Competence in agitator seals
Important note

All the technical specifications are based on extensive tests and our many years of experience. However, the diversity of possible applications means that they can serve as guide values only.

It should be noted that the extremal values of each operating parameter cannot be applied at the same time because of their interaction. Furthermore, the operating range of each specific product depends on the respective shaft diameter, materials used, mode of operation and on the medium to be sealed.

A guarantee can only be given in the individual case if the exact conditions of application are known and these are confirmed in a special agreement. When critical conditions of operation are involved, we recommend consulting with our specialist engineers.

Subject to change.

EagleBurgmann as sealing partner:
Competence in standard and engineered solutions.

First EagleBurgmann mechanical seal:
We supplied our first mechanical seal in 1962. The HS-D double seal was used in an agitator in a chemical company in southern Germany.

Complete product portfolio:
EagleBurgmann is one of the few suppliers of dry-running mechanical seals for bottom and side entry drives.

Project management strengths:
EagleBurgmann supplied 20 seals for Chemineer and SPX Lightnin agitators and reactors to the Sadara chemical complex in Saudi Arabia.

Worldwide partner for end users:
EagleBurgmann is the worldwide supplier of dry-running seals to Novartis.

Extreme operating conditions:
EagleBurgmann supplied a mechanical seal for operation at 200 bar (2,900 PSI) and 200 °C (572 °F) in a reactor used for PE manufacturing at DuPont USA.

Gas seal pioneer:
EagleBurgmann was the first successful manufacturer of gas seals for agitators (top, side and bottom entry).

Project management strengths:
EagleBurgmann supplied 20 seals for Chemineer and SPX Lightnin agitators and reactors to the Sadara chemical complex in Saudi Arabia.

Worldwide partner for end users:
EagleBurgmann is the worldwide supplier of dry-running seals to Novartis.

Extreme operating conditions:
EagleBurgmann supplied a mechanical seal for operation at 200 bar (2,900 PSI) and 200 °C (572 °F) in a reactor used for PE manufacturing at DuPont USA.

Gas seal pioneer:
EagleBurgmann was the first successful manufacturer of gas seals for agitators (top, side and bottom entry).
Long operating periods:
Even after 20 years use in a dispersion reactor, an EagleBurgmann mechanical seal is still running successfully. Regular servicing and various optimizations keep the technology up-to-date.

Sealing even at ice-cold temperatures:
A gas-lubricated EagleBurgmann AGSR is sealing a filter dryer with shaft cooled to −45 °C (−49 °F). An integrated bellows compensates for axial movements of up to 200 mm (7.87”).

The sealing specialist for process machinery
EagleBurgmann is one of the world’s leading system suppliers of sealing technology for process machinery in the chemical, pharma and food industries. For more than 50 years we have been successfully supplying this special market with its many different application scenarios. Numerous manufacturers and users around the world rely on EagleBurgmann seals.

Best sealing technology from a single source
EagleBurgmann seals are applied in all types of process machinery, such as agitators, mixers, dryers or nutsche filters to safely seal the shaft. They can be used for all mixing, filtering and separation processes, whether mechanical or thermal.

The demands of manufacturers, operators and the environment regarding safety, leak tightness and ruggedness are challenging. For dry-running, gas or liquid-lubricated seals, EagleBurgmann responds with not only the most technically safe but also the most cost-effective solution. EagleBurgmann supplies everything from one source – without compromise.

Full service partner with a global presence
Research and development, consulting, engineering, design, production and a broad range of modular services are skills that our customers demonstrably use to their benefit. Our comprehensive network of production facilities and sales and service centers means we are never far away, wherever you are in the world.
Experience, demand and commitment: The building blocks for perfected sealing concepts for agitator applications.

Reliable market partner with a global presence

With over 60 subsidiaries and 250 locations worldwide, we use our global focus to the benefit of our customers. Thus our production network, which has plants in Europe, Asia, North and South America, will always ensure that we can produce in line with market requirements and on attractive terms and can supply regional markets.

We also have a comprehensive network of sales and service centers which covers every important economic region. Being close to our customers also means we are precisely acquainted with their processes and individual requirements.

EagleBurgmann is part of the German Freudenberg Group and the Japanese Eagle Industry Group. We are equipped with all the resources we need to offer optimum support to major customers at the international level and be their long-term, reliable partner.

Consulting and engineering with meaning

Technical expertise is derived from knowledge. It is not just knowledge of sealing technology. We also need to understand the process machinery, facilities and systems, not to mention the specific processes and operating conditions.

Knowledge management helps us keep our comprehensive knowledge up to date and make it available to the entire company. We use databases, courses and training to develop our employees and bundle our expert knowledge from all around the world.

Our dedicated and committed employees use this wide and varied know-how to give our customers well-founded advice on how to choose the best technical and economical sealing solution as well as how to calculate and design according to need.

High-level research and development

We invest a great deal in research and development in order to consistently improve the performance of our products. EagleBurgmann carries out publicly sponsored research projects and works together with institutes and universities. Joint projects with customers and suppliers are a regular source of new solutions.

Two large research and development centers in Germany and Japan combined with a worldwide network of testing facilities allow us to respond flexibly to the requirements of our customers.
Broadly-based standard product portfolio and custom solutions

Largely standardized and modularly structured product series are an essential part of our seal portfolio. But we also offer individual solutions and provide the necessary development, engineering and production capacity. Using the latest calculation and design methods, such as 3D-CAD, we adapt our products to customer-specific requirements or design new solutions.

EagleBurgmann produces in accordance with the highest internal and external standards. We use most modern machines, optimized and standardized production processes and a high level of vertical integration – and excellent employees provide the reliable base. Our quality management systems are certified e.g. in accordance with ISO 9001.

Protection of humans, the environment and industrial facilities

Safety is a fundamental requirement for industrial sealing technology. Ultimately, it’s all about protecting humans, the environment, products and resources. A lot of what EagleBurgmann does greatly exceeds the legal requirements. This sense of responsibility is part of the corporate culture and is firmly anchored in the guiding principles of the group.

Our environmental management system is ISO 14001 certified and our work safety management system fulfills OHSAS 18001. Regular audits and numerous training courses raise awareness in employees and management alike. This develops a culture in which everyone feels responsible for work safety, the environment and health protection. Within the company and on our customers’ premises.

Modular service concept ensures maximum flexibility

Products and services are two sides of the same coin. Professional installation and start-up, practical knowledge transfer, intelligent provision of spare parts as well as regular servicing and maintenance extend operating periods and protect investments.

The need for services varies according to enduser and facility and is as diverse as the industry itself. Failure mode analysis, tailored on-site services and engineering services related to sealing technology are playing an increasingly important role.

Whether individual sealing systems, critical process elements, specific plant units or a comprehensive service agreement for entire plants – our TotalSealCare modular service concept has the solution for every requirement. The individual service modules can be combined as needed to ensure maximum flexibility.
No compromises: The EagleBurgmann shaft seals portfolio.

EagleBurgmann mechanical seals – so versatile, so good

Dry-running, gas or liquid-lubricated seals for steel or glass-lined vessels, special series for mid-range and the highest pressures, as series-produced seals or special design: our product portfolio of mechanical seals for agitator applications is consistently tailored to the needs of our customers.

With cost-effective and flexible modular systems, various additional features and design options, our single and double seals can be adapted to every requirement and machine. Seals can be supplied with or without bearings. Bearings (including self-aligning roller bearings, ceramic bearings, solid oil bearings and special bearings) are a significant area for seal functionality. Here, again, our customers can rely on our long experience and expertise.

All EagleBurgmann agitator seals are ready-to-fit and factory-tested. And they offer maximum operational reliability. For example, the hydraulic conditions in many of our liquid-lubricated seals are designed so that the seals remain closed if the barrier pressure fails.

They also fulfil the particular requirements of the food and pharmaceutical industries with respect to Hygienic Design, CIP and SIP capability and FDA-compliant materials.

Operating range covered

| Shaft diameter: d = 20 ... 500 mm (0.79" ... 19.69") |
| Temperature: t = −40 °C ... +350 °C |
| Pressure: p = vacuum ... 250 bar (3,625 PSI) |

EagleBurgmann magnetic couplings – hermetically sealed

There are numerous processes that require the agitators used to be hermetically sealed. Magnetic couplings fulfil all the criteria associated with creating a leak-free system, e.g. for particularly hazardous media, or if no contamination of the product by the barrier fluid is permitted, as is the case with pharmaceutical end products.

EagleBurgmann supplies magnetic couplings for both bottom and top entry drives. They are hermetically sealed and can be supplied with electropolished surfaces or as a hygienic version. Power is transmitted from the drive to the shaft rotating in the product without contact, using magnets.

