can develop. Several technical options exist for realizing explosion protection for an electrical device. ATEX defines ignition protection types such as flameproof encapsulation, pressurized encapsulation, intrinsic safety, and cast encapsulation and assigns them to the area of application and zone.



◀ Rexroth offers a wide variety of certified products for different hazard zones and equipment categories

Explosive area Gas	Frequency	Equipment group	Equipment category	Area of application	Level of protection
<b>Zone 0</b>	Continuous, frequent, long-term	II	1G	Gases, vapors, fog/mist	Ga Very high level of protection
<b>Zone 1</b>	Occasional	II	2G	Gases, vapors, fog/mist	Gb High level of protection
<b>Zone 2</b>	Seldom, short time frame, at malfunction	II	3G	Gases, vapors, fog/mist	Gc Normal level of protection

Explosive area Dust	Frequency	Equipment group	Equipment category	Area of application	Level of protection
<b>Zone 20</b>	Continuous, frequent, long-term	II	1D	Dusts	Da Very high level of protection
<b>Zone 21</b>	Occasional	II	2D	Dusts	Db High level of protection
<b>Zone 22</b>	Seldom, short time frame, at malfunction	II	3D	Dusts	Dc Normal level of protection

Explosive area Mining	Frequency	Equipment group	Equipment category	Area of application	Level of protection
<b>Mining</b>	Continuous	I	M1	Methane, coal dust	Ma Very high level of protection
<b>Mining</b>	Frequent	I	M2	Methane, coal dust	Mb High level of protection



**Temperature classes, temperature limits**

The ignition temperature of a combustible gas or liquid is the lowest temperature at which the gas/air or vapor/air ignition event occurs. The highest surface temperature of an operating resource must therefore always be lower than the ignition temperature of the surrounding atmosphere. The maximum permissible surface temperature of operating resources assigned to equipment group I depends on the accumulation of coal dust (with/without coal dust deposits).

Temperature classes T1 to T6 were introduced for electrical operating resources of equipment group II used in areas subject to gas and vapor explosions. Every operating resource is assigned a respective temperature class based on its maximum surface temperature. For electrical operating resources of equipment group II used in areas subject to dust explosions, the maximum surface temperature is specified as a temperature value in °C. The maximum surface temperature of the operating resource must not exceed the ignition temperature of a layer of dust or a cloud of combustible dust.

Operating resources that correspond to a higher temperature class can also be used for applications with a lower temperature class in the same way that equipment with a high level of protection can likewise be used in areas with a lower level of protection (e.g. equipment category 1 in the vicinity of application areas aligned with equipment categories 2 and 3).

**Non-electrical equipment**

Non-electrical equipment is also subject to the requirements defined by the explosion protection directive. Rexroth has carried out and documented an ignition risk assessment i.a.w. DIN EN 13463-1 for these product series and thus meets the basic health and safety requirements defined by explosion protection directive 94/9/EC.



**Conformity assessment procedures**

Different procedures for verifying the standardized characteristics and properties of operating resources are prescribed depending on the level of equipment protection. For example, when stricter requirements apply, type testing routines must be carried out externally, whereas a conformity assessment made by the manufacturer is sufficient in cases involving less strict requirements. Rexroth makes its assessments in full accordance with operative requirements.

Category n. 94/9/EC	Type of product	Procedure	Document filing
IM1 II1G II1D	Electrical or non-electrical	EC type testing by a notified body	Rexroth and at notified body with confirmation
IM2 II2G II2D	Electrical	EC type testing by a notified body	Rexroth and at notified body with confirmation
IM2 II2G II2D	Non-electrical	Conformity assessment by manufacturer	Rexroth and at notified body
II3G II3D	Electrical or non-electrical	Conformity assessment by manufacturer	Rexroth

# Individual solution for every situation

Tailor-made products with the required level of protection for your application: Rexroth leverages its experience and broad product portfolio in helping you choose the right standards-compliant components and equipment for targeted application in potentially explosive environments.



We will systematically clarify with you all applicable explosion protection requirements prior to order placement. In the process, we will take into account every conceivable factor such as the surrounding medium, zoning, and the equipment group, from which the maximum permissible surface temperature and the preferred ignition protection type are derived.