Operating range covered

| Shaft diameter: d = ... 40 mm (1.57") |
| Pressure: p = vacuum ... 7 bar (102 PSI) |
| Temperature: t = −40 °C ... +150 °C |
| Rotational speed: n = ... 400 min⁻¹ |
| Torque: max. 270 Nm (bottom entry), 330 Nm (top entry) |
**EagleBurgmann Espey agitator seals – dry media optimally sealed**

Our carbon floating ring seals provide reliable solutions for the sealing of a vast range of gases, gas mixtures, dry, powdered media, dusts and vapors in agitators, dryers, centrifuges and mills, for example. The carbon segment rings, arranged radially behind one another, slide on the shaft with a minimal sealing gap.

The Espey carbon floating ring seals set the standards in terms of high temperatures, tolerance with respect to large radial shaft deflections and use with even highly viscous media. They need no bearings, remain functional even with maximum axial shaft misalignment, have long operating periods and are easy to maintain.

**Operating range covered**

Shaft diameter: \( d = 45 \ldots 340 \text{ mm (1.77" \ldots 13.89")} \)
Pressure: \( p = \text{vacuum} \ldots 3 \text{ bar (44 PSI)} \)
Temperature: \( t = -120 \degree \text{C} \ldots +500 \degree \text{C} \)
\((-184 \degree \text{F} \ldots +932 \degree \text{F})\)
Sliding velocity: \( v_g = \max. \, 40 \text{ m/s (131 ft/s)} \)

**EagleBurgmann compression packing cartridge units – proven and rugged**

Packing cartridges are ideal for applications that demand simple and cost-effective solutions. They are both easy to assemble and robust. The EagleBurgmann sealing units from the 9984 series absorb large axial shaft movements without further assistance. The packing quality and technical features of the cartridge unit are selected to suit the operating conditions, the medium to be sealed and the machine requirements.

**Operating range covered**

Shaft diameter: \( d = 6 \ldots 500 \text{ mm (0.24" \ldots 19.69")} \)
Pressure: \( p = \text{vacuum} \ldots 100 \text{ bar (1,450 PSI)} \)
Temperature: \( t = -40 \degree \text{C} \ldots +500 \degree \text{C} \)
\((-40 \degree \text{F} \ldots +932 \degree \text{F})\)
Sliding velocity: \( v_g = \max. \, 20 \text{ m/s (66 ft/s)} \)

**EagleBurgmann seal supply systems – everything is possible**

We are system suppliers. This means that, with EagleBurgmann, you receive both seal and supply system from a single source – comprising engineering, design and production through to commissioning and services. EagleBurgmann supplies the best and most cost-effective system for every application: quench and thermostophion systems, open and closed barrier fluid circuits and gas supply systems – series solutions, complete systems or systems tailored to the specific application.

**Available standards**

- PED 2014/68/EU (Design, calculation and production in accordance with the EU Pressure Vessel Directive)
- ASME VIII, Div. 1 (Design, calculation and manufacturing)
- API 682 4th edition
- FDA-compliant materials
- Electropolished versions
- Hygienic Design
The position of the seal:
Drive types and DIN drives.

Top entry drive

Top entry drives are generally used to seal the gas phase above the medium. This means that there is no liquid product in contact with the seal that could lubricate its sliding faces, but contact by splashes or foam is possible.

Dry-running mechanical seals are often used as they do not need an external medium for lubrication. Liquid-lubricated mechanical seals with quench are also common or double seals with barrier pressure for hazardous media. In this case, small amounts of the barrier fluid reach the product medium. For this reason, compatibility with the product must be checked in advance.

The maximum rotational speed, temperature and system pressure to be sealed are important factors that affect the design of the sealing system. The agitator shafts are subject to stresses that could lead to radial shaft deflection or wobble movements. These shaft movements must be absorbed and compensated by the seal.

Typical mechanical seals

Dry-running, with contacting sliding faces:
- EagleBurgmann SeccoMix single seal
- EagleBurgmann SeccoMix double seal

Gas-lubricated with non-contacting sliding faces:
- EagleBurgmann AGSZ double seal
- EagleBurgmann AGSR double seal

Liquid-lubricated:
- EagleBurgmann M481 single or double seal, for steel vessels
- EagleBurgmann M461 double seal (see photo), for glass-lined vessels
  For higher pressures:
  - EagleBurgmann HS(L)-D up to 30 bar (435 PSI),
  - EagleBurgmann HSH(L)(V)-D up to 250 bar (3,625 PSI)

Bottom entry drive

With bottom entry drives, the rotating agitator shaft must be sealed off from the bottom of the vessel. The product to be sealed and the full product temperature are in direct contact with the seal. Primarily pressurized double seals are used in order to overcome the challenging operating conditions and the media which often tend to leave deposits. Other features are sometimes added, such as a flush integrated into the seal.

Typical mechanical seals

Dry-running, with contacting sliding faces:
- EagleBurgmann SeccoMixR double seal

Gas-lubricated with non-contacting sliding faces:
- EagleBurgmann AGSR double seal

Liquid-lubricated:
- EagleBurgmann MR34 double seal
  For higher pressures:
  - EagleBurgmann HSH(L)U-D up to 60 bar (870 PSI)
Side entry drive

Direct contact or no contact with the liquid medium or changing conditions: when used in a side entry arrangement, the shaft seal may be subject to various requirements and be designed accordingly.

Two different machine types are used with side entry drives. These have bearings on one or two sides. Overhung designs only occur in smaller machines. The weight of the shaft, as the size increases, causes deflection and bending of the shaft that has to be absorbed by the seal. For this reason, the mechanical seals are equipped with an integrated bearing.

Larger machines have bearings on two sides. Under certain circumstances, however, the weight of the shaft during operation causes bending that has to be tolerated or compensated by the mechanical seal. In addition, on one side, the seal must compensate for changes in the length of the shaft caused by thermal expansion.

These axial movements can be absorbed by scrapers or metal bellows. Bellows can compensate for a misalignment of up to 500 mm (19.69’’); scrapers tend to be used for small deflections.

Paddle dryers and double conical dryers are typical machines that are equipped with side entry drives.

Typical mechanical seals

Dry-running, with contacting sliding faces:
- EagleBurgmann SeccoMixR double seal

Gas-lubricated with non-contacting sliding faces:
- EagleBurgmann AGSR double seal

Liquid-lubricated:
- EagleBurgmann MR34 double seal
- For higher pressures:
  - EagleBurgmann HSH(L)-D up to 60 bar (870 PSI)

DIN standard for agitator drives

DIN 28161 “Requirements on agitator drives” covers the most important requirements for the seal. It defines limit rotational speeds, pressures and temperatures, direction of rotation, bearing, running accuracy and the mounting space for mechanical seals. The running accuracy of the agitator is defined in relation to the shaft diameter, but does not consider dynamic loads on the agitator shaft during operation.

Range of validity

Shaft diameter: \( d = 40 \ldots 220 \text{ mm} \) (1.57” ... 8.66’’)
Pressure: \( p = -1 \ldots 6 \text{ bar} \) (-15 ... 87 PSI)
Temperature: \( t = -25 \text{ °C} \ldots +200 \text{ °C} \) (-13 °F ... +392 °F)
Sliding velocity: \( v_g = \ldots 2 \text{ m/s} \) (7 ft/s)

Available at short notice and cost-effective to buy: Within the DIN range, EagleBurgmann supplies proven sealing solutions tailored to different requirements, for steel or glass-lined vessels, such as the M4 ..., SeccoMix4 and AGSZ series.
Every area of application has its own challenges: EagleBurgmann supplies the right sealing solution.

**Chemical industry**

Basic chemicals plants are generally dominated by pumps; agitator applications can only be found in certain processes, such as HDPE (high-density polyethylene) manufacturing. The polymerization reactors used in this area are equipped with mechanical seals, as are often the centrifuges in which the HDPE is separated out downstream of the reaction. The shafts of the reactors and crystallizers used in PTA (purified terephthalic acid) production are also equipped with mechanical seals.

Fine chemicals plants generally contain discontinuous processes and many different machines and equipment and offer a wide range of possible applications for mechanical seals. Successive production steps, such as mixing, reacting and separating are typical here. The processed batches are often relatively small, while the processes are sophisticated and the products often very valuable. Flexible, multi-purpose plants, usually equipped with agitators, reactors, filters, dryers and other special equipment, are predominantly used.

The particular challenge for sealing technology arises from the different manufacturing processes and the crystallizing, paste-like, highly viscous or highly corrosive media under changing pressure and temperature conditions.

EagleBurgmann agitator seals have become the established standard in the chemical industry. They are robust and durable, significantly contributing to the plant availability.

**Pharmaceutical and food industry**

The pharmaceutical industry is a special area of the fine chemicals industry. In addition it requires machines, seals and supply systems which are easy to clean.

The sealing system is designed according to hygienic design rules. To achieve a hygienic design, consideration must be given to the design of the seal and installation space and to important criteria in the material selection. Parts of the seal in contact with the product must be suitable for CIP (Cleaning in Place) and SIP (Sterilization in Place). Other features of seals in this category are a minimum of dead spaces, open gaps, springs protected against the product and smooth, polished surfaces.

The materials of the sealing system must always fulfil the statutory requirements for the application. Physiological harmlessness along with chemical and mechanical resistance play a central role here. Naturally, the materials used must also not affect foodstuffs or pharmaceutical products in terms of odor, color or flavor.

EagleBurgmann uses high quality standard materials, such as silicon carbide (Q1) and food grade carbon graphite (B) as sliding materials, EPDM (E1), PTFE (T, T2), FFKM (KL) and silicone rubber (S1, S2) for the secondary seals and finally 1.4571 (316 Ti) (G), 1.4404 (316 L) (G), 1.4435 (316 L) (G) and 2.4610 (Hastelloy®-C4) (M) as construction materials.

EagleBurgmann has defined hygienic categories for mechanical seals and supply systems in order to simplify the selection of the right components for manufacturers and endusers. Hygienic requirements on the seal are linked to design features of the seal and supply system. The higher the class, the higher the requirements on materials, surface quality and secondary seals (with the corresponding consequences in terms of cost).
Steel and glass-lined vessels

The two categories of steel vessels and glass-lined vessels have a significant influence on the version of the mechanical seal. The EagleBurgmann mechanical seal series SeccoMix481 (dry-running), AGSZ481 (gas-lubricated) and M481 (liquid-lubricated) are designed for use on steel vessels. With the SeccoMix461, AGSZ461 and M461 series, the parts in contact with the product, such as the connecting flange, are glass-lined.

Vessels coated with enamel are catalytically inert. This means that they do not affect the product due to reactions with the vessel material. They are also highly resistant to chemicals and are easy to clean, which is why glass-lined devices are often used for applications with strict hygiene requirements.

Large shaft diameter, heated shafts, large axial movements

The trend is moving toward increasingly large plants and thus to larger machines and shaft diameters. In plants for manufacturing PTA (purified terephthalic acid), the standard shaft diameters for reactors and crystallizers are now 200 mm (7.87") or more. The largest shaft diameter to date for such a facility is now 480 mm (18.90").

The dimensions and weight of the corresponding mechanical seals of up to 1,500 kg sets new challenges for the seal and machine manufacturers and for the assembly team on site at the plant.

The difficulty with such large seals is to be able to control the deformation of the sliding seal parts and thus the gap geometry over the entire sliding face. This is a precondition for low and stable leakage and a minimal sliding face temperature, which has a decisive effect on the service life of the seal.

To determine the optimum gap geometry, extensive calculations are carried out by our in-house experts which are then verified by means of test runs.

Heated shafts, as are often found in dryers or filter dryers, for example, are another challenge for the seal as they significantly increase the temperature at the seal. The right selection of design and sliding materials, the elastomers and the bearings and bearing grease are particularly important for guaranteeing the seal functionality.

Not least it is essential to control large axial shaft deflections of the type that occur due to thermal expansion in paddle dryers with bearings on both sides or due to active lifting movements in the case of nutsche filters.

EagleBurgmann has considerable experience in the sealing of technically challenging parameters and implements innovative and safe sealing solutions in close collaboration with manufacturers and endusers.

ATEX conformity

Solvents and other explosive substances are used in many process steps with the result that a potentially explosive atmosphere can arise. In these cases, the seals must meet the requirements of the ATEX directive (2014/34/EU). The agitator seal is generally treated as an equipment, rather than a machine component, so a separate ATEX certificate of conformity must be issued for it.

We have therefore carried out EU type examination on our standard series for agitators and special machinery and are able to issue a declaration of conformity for them. Individual acceptance tests can also be carried out for engineered seals. In this case, the seal is tested for its temperature behaviour on a test rig. EagleBurgmann is qualified by the TÜV to independently carry out its own type examinations and individual acceptance tests.
Basic process engineering operations: Processes, machines and requirements for the sealing technology.

Mixing processes
Mixing processes are particularly important in the chemical, pharmaceutical and food industries. The intermediate or end products are often dispersions or emulsions. For chemical reactions in the vessel, the reactants must be distributed as homogeneously as possible to guarantee an optimum transfer of material and heat. Mixing processes can be assigned to one of three categories:

- Agitation (liquid-dominated media)
- Kneading (highly viscous, paste-like media)
- Mixing (solid substances)

Agitators
Generally agitators with top entry drives, often known as DIN agitators, are used. The standard operating conditions are atmospheric pressure up to 6 bar (87 PSI) and ambient temperature up to 150 °C (302 °F). We distinguish between agitators with steel vessels and those with vessels in which the surfaces in contact with the product (including the flange of the mechanical seal) are glass-lined.

In addition to the central mixing element, some machines have another mixing element that generally turns in the opposite direction to the central element. It provides additional restructuring of the flow of mixed material and prevents sticking on the vessel wall. Again, EagleBurgmann has experience of such complex applications.

Additional units in the form of choppers or rotor/stator systems are used to accelerate mixing processes and to break up clumps. These choppers are generally arranged on the side in the bottom part of the vessel. High rotational speeds of up to 3,000 min⁻¹ are achieved.

Kneaders
Kneaders are used for highly viscous and paste-like media. They need to be very robust. The same requirement applies to the mechanical seals. As a rule, several agitator blades turn slowly toward one another. The distances between the agitator blades or between the wall and blade are relatively small in order to generate the high shear forces that are required.

Extruders, which are a special type of kneader, are extrusion screws that work on the same principle as a meat grinder to press solid to thick viscous masses evenly out of an opening under high pressure and temperature. Pressures of 10 bar (145 PSI) to 300 bar (4,350 PSI), sometimes as high as 700 bar (10,153 PSI) and temperatures of 120 °C (284 °F) to 300 °C (572 °F) are achieved, depending on the product.

The challenges for the seals are the small installation space and the high temperatures. The products are generally viscous and sticky and some solidify as they cool. Flushing is therefore often used to keep the product away from the seal.
Reactors

Chemical reactions are the central process step in every facility in the chemical or pharmaceutical industry. The reactions take place either in the liquid phase or in a suspension with solids. The reactions that take place mean that high pressures of up to 200 bar (2,900 PSI) in individual cases and high temperatures, sometimes as much as 400 °C (752 °F), are needed in the reaction vessel. This places correspondingly high demands on the sealing technology. Mechanical seals are installed above all in tank reactors and combustion reactors and wherever a mixing element is used. This generally involves machines with top entry drive.

Mechanical and thermal separating processes

The separation of substance mixtures is one of the most important basic process operations. The majority of the products obtained by chemical reaction are mixtures of substances that have to be separated into their components for further processing or end use.

We distinguish between mechanical, thermal and physical-chemical separating methods according to which properties are used for separation. Mechanical separating methods include centrifuging and filtering which utilize the differences in density or size between the various components. Thermal separating methods such as drying utilize different boiling points for separation. The physical-chemical separating methods include crystallization and extraction which utilize the differences in solubility of substances.

A large variety of machines are used in these processes: nutsche filters and filter dryers, centrifuges, separators, thin-film evaporators, paddle dryers, conical dryers, crystallizers and extractors, to name just a few. These are all engineered equipment that is specifically adapted to the customer’s requirements.

The sealing technology also needs to adapt flexibly to these requirements:
• Top, side or bottom entry drives
• High and low pressures and temperatures
• Products with and without solids, viscous, sticky and highly corrosive media
• Explosive media, so that the seals have to meet the requirements of the ATEX directive (2014/34/EU)
• Hygiene requirements such as CIP and SIP compliance for the entire sealing system
• Small shaft diameters of 20 mm (0.79”) up to large diameters of 300 mm (11.81”) and sometimes even larger
• Large axial shaft deflections that need to be absorbed with metal bellows or special scraper systems.
• Constantly changing operating conditions due to lots of start-up and shut-down operations
Basic process engineering operations: Processes, machines and requirements for the sealing technology.

Centrifuges

Centrifuging means the mechanical separation of a suspension or emulsion with the aid of centrifugal forces. Typical machines include pusher centrifuges, decanters and separators. Mechanical seals are generally only used in centrifuges that work under higher pressures or in a vacuum. In these cases, the feeder, housing and bearing all have to be sealed. Carbon segment rings are frequently used in unpressurized machines.