All Rexroth products for environments subject to explosion meet the requirements defined by the ATEX directive and other regulations regarding local explosion protection as a result of their design, the manufacturing process behind them, which is controlled and checked by a sophisticated quality management system, and full and complete documentation and labeling in line with requirement specifications upon delivery.

## **ATEX: Systematic approach**

ATEX Directive 94/4/EC applies to the entire European Union and encompasses all electrical and non-electrical components, equipment, and protective devices that are used in potentially explosive atmospheres:

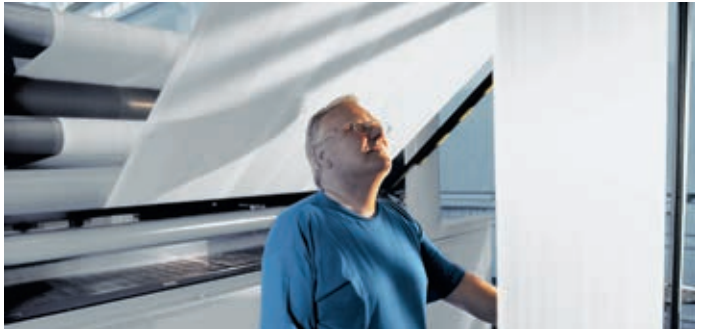
- ▶ Operating resources that have their own potential ignition sources
- ▶ Electrical operating resources whose ignition source could be electricity and all associated physical effects such as heat, sparks, and radiation emissions
- ▶ Non-electrical operating resources whose ignition sources could be hot surfaces, friction, and mechanically generated sparks

The directive also makes reference to control and regulation units used outside the explosion zones that safeguard the reliable operation of equipment and safety systems designated to provide explosion protection.

Other international and national regulations are worded very similarly when it comes to classification characteristics.

# Explosion protection for your industry

Every industry has its own special requirements, which is why we coordinate our global application experience accordingly to offer customers tailor-made solutions for a wide variety of applications, particularly as they concern explosive atmospheres containing zone 1 (2G) and zone 2 (3G) gas/air mixtures – the main application areas of our focus sectors.





Escaping gases, vapor, fog/mist, or dust in factories, large facilities, or off-shore environments: The solutions from Rexroth offer proven performance in numerous applications for safe and reliable explosion protection. To this end, Rexroth always combines a standards-compliant design with ultrahigh reliability and component performance geared toward high productivity throughout the entire life-cycle.



Our products are in widespread use in the following industries and applications:

- ▶ Off-shore industry
  - Drilling platforms
  - Oil refinery ships
- ▶ Mining
  - Feeder units
  - Bucket-wheel excavators
  - Clamping systems for conveyor belts
- ▶ Chemical industry
  - Chemical reactors
  - Kneader systems
  - Extruder systems
- ▶ Drilling rigs
  - Land-based drilling platforms
  - Flushing pumps (drilling fluid)
  - Lifting equipment for drilling rigs
- ▶ Metallurgy
  - Coal gasification equipment
- ▶ Energy technology
  - Turbine starters
  - Control systems for gas pipelines
  - Gas turbines
- ▶ Oil production technology
  - Crude oil pumps
- ▶ Printing industry
  - Printing machines
- ▶ Automotive industry
  - Paint shops

# Powerful, highly dynamic, and explosion-proof: Hydraulic and electrical components and systems

Rexroth products with built-in explosion protection help machine manufacturers and users alike play it safe. All respective components have successfully passed documented type testing routines and are designated or marked accordingly. Rexroth guarantees the quality and traceability of its ex-protected products, which are always delivered together with comprehensive, multilingual documentation that meets all relevant documentation requirements.



**Rexroth offers a wide variety of certified products for different hazard zones and equipment categories**



#### **Hydraulic valves**

Rexroth offers a wide variety of certified hydraulic valves that range from shut-off to highly dynamic servo valves. This, in turn, allows you to cover all hydraulic control tasks and pressure ranges while combining explosion protection with ultrahigh flexibility and productivity.

#### **Hydraulic cylinder**

Hydraulic cylinders move heavy loads without exhibiting mechanical wear. Mill type cylinders with piston diameters of up to 320 mm, strokes of up to 6,000 mm, and different pressure ratings meet the operative requirements of a large number of industrial applications in on-shore and off-shore environments.