Dryers

By drying, we mean the thermal separation of a suspension by evaporating the liquid and removing the resulting steam. Typical machines that are equipped with mechanical seals are filter dryers (nutsche dryers), paddle dryers, conical dryers and double conical dryers. Filter dryers are a variant of the nutsche filter that can be heated. They combine the filtration and cake drying steps in a single machine, generally under vacuum.

Bead and ball mills

Bead and ball mills are used for the fine and ultra-fine comminution and mixing of substances for manufacturing color pigments, for example. The mill feed is comminuted by special milling balls. In wet milling, the solids are mixed with a solvent. The media to be sealed generally have a high solids content and are very abrasive. For this reason, pressurized double mechanical seals are used in these applications. Parts in contact with the product, such as the seal flange, have to be protected against excessive abrasion by a special coating, for example.
Full-range supplier: EagleBurgmann seals and supply systems for agitator applications.

EagleBurgmann offers a fine-tuned portfolio that covers a wide range of applications.

The following pages contain an overview of our product lines and series, from the compression packing cartridge, taking in carbon floating ring seals and magnetic couplings through to all types of mechanical seals and the corresponding supply systems. Detailed information and data sheets for the individual products can be found on our website:

eagleburgmann.com

Shaft seals

Dry-running mechanical seals
AD510 / AD520, SeccoMix1, SeccoMix481, SeccoMix461, SeccoMixR

Gas-lubricated mechanical seals
AGSZ, AGSR

Liquid-lubricated mechanical seals
M481, M461, MR-D, ERB, HS-D, HSH-D, HSH(L)U-D

Magnetic couplings
SMAK, MAK66

Carbon floating ring seals
Espey WDMS500, Espey WKA200/5000

Compression packings
9984 Packing cartridge

Seal supply systems

Quench fluid systems
QFT1000, QFT2000, QFT3000, QFT6000

Thermosiphon systems
TS1000, TS2000, TS3000, TS4000, TS5000

Pressure booster systems
DRU2063/A001, DRU2063/A002

Barrier fluid systems
SPA1000, SPA2000, SPA3000

Refill units
SPN2000, SPN4000, SPN1000, SPN3000

Gas supply systems
GSS4016/A250-D1, GSS4016/A350-D1, GSS4015/A400-D0
The seals from the AD500 series are dry-running single seals. They are optionally supplied with (AD510) and without (AD520) housing parts. Cooling jackets on the flange side of the vessel with carbon throttle and version with gas flushing and lip seal are available as additional options.

**Features**
- Dry-running
- Single seal
- Independent of direction of rotation

**Operating range**
- Pressure: \( p = \text{vacuum (7 mbara)} \ldots 5 \text{ bar (73 PSI)} \)
- Temperature: \( t = -30 \, ^\circ\text{C} \ldots +175 \, ^\circ\text{C} \)
  \((-22 \, ^\circ\text{F} \ldots +347 \, ^\circ\text{F})\)
- Sliding velocity: \( v_g = \text{max. 1.0 m/s (3 ft/s)} \)
- Allowable gas consumption: 2 Nl/h

**Materials**
- Seal face: PTFE, carbon fiber and glass fiber-reinforced
- Seat: Silicon carbide (Q1), Aluminum oxide (V)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>O-Ring</td>
</tr>
<tr>
<td>2</td>
<td>Seat</td>
</tr>
<tr>
<td>3</td>
<td>Seal face</td>
</tr>
<tr>
<td>4</td>
<td>O-Ring</td>
</tr>
</tbody>
</table>

EagleBurgmann.
SeccoMix1 are dry-running semi-cartridge single seals. They are available with or without mounting flange, and are suitable for pressure reversal/vacuum operation. The SeccoMix1 seals are of an intrinsically safe design, even without temperature monitoring.

**Features**
- For top entry drives, side entry on request
- Dry-running
- Single seal
- Balanced
- Outboard mounted
- Multiple springs rotating
- Independent of direction of rotation

**Operating range**
- Shaft diameter: \( d_1 = 25 \ldots 220 \text{ mm} \) (0.98" … 8.66")
- Pressure: \( p_1 = \text{vacuum} \ldots 6 \text{ bar} \) (87 PSI)
- Temperature: \( t_1 = -20 \degree \text{C} \ldots +150 \left(250\right) \degree \text{C} \)
  - \(-4 \degree \text{F} \ldots 302 \left(482\right) \degree \text{F}\)
- Sliding velocity: \( v_g = 0 \ldots 2 \text{ m/s} \) (0 ... 6 ft/s)
- Axial movement: ± 1.5 mm
- Radial movement: ± 1.5 mm

For applications beyond this range, please inquire.

* with cooling flange

**Materials**
- Seal face: Carbon graphite, FDA-compliant
- Seat: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer's specifications.
SeccoMix481

Seals from the SeccoMix481 series are dry-running and specially designed for DIN or non-DIN steel vessels with top entry drive. Additional options such as cooling or heating flange, wear trap with flush or polymerization barrier are available. ATEX certificate available on request.

Features
• For top entry drives
• For steel vessels acc. to DIN resp. non-DIN
• Dry-running
• Nitrogen pressurized dual seal, single seal optional
• With or without bearing available
• Balanced
• Multiple springs rotating
• Independent of direction of rotation

Operating range
- Shaft diameter: $d_1 = 40 \ldots 200$ mm (1.57” ... 7.87”)
- Pressure: $p_1 =$ vacuum ... 6 bar (87 PSI)
- Temperature: $t_1 =$ -20 °C ... +150 (250*) °C
  (-4 °F ... +302 (482*) °F)
- Sliding velocity: $v_g =$ 0 ... 2 m/s (0 ... 6 ft/s)

For applications beyond this range, please inquire.

* with cooling flange

Materials
Seal face: Carbon graphite, FDA-compliant
Seat: Silicon carbide, FDA-compliant
Secondary seals and metal parts according to application and customer’s specifications.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seal face, atmosphere side</td>
</tr>
<tr>
<td>2</td>
<td>Seal face, product side</td>
</tr>
<tr>
<td>6, 14, 15</td>
<td>O-Ring</td>
</tr>
<tr>
<td>11</td>
<td>Seat, product side</td>
</tr>
<tr>
<td>12</td>
<td>Seat, atmosphere side</td>
</tr>
<tr>
<td>34</td>
<td>Lip seal</td>
</tr>
</tbody>
</table>
Dry-running seals from the SeccoMix461 series are specially designed to seal DIN or non-DIN glass-lined vessels with top entry drive. The complete seal unit can be lifted off from the glass-lined flange. The sensitive basic flange remains on the vessel. ATEX certificate available on request.

Features
- For top entry drives
- For DIN or non-DIN glass-lined vessels
- Dry-running
- Nitrogen pressurized double seal
- Available with or without bearing
- Balanced
- Multiple springs rotating
- Independent of direction of rotation

Operating range
- Shaft diameter: \( d_1 = 40 \ldots 200 \text{ mm} \) (1.57” \ldots 7.87”)
- Pressure: \( p_1 = \text{vacuum} \ldots 6 \text{ bar} \) (87 PSI)
- Temperature: \( t_1 = -20 ^\circ C \ldots +150 \ (250^* \ ^\circ C) \) \(-4 ^\circ F \ldots +302 \ (482^*) ^\circ F\)
- Sliding velocity: \( v_g = 0 \ldots 2 \text{ m/s} \) (0 \ldots 6 ft/s)

For applications beyond this range, please inquire.
* with cooling flange

Materials
- Seal face: Carbon graphite, FDA-compliant
- Seat: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer’s specifications.
SeccoMixR are dry-running double seals. They are used for top, bottom and side entry drives. Design features include smooth surfaces without dead spaces. Optional axial expansion joints or scrapers are available to compensate for large axial movements of the shaft. ATEX certificate available on request.

**Features**
- For top, side and bottom entry drives
- Dry-running
- Nitrogen pressurized double seal
- Available with or without bearing
- Rotating seat on product side
- Balanced
- Independent of direction of rotation

**Operating range**
- Shaft diameter: \( d_1 = 45 \ldots 220 \text{ (300) mm} \)
  \( (1.77'' \ldots 8.66'' \text{ (11.81'')} \)\)
- Pressure: \( p_1 = \text{vacuum} \ldots 6 \text{ bar} \text{ (87 PSI)} \)
- Temperature: \( t_1 = -20 \text{ °C} \ldots +150 \text{ °C} \)
  \( (-4 \text{ °F} \ldots +302 \text{ °F}) \)
- Sliding velocity: \( v_g = 0 \ldots 2 \text{ m/s} \text{ (0 \ldots 6 ft/s)} \)

For applications beyond this range, please inquire.

**Materials**
- Seal face: Carbon graphite, FDA-compliant
- Seat: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer’s specifications.
Agitator seals from the AGSZ series are gas-lubricated double seals with a centrally arranged seat. They run contact-free, so no frictional heat is introduced into the product. Available variants are seals with or without integral bearings for steel and glass-lined vessels. Additional options such as cooling or heating flange and flush are available. ATEX certificate available on request.

**Features**
- For top entry drives
- Double seal
- Balanced
- Independent of direction of rotation
- Gas-lubricated
- Cartridge unit

**Operating range**
- Shaft diameter: \( d_1 = 40 \ldots 220 \text{ mm (1.6" \ldots 8.7")} \)
- Pressure: \( p_1 = \text{vacuum} \ldots 6 \text{ bar (87 PSI)} \)
- \( \Delta p = \text{min. 3 bar (44 PSI)} \), \( p_3 = 9 \text{ bar (131 PSI)} \)
- Temperature: \( t_1 = 0 \degree C \ldots +150 \degree C (+250\*) \)
- \( +32 \degree F \ldots +302 \degree F (+482\*) \)
- Sliding velocity: \( v_g = 0 \ldots 2 \text{ m/s (0 \ldots 7 ft/s)} \), higher velocities on request.

* with cooling flange

**Materials**
- Seal faces and seats: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer's specifications

**Item** | **Description**
--- | ---
1 | Seal face, atmosphere side
2 | Seal face, product side
6, 7 | O-Ring
11 | Seat
17 | Flange
22 | Clamping ring
AGSR gas-lubricated double seals with stationary springs on the product side are the ideal solution for top, bottom and side entry drives. No frictional heat is introduced from the sliding faces into the product. There is a hygienic variant and integrated flushing available for side or bottom entry drives. ATEX certificate available on request.

**Features**
- For top, bottom and side entry drives
- Double seal
- Balanced
- Stationary springs on product side
- Independent of direction of rotation
- Gas-lubricated
- Cartridge unit

**Operating range**
- Shaft diameter: \( d_1 = 20 \ldots 200 \text{ mm (0.8" \ldots 7.9")} \)
- Pressure: \( p_1 = \text{vacuum} \ldots 6 \text{ bar (87 PSI)} \), \( \Delta p = \text{min. 3 bar (44 PSI)} \), \( p_3 = \text{max. 9 bar (131 PSI)} \)
- Temperature: \( t_1 = 0 \degree \text{C} \ldots +150 \degree \text{C} \)
- Sliding velocity: \( v_g = 0 \ldots 2 \text{ m/s (0 \ldots 7 ft/s)} \)*

* Higher velocities on request

**Materials**
- Seal faces and seats: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer’s specifications.

---

**Diagram**

[Diagram of AGSR gas-lubricated double seals with stationary springs on the product side.]
The many versions of the ERB series allow it to be used universally and have become established for standardization, for example. The mechanical seals, which are available with or without bearings, are easy to install without having to pull the agitator shaft.

Features
- Cartridge unit
- Double seal with integrated bearing
- Unbalanced
- Independent of direction of rotation

Operating range
Pressure: \( p = \text{vacuum} \ldots 10 \text{ bar (145 PSI)} \)
Temperature: \( t = -30 ^\circ \text{C} \ldots +200 ^\circ \text{C} \)
\((-22 ^\circ \text{F} \ldots +392 ^\circ \text{F})\)
Rotational speed: \( n = \text{max.} \ 200 \text{ min}^{-1} \)
Axial movement: max. 0.3 mm

Materials
Diameter 50…100 mm (1.97”…3.94”):
Seal faces: Carbon graphite resin-impregnated
Seats: Silicon carbide, Tungsten carbide, Chromium oxide-coated

Diameter 110…200 mm (4.33”…7.87”):
Seal faces: Silicon carbide, Tungsten carbide,
Chromium oxide-coated
Seats: Carbon graphite resin-impregnated,
Silicon carbide, Tungsten carbide

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Benennung</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 4, 5, 8</td>
<td>O-Ring</td>
</tr>
<tr>
<td>2, 6</td>
<td>Seat</td>
</tr>
<tr>
<td>3, 7</td>
<td>Seal face</td>
</tr>
<tr>
<td>9</td>
<td>Lip seal</td>
</tr>
</tbody>
</table>
Robust, reliable and configurable for all applications: these are the attributes of the M481 series. They have established their place as the standard for DIN and non-DIN (M451) top entry drives in the chemical and pharmaceutical industries. The single and double cartridge seals for steel vessels can be equipped with various torque transmissions and options such as leakage drain, flushing, heating or cooling flange or polymerization barrier. ATEX certificate available on request.

**Features**
- For top entry drives
- Unbalanced
- Independent of direction of rotation
- Multiple springs rotating
- Liquid-lubricated
- Available with or without bearing
- Self-closing on product side

**Operating range**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seal face, atmosphere side</td>
</tr>
<tr>
<td>2</td>
<td>Seal face, product side</td>
</tr>
<tr>
<td>6, 7, 13, 14, 15</td>
<td>O-Ring</td>
</tr>
<tr>
<td>11</td>
<td>Seat, product side</td>
</tr>
<tr>
<td>12</td>
<td>Seat, atmosphere side</td>
</tr>
</tbody>
</table>

**Shaft diameter:** $d_1 = 40 \ldots 220 \text{ mm (1.57" \ldots 8.66")}$

**Single seals:**
- Pressure: $p_1 = \text{vacuum} \ldots 6 \text{ bar (87 PSI)}$, $p_3 = \text{pressureless}$
- Temperature: $t_1 = -40 \text{ °C} \ldots +150 \text{ (250*) °C}$
  $(-40 \text{ °F} \ldots +302 (482*) °F)$

**Double seals:**
- Pressure: $p_1 = \text{vacuum} \ldots 16 \text{ bar (232 PSI)}$, $p_3 = \text{max. 18 bar (261 PSI)}$
- Temperature: $t_1 = -40 \text{ °C} \ldots +200 \text{ (350*) °C}$
  $(-40 \text{ °F} \ldots +392 (662*) °F)$

**Sliding velocity:** $v_g = 0 \ldots 5 \text{ m/s (0 \ldots 16 ft/s)}$

For applications beyond this range, please inquire.

* with cooling flange

**Materials**

Seal faces: Carbon graphite or Silicon carbide, FDA-compliant
Seats: Silicon carbide, FDA-compliant
Secondary seals and metal parts according to application and customer's specifications.
The M461 series was specially designed for DIN and non-DIN (M491) glass-lined vessels with top entry drive. The double cartridge seals (single seals on request) can be fitted with cooling or heating flange, leakage drain or flushing. The complete seal unit can be lifted off from the glass-lined flange for maintenance. The sensitive mounting flange remains on the vessel. ATEX certificate available on request.

**Features**
- For top entry drives
- For glass-lined vessels
- Unbalanced
- Independent of direction of rotation
- Multiple springs rotating
- Liquid-lubricated
- Available with or without bearing
- Self-closing on product side

**Operating range**
- Shaft diameter: \( d_1 = 40 \ldots 160 \text{ mm (1.6" \ldots 6.3")} \)
- Pressure: \( p_1 = \text{vacuum} \ldots 16 \text{ bar (232 PSI)} \), \( p_3 = \text{max. 18 bar (261 PSI)} \)
- Temperature: \( t_1 = -40 \degree C \ldots +200 (250\*) \degree C \) (\(-40\degree F \ldots +392 (482\*) \degree F\))
- Sliding velocity: \( v_g = 0 \ldots 5 \text{ m/s (0 \ldots 16 ft/s)} \)

For applications beyond this range, please inquire.

* with cooling flange

**Materials**
- Seal faces: Carbon graphite or Silicon carbide, FDA-compliant
- Seats: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer’s specifications.
The double seals from the MR-D series can be used for top, side or bottom entry drives. The smooth surface contour without dead spaces makes them ideal for use in hygienic applications. They are CIP/SIP-compliant. In addition to heating and cooling flanges, the seals can be equipped with axial expansion joints or scrapers for large axial movements of the shaft. ATEX certificate available on request.