#### **Axial piston machines**

Rexroth offers high pressure pumps and motors in proven axial piston design and with ATEX certification for ultra-high levels of safety, availability, and efficiency. The product line includes not only bent-axis motors, but also open and closed-circuit pumps for applications involving up to 350 bar in pressure and with a power transfer capacity of up to 525 KW.

#### **Heavy-duty motors**

Hägglunds heavy-duty motors for environments with explosion protection offer a high degree of freedom for customized solutions thanks to their modular configuration. They are frequently used in mining operations, recycling facilities, oil and natural gas production, and on-shore and off-shore applications.





### Synchronous motors

Synchronous servo motors from Rexroth are characterized by their high torque density and especially compact design. In ATEX configuration, they generate a maximum torque of 231 Nm while offering numerous functional options. Basic or high-resolution encoder systems and the high degree of protection provided by the IP 65 protection class also allow the motors to be used in almost all applications.

Outfitted with flameproof encapsulation, motors specifically designed to be operated in production lines cover a broad spectrum of application scenarios in which an explosive mixture comprising air and combustible gases, vapor, fog/mist, or dust can develop. Four graduated motor sizes and an abundance of accessories facilitate a large number of applications.

### Asynchronous motors

Compact, high-performance asynchronous motors with external fan cooling or liquid cooling cover performance requirements up to 120 kW. Different bearings, easily serviceable quick couplings, and high-resolution encoder systems in dedicated flameproof encapsulation combine explosion protection with dynamic performance and precision.



**IndraDyn S – synchronous motors for the most demanding of requirements, e.g.:**

- ▲ MKE 047
- ▲ MSK 040

**IndraDyn A – asynchronous motors for main spindle drives, e.g.:**

- ◀ MAD 130

**A complete overview of all products featuring built-in explosion protection and your level of equipment protection can be found online at:**

**[www.boschrexroth.com/explosionprotection](http://www.boschrexroth.com/explosionprotection)**



### Hydraulic power units

Rexroth will work closely with you to develop tailor-made hydraulic power units for standards-compliant installation and operation in environments subject to explosions. The modular design of the units combines the benefits of explosion protection with application-specific performance data. Your benefit: Safe, reliable hydraulic power units that maintain ultrahigh levels of productivity in gas and dust-laden atmospheres.

### Drive and control solutions in accordance with the ATEX directive

It goes without saying that Rexroth will work with the customer to develop application-specific system solutions for areas subject to explosions and even realize turn-key systems if required. In the process, we combine the application experience we have gained in your industry with our explosion protection know-how and knowledge of all relevant national and international regulatory requirements.



# Rexroth Service – your key to higher productivity

Explosion protection applies to the entire service life of a machine, which is why directives such as the ATEX directive stipulate that only well-trained and certified workshops may carry out repairs to products with built-in explosion protection. Rexroth meets these requirements with certified service centers. Maximum equipment availability and ultrahigh efficiency throughout the entire lifecycle of your machines and plants are also key factors that determine the productivity of your manufacturing processes. Rexroth offers comprehensive services to ensure that you get the most out of your production application.



Our modular service portfolio reduces the complexity and costs associated with maintaining and repairing your production equipment, and our qualified technicians are available at short notice – guaranteed. With our know-how of drive and control technology, we can meet whatever requirements you may have quickly and reliably. We ensure accurate diagnosis and fast delivery of spare parts while reducing costs by implementing standardized processes and testing procedures thanks to our highly qualified employees in 80 countries.



**Spare parts**



**Repairs**



**Field service**



**Modernization/retrofitting**



**Preventive services**

We can also ensure that your machines operate at peak efficiency throughout their entire lifecycle with our preventive services, which include fitness checks and oil analyses. Working together with you, we analyze the benefits of modernization/retrofit measures and implement them in a practical manner. Your operating costs are considerably reduced as a direct result of higher productivity, better energy efficiency, and optimal safety standards. Choose from our range of services; we offer tailor-made solutions that target your specific requirements.

Detailed information is available online at  
**[www.boschrexroth.com/service](http://www.boschrexroth.com/service)**







Tough application,  
ingenious solution } Exactly

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