Features
- For top, side and bottom entry drives
- Rotating seat on product side
- Unbalanced
- Liquid-lubricated
- Double seal
- Independent of direction of rotation
- Cartridge unit
- Available with or without bearing
- Shaft sleeve not in contact with product

Operating range
- **Shaft diameter:** \(d_1 = 35 \ldots 140 \text{ (500) mm}
  (1.38" \ldots 5.51" (19.68"))
- **Axial offset shaft/housing:** \(d_1 = 35 \ldots 60 \text{ mm}
  (1.38" \ldots 2.36"): max. \(\pm 1.5 \text{ mm}
  \ d_1 > 60 \text{ mm (2.36"): max. } \pm 2.0 \text{ mm}
- **Radial offset shaft/housing:** max. \(\pm 0.3 \text{ mm}

Pressure: \(p_1 = \text{ vacuum} \ldots 14 \text{ (23) bar (203}
(334 \text{ PSI})) \ p_3 = \text{ max. } 16 \text{ (25) bar (232 (363 PSI))}
\Delta p_3-p_1 = 2 \ldots 10 \text{ bar (29 ... 145 PSI)},
higher \(\Delta p\) on request

Temperature: \(t_1 = -20 \text{ °C} \ldots +200 \text{ (300) °C}
(-4 °F ... +392 (572) °F)
Sliding velocity: \(v_g = \text{ max. } 10 \text{ (20) m/s (33 (66) ft/s)

For applications beyond this range and for values in brackets, please inquire.

Materials
- Seal faces: Silicon carbide, FDA-compliant
- Seat: Carbon graphite (atmosphere side) or Silicon carbide (product side), FDA-compliant
- Secondary seals and metal parts according to application and customer's specifications.
HS-D double cartridge seals for top entry drives are designed for the middle pressure range, have proved to be extremely reliable and have a long service life in practice. Hydrodynamic grooves for optimum lubrication are integrated into the sliding faces of the double seal. Optional equipment such as leakage drain, heating or cooling flange or polymerization barrier is available. ATEX certificate available on request.

**Features**
- For top entry drives
- Double seal
- Unbalanced
- Independent of direction of rotation
- Multiple springs rotating
- Liquid-lubricated
- Available with or without bearing
- Self-closing on product side

**Operating range**
- Shaft diameter: \( d_1 = 20 \ldots 500 \text{ mm} (0.79'' \ldots 19.69'') \)
- Pressure: \( p_1 = \text{vacuum} \ldots 30 \text{ bar} (435 \text{ PSI}) \)
- Temperature: \( t_1 = -40 \degree \text{C} \ldots +200 (350\degree) \text{ C} \)
  \((-40 \degree \text{F} \ldots +392 (662\degree) \text{ F})\)
- Sliding velocity: \( v_g = 0 \ldots 5 \text{ m/s} (0 \ldots 16 \text{ ft/s}) \)

For applications beyond this range, please inquire.

* with cooling flange

**Materials**
- Seal faces: Carbon graphite or Silicon carbide, FDA-compliant
- Seats: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer’s specifications.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seal face, atmosphere side</td>
</tr>
<tr>
<td>2</td>
<td>Seal face, product side</td>
</tr>
<tr>
<td>4, 5, 11, 12, 13</td>
<td>O-Ring</td>
</tr>
<tr>
<td>9</td>
<td>Seat, product side</td>
</tr>
<tr>
<td>10</td>
<td>Seat, atmosphere side</td>
</tr>
</tbody>
</table>
HSH-D double cartridge seals for top entry drives are designed for the higher pressure range. They have proved to be reliable and long-lasting solutions in numerous applications. Hydrodynamic grooves for optimum lubrication are integrated into the sliding faces of the double seal. Optional equipment such as leakage drain, heating or cooling flange or polymerization barrier is available. ATEX certificate available on request.

**Features**
- For top entry drives
- Double seal
- Balanced
- Independent of direction of rotation
- Multiple springs rotating
- Liquid-lubricated
- Available with or without bearing
- Self-closing on product side

**Operating range**
- Shaft diameter: \( d_1 = 20 \ldots 400 \text{ mm} (0.79'' \ldots 15.75'') \)
- Pressure: \( p_1 = \text{vacuum} \ldots 250 \text{ bar} (3,625 \text{ PSI})^* \), \( p_3 = p_1 + 10 \% \)
- Temperature: \( t_1 = -40 \, ^\circ \text{C} \ldots +200 \, (350^**) \, ^\circ \text{C} \)
  \( (-40 \, ^\circ \text{F} \ldots +392 \, (662^**) \, ^\circ \text{F}) \)
- Sliding velocity: \( v_g = 0 \ldots 5 \text{ m/s} (0 \ldots 16 \text{ ft/s}) \)

* Depending on size, from 100 \ldots 150 \text{ bar} (1,450 \ldots 2,175 \text{ PSI})
  executed as tandem seal (pressure reduction in 2 stages).
** with cooling flange

**Materials**
- Seal faces: Carbon graphite, FDA-compliant
- Seats: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer’s specifications.
The HSH(L)D is the high pressure cartridge seal for customer-specific individual solutions with bottom entry drive. It is established, reliable and has a long service life. Hydrodynamic grooves for optimum lubrication are integrated into the sliding faces of the double seal. Optional equipment such as leakage drain, heating or cooling flange or shut-down seal and customized torque transmissions are available. ATEX certificate available on request.

**Features**
- For bottom entry drives
- Double seal
- Balanced
- Independent of direction of rotation
- Multiple springs rotating
- Liquid-lubricated
- Available with or without bearing
- Self-closing on product side

**Operating range**
- Shaft diameter: \( d_1 = \ldots 400 \text{ mm (15.75")} \)
- Pressure: \( p_1 = \text{vacuum} \ldots 60 \text{ bar (870 PSI)} \)
- Temperature: \( t_1 = -40 \degree \text{C} \ldots +200 \degree \text{C} \)
  \((-40 \degree \text{F} \ldots +392 \degree \text{F})\)
- Sliding velocity: \( v_g = \ldots 5 \text{ m/s (0 \ldots 16 ft/s)} \)

For applications beyond this range, please inquire.

**Materials**
- Seal faces: Carbon graphite, FDA-compliant
- Seats: Silicon carbide, FDA-compliant
- Secondary seals and metal parts according to application and customer’s specifications.
Espey WDMS500

Espey carbon floating ring seals can be used in DIN installation spaces. They are optionally available with or without bearing. The split cartridge unit guarantees simple assembly. Scraper rings are arranged upstream facing the product for applications creating dust or powder. Can be used in ATEX areas, for pressure reversal and in pharmaceutical and food applications (FDA-compliant materials). Easy to maintain and long operating periods are characteristics of the WDMS500.

Features

- Multipart sealing rings, overlapped and mortised with gas-tight joints
- Split housing design
- Smallest possible operating gap – minimal leakage
- Dry-running, pressurized with nitrogen
- Self-adjusting sealing rings
- Sealing rings follow radial shaft movements
- Compensates for axial shaft movements
- No sealing components mounted on the shaft and hence no additional shaft vibrations
- Cooling of sealing area not required for high-temperature applications

Operating range

- Shaft diameter: \( d = 40 \ldots 220 \text{ mm} \) (1.57” … 8.66”)
- Operating pressure: \( p = \text{ vacuum} \ldots 6 \text{ bara} \) (87 PSIA)
- Operating temperature:
  - \( t = -40 ^\circ C \ldots +500 ^\circ C \) \((-40 ^\circ F \ldots +932 ^\circ F) \) (carbon),
  - \( -40 ^\circ C \ldots +200 ^\circ C \) \((-40 ^\circ F \ldots +392 ^\circ F) \) (PTFE compound)
- Sliding velocity: \( v_s = \text{ max.} \ 5 \text{ m/s} \) (16 ft/s)
- Radial clearance: \( \pm 5.0 \text{ mm} \)
- Axial movement: theoretically unlimited
  (version without bearing),
  \( \pm 2.0 \text{ mm} \) (version with bearing)
- Recommended wear protection: >58 HRC

Materials

- Sealing ring: Carbon, PTFE compound
- Housing: 1.4571, others
- Tension spring / detent: 1.4571

Item Description

1. O-Ring flange
2. Housing, 2-piece
3. Sealing ring
4. Tension spring
5. Detent
6. O-Ring shaft sleeve
7. O-Ring bearing
The WD200/500 is proven in numerous applications in mixers, mills and, in particular, dryers for powdered media. It is characterized by the split housing, segmented sealing rings which can be replaced easily and non-contacting operation. Plant operators benefit from the long operating periods, high operational safety and straightforward maintenance.

**Features**

- Dry-running, pressurized with nitrogen
- Multi-part sealing ring, generally cut radially on the process side, overlapped and mortised on the atmospheric side with gas-tight joints
- Very small operating gap – low leakage
- Approval for materials: FDA

**Operating range**

- Shaft diameter: \( d = 45 \text{ mm} \ldots 340 \text{ mm} \ (1.77'' \ldots 13.89'') \)
- Operating pressure: \( p \) = vacuum \ldots 3 bara (44 PSIA) (subject to circumferential velocity)
- Operating temperature: \( t \) = \(-120^\circ\text{C} \ldots +500^\circ\text{C}\) (carbon), \(-120^\circ\text{C} \ldots +150^\circ\text{C}\) (PTFE compound)
- Sliding velocity: \( v_s \) = max. 40 m/s (131 ft/s)
- Radial play: \( \pm 2.5 \ldots 5.0 \text{ mm} \)
- Axial movement: theoretically infinite
- Recommended wear protection: >58 HRC

**Materials**

Sealing ring: Carbon, PTFE compound
Housing: 1.4021, 1.4571, Hastelloy®, Titanium, Inconel®, others
Tension spring / detent: 1.4571, Hastelloy®, Titanium, Inconel®
Magnetic couplings from the SMAK series are a hermetically-sealed and low-maintenance solution for torque transmission in agitators. Hazardous or valuable media stay where they belong: in the closed vessel. Conversely, nothing that could contaminate the medium can penetrate the system. SMAK couplings are designed for strict hygienic requirements and are available for top and bottom entry drives. Naturally they can be sterilized.

**Features**
- Surfaces that come in contact with the product are electropolished
- Includes sliding bearing for bottom entry
- Optional rotational speed monitoring
- Welded or screw flange available
- No maintenance required with interruption-free operation
- Magnetic couplings available for non-sterile agitator applications (MAK66)

**Operating range**
- Shaft diameter: \( d = \ldots 40 \text{ mm (1.57")} \)
- Pressure: vacuum \( \ldots 7 \text{ bar} \)
- Temperature: \( t = -40 ^\circ \text{C} \ldots +150 ^\circ \text{C} \)
  \((-40 ^\circ \text{F} \ldots +302 ^\circ \text{F})\)
- Speed: \( n = \ldots 400 \text{ min}^{-1} \)
- Viscosity: \( 0.3 \ldots 5,000 \text{ mPas (SiC)} \)
- Torque: max. 270 Nm (bottom entry), 330 Nm (top entry)
- Solids: max. 0.1 mm; max. 5 % by weight; grain hardness max. 700 HV

**Materials**
- Sliding bearings: Silicon carbide or Zirconia, FDA-compliant
- Bearings: Silicon nitride
- Magnets: Samarium cobalt
- Secondary seals and metal parts according to application and customer’s specifications.

**Item**
- 1.1 Inner rotor
- 1.2 Outer rotor
- 2 Can
- 3 Nut
- 4 Bearing bushing
- 5, 6 O-Ring
- 7 Set screw
- 8 Motor shaft connection
- 9, 10 Bearing
- 11 Agitator blade connection
Compression packing cartridge units have a simple system structure and are robust. They are ideal for absorbing larger axial and radial shaft movements and are suitable for dry-running, depending on the operating conditions and packing quality. The design is tailored to the application parameters.

**Features**
- Standard DIN/ASME (agitators) connection sizes
- Live-loaded system (outside disk spring arrangement) with defined surface pressure and visual check
- Available with integrated shaft bearing
- Lubrication or pressurized barrier gas possible via lantern ring
- Shaft sleeve with chromium oxide coating or hardened to protect against abrasive particles in the medium
- Suitable for "floating" arrangement of packing set for large radial shaft deflections
- Easy and fast to change compression packing due to split housing

**Operating range covered**
- Shaft diameter: \( d = 6 \ldots 500 \text{ mm (0.24" to 19.69")} \)
- Pressure: \( p = \text{vacuum} \ldots 100 \text{ bar (1,450 PSI)} \)
- Temperature: \( t = -40 \, ^\circ \text{C} \ldots +500 \, ^\circ \text{C} \)
  \((-40 \, ^\circ \text{F} \ldots +932 \, ^\circ \text{F})\)
- Sliding velocity: \( v_g = \max. \ 20 \text{ m/s (66 ft/s)} \)

**Item** | **Description**
--- | ---
1 | Stuffing box housing
2 | O-Ring or Statotherm profile ring
3 | Gland follower
4 | Shaft sleeve
5 | Packing set
6 | Guide sleeve for spring washer
7 | Lantern ring
Excellence in detail: Design solutions for a perfect agitator seal.

Every application has its own special requirements for the sealing technology used. High or low process temperatures, highly viscous, pasty, sticky or crystallizing media: various additional options can be supplied to ensure failure-free operation. Flushing, cooling, heating, prevention of polymerization at the seal and controlled collection and removal of leakage are all achieved with design solutions integrated into the seal.

Structured sliding faces with hydrodynamic grooves (see photo) improve the lubrication and thus reduce the heat generation. Control interfaces, e.g. for buffer/barrier fluid or sliding face temperature or leakage detection, allow the operator to monitor the seal.

EagleBurgmann also supplies integrated safety seals; these are automatically closed by springs when the barrier pressure drops below a defined barrier pressure. The application of a pneumatically activated EagleBurgmann STD shut-down seal enables the agitator seal to be replaced while the shaft is stopped, even if the vessel is filled and pressurized.

Here we show a selection of options which can be combined with one another as required. We will be pleased to present further intelligent and proven solutions on request.

---

**Cooling flange / Heating flange**
For active cooling/heating of the seal under extreme process temperatures.

**Flush**
Flush with an external medium as a barrier between the process medium and seal.

**Leakage drain / Wear trap**
Controlled removal of leakage or wear. Can be used alternatively as a flush for cleaning.

**Polymerization barrier**
Liquid barrier between the process medium and seal.

**STD1 shut-down seal**
 Shaft diameter: \(d_1 = 40 \ldots 200 \text{ mm (1.57" \ldots 7.87")}\)
 Pressure: \(p_1 = 16 \text{ bar (232 PSI)}\)
 Temperature: \(t_1 = +100 \text{ °C (+212 °F)}\)
 Elastic sealing element (item no. 1), pneumatically or hydraulically actuated (closing pressure \(p_4 > p_1\)).
Seal supply systems

Error-free operation of liquid-lubricated mechanical seals can only be ensured if the space between product and atmosphere side of the seal is completely filled with clean medium in order to ensure continuous lubrication of the sliding faces. Supply units and systems of differing levels of complexity are used for this purpose.

Functions and tasks

- Leakage monitoring, drain and compensation
- Lubrication of the sliding faces with buffer/barrier fluid
- Pressure build-up in the seal chamber
- Cooling or heating the seal
- Storing, supplying and circulating of the buffer/barrier fluid
- Monitoring the buffer/barrier fluid (e.g. pressure, temperature and fill level)

We distinguish between quench, buffer fluid or barrier fluid according to the prevailing pressure conditions.

Quench

Supply of an external fluid to the atmosphere side of a mechanical seal. The pressure of the quench medium is equal to the atmospheric pressure.

The quench performs at least one of the following tasks:
- Absorption or removal of leakage by the quench fluid
- Monitoring of the leakage rate by periodic measurement of the level of quench fluid in the circulation or buffer tank
- Prevention of contact between leakage and the atmosphere (for media which react undesirably with atmospheric oxygen)
- Protection against dry-running
- Prevention of ice formation
- Cooling
- Stabilization of the lubricating film
- Heating of the seal for process media with high melting points
- Prevention of deposits on the atmosphere side of the seal

Buffer fluid

Supply of an external fluid between two mechanical seals. The pressure of the buffer fluid is lower than the pressure of the process medium to be sealed. If the pressure of the buffer fluid is equal to atmospheric pressure, then we talk of an unpressurized buffer fluid.

Barrier fluid

Supply of an external fluid between two mechanical seals. The pressure of the external fluid is higher than the pressure of the process medium to be sealed.

Barrier pressure systems or supply systems for liquid-lubricated mechanical seals can be divided into two types:

Open circuit:
A circuit which provides both circulation and pressurization via a barrier pressure unit (e.g. EagleBurgmann SPA). The barrier fluid relief pressure after it has circulated and is collected in an unpressurized vessel.

Closed circuit:
Here, all components have the same pressure. Pressurization performed via an external pressure source or nitrogen (EagleBurgmann TS system), via a refill unit (EagleBurgmann SPN) or the process pressure (EagleBurgmann DRU system) or via a bladder accumulator.

Flushing

The process medium or an external fluid is fed into the buffer chamber in the area of the sliding faces. The flushing pressure is always higher than the pressure to be sealed.

Gas supply systems GSS

Pressurized, gas-lubricated mechanical seals have to be operated with a sufficiently pressurized gas barrier. Gas supply systems of the EagleBurgmann GSS series ensure a supply of barrier gas for non-contacting, gas-lubricated or dry-running double mechanical seals. However, they can also be used where gas flushing is required.

Important GSS functions:
- Filtering the barrier or flushing gas
- Monitoring and controlling the pressure
- Measuring and monitoring the flow rate
- Control and discharge of leakage

The following pages provide a cross-section of our seal supply system product portfolio. We can also supply specific solutions for practically any application.
**Quench fluid systems**

Quench fluid systems are used as an unpressurized supply for single or tandem mechanical seals based on API 682, Plan 51. They act as a convenient fluid reservoir. The fluid is circulated using the thermosiphon principle or by forced circulation, e.g. with a pumping screw in the seal or by means of an external pump.

EagleBurgmann offers four series:

**QFT1000**
Transparent polyethylene tank, preassembled as a complete unit with stainless steel clips. The QFT1000 is resistant to water, glycerin, glycols and methanol. Allowable temperature: –30 °C ... +70 °C (–22 °F ... +158 °F).

**QFT2000**
The stainless steel tank (see photo) is equipped with sight glasses for MIN/MAX fill level monitoring. The leakage overflow can be selectively discharged. Operating temperature range: –30°C ... +200 °C (–22°F ... +392 °F), depending on the version.

**QFT3000**
Stainless steel tank with two sight glasses on opposite sides for monitoring the MIN fill level. Operating temperature range: –40 °C ... +120 °C (–40°F ... +248 °F).

**QFT6000**
Stainless steel tank with sight glass for monitoring the MIN/MAX fill level. API 682 compliant version. Operating temperature range: –20 °C ... +100 °C (–4 °F ... +212 °F), depending on the version.

**Thermosiphon systems**

EagleBurgmann thermosiphon systems are used to supply double and tandem mechanical seals for a broad range of applications based on API 682, Plan 52 and Plan 53A. The EagleBurgmann TS1000 and TS2000 series offer preconfigured complete systems with short delivery times to cover the main applications.

EagleBurgmann offers five series:

**TS1000**
Vessel with flat heads (see photo an page 35). Allowable pressure: 16 bar (232 PSI), allowable temperature: –60 °C ... +200 °C (–76 °F ... +392 °F), depending on the version.

**TS2000**
Vessel with dished heads (photo: TS2000 with SPI Measuring unit, SPN2063 Refill unit and SPU5000 circulation pump). Allowable pressure: 63 bar (914 PSI), allowable temperature: –29°C ... +200 °C (–20°F ... +392 °F), depending on the version.

**TS3000**
Specially designed for operation or supply of mechanical seals in hygienic applications. Surfaces are electropolished, construction is cavity-free. Allowable pressure: 8 bar (116 PSI), allowable temperature: –10 °C ... +140 °C (+14 °F ... +284 °F), depending on the version.

**TS4000**
Completely gap-free version with dished heads for demanding applications. Allowable pressure: 30 bar (435 PSI), allowable temperature: –60 °C ... +200 °C (–76 °F ... +392 °F).

**TS5000**
Separable version for best possible and easy cleaning of the inside of the vessel. Allowable pressure: 30 bar (435 PSI), allowable temperature: –60 °C ... +200 °C (–76 °F ... +392 °F).

**Pressure booster systems**

The EagleBurgmann DRU system is used to supply double and tandem seals for a broad range of applications based on API 682, Plan 53C. Basically the function is similar to the TS system but, in this case, the barrier pressure is provided by the reference pressure (e.g. process pressure) without nitrogen supply. The pressure booster is used for storing and cooling the barrier fluid. Pressurization takes place via piston in relation to the process/medium pressure; the pressure is automatically raised according to the transmission ratio.

EagleBurgmann offers two variants:

**DRU2063/A001**
Allowable pressure: 63 bar (913 PSI), allowable process/medium pressure: 57 bar (827 PSI), allowable temperature: –60 °C ... +200 °C (–76 °F ... +392 °F). Transmission ratio: 1:1.1.

**DRU2063/A002**
Allowable pressure: 63 bar (913 PSI), allowable process/medium pressure: 42 bar (609 PSI), allowable temperature: –60 °C ... +200 °C (–76 °F ... +392 °F). Transmission ratio: 1:1.5.
Barrier fluid systems

Barrier pressure units from the SPA series perform and fulfill all the tasks needed to operate double seals (circulating, cooling and pressurizing the barrier fluid and compensation of leakage).

EagleBurgmann offers three versions:

**SPA1000**
- Vessel content 40 l, flow rate 6 l/min.

**SPA2000**
- Vessel content 100 l, flow rate 12 l/min.

**SPA3000**
- Vessel content 100 l, flow rate 23 l/min.

The systems are designed for hydraulic oil with a viscosity of 12 ... 90 mm²/s at operating temperature (tank temperature). Operating temperature in the tank max. 80 °C (176 °F) (return line max. 90 °C (194 °F)).

Refill units

Refill units are used for refilling barrier fluid during operation. EagleBurgmann offers manual and automatic refill units with vessel capacities from 20 up to 200 liters, and also mobile systems.

**Manual refill units:**

**SPN2000**
- Stainless steel manual pump for universal application (see photo on page 35).
- Allowable temperature: +60 °C (+140 °F).
- Pressure-limiting valve: 30 or 63 bar (435 or 913 PSI).

**SPN4000**
- Specially designed for use with TS1016 systems.
- Polyethylene tank. Allowable temperature: +60 °C (+140 °F), pressure-limiting valve: 16 bar (232 PSI).

**Automatic refill units:**

The basic versions of the SPN automatic refill unit only perform or fulfill two of the four tasks of a barrier fluid system SPA: pressurizing the barrier fluid and leakage compensation. The required barrier fluid pressure is achieved by an electrically or pneumatically-driven piston pump.

SPN Automatic refill units are custom designed for the application. Variable barrier pressure: 0.5 ... 120 bar (7.25 ... 1,740 PSI), max. flow rate 10 ... 600 l/h.

**SPN1000**
- Vessel capacity 20 resp. 40 l

**SPN3000**
- Vessel capacity 40, 60 resp. 200 l

Gas supply systems

Gas supply systems (GSS) are specially designed for non-contacting, gas-lubricated mechanical seals and dry-running seals. The gas taken from the supply network (e.g. air or nitrogen) is controlled and monitored by the system according to the requirements of the seals to be supplied. GSS systems are equipped with alarm and/or switch-off points depending on specific safety requirements. Centralized monitoring of the measured values is possible. Gas supply with reference to API 682, Plan 74.

The GSS series from EagleBurgmann includes three variants:

**GSS4015/A400-D0**
- (with bracket for wall mounting)

**GSS4016/A250-D1**
- (painted housing)

**GSS4016/A350-D1**
- (stainless steel housing)

Operating range
Pressure to be sealed: 0.5 ... 11 bar (7.5 ... 160 PSI)
Barrier pressure mechanical seal: 2.5 ... 13 bar (36.5 ... 189 PSI)
Design pressure: 13 bar (189 PSI), max. 16 bar (232 PSI) at +20 °C (+68 °F)
Best practice: Successful sealing solutions for our customers.

Wacker Chemie AG in Burghausen, Germany, seals a number of top entry high pressure reactors for polymer dispersion manufacturing with EagleBurgmann HSHLV-D high pressure seals with cooling flange. A shared barrier fluid system supplies all the seals. Temperature: \( t = \ldots +100 \, ^\circ C \) \((+212 \, ^\circ F)\), pressure: \( p_1 = \text{vacuum} \ldots 100 \, \text{bar} \) \((1,450 \, \text{PSI})\), rotational speed: \( n = \ldots 6 \, \text{min}^{-1} \).

A paddle dryer is used in the manufacturing of colors and pigments at BASF Colors & Effects GmbH in Ludwigshafen. The shaft is reliably sealed by an EagleBurgmann 9984 packing cartridge. To compensate for any thermal expansion, the unit is equipped with an integrated metal expansion joint, while a life-load system for the packing rings ensures long maintenance intervals without tightening of the packing. The packing unit is supplied with flushing fluid and pressurized with nitrogen with reference to TA-Luft and in order to fulfil the ATEX requirements.

Shaft diameter: \( d = 260 \, \text{mm} \) \((10.24")\), temperature: \( t = +140 \, ^\circ C \) \((+284 \, ^\circ F)\), pressure: \( p = \text{min} \).
20 mbara (0.29 PSIA), max. 5 bara (73 PSIA), rotational speed: \( n = 6 \, \text{min}^{-1} \). Medium: p-xylene, water, sodium hydroxide, salt of tetrachlorophthalic acid, pigments. Flushing fluid: p-xylene, barrier fluid: nitrogen.

In Zhuhai, China, BP operates a PTA facility with SPX Flow Technology reactors and crystallizers which are equipped with 13 EagleBurgmann HSH high pressure mechanical seals including supply systems. These include the largest agitator seal to date, weighing in at 1,500 kg.

These cartridge-type double seals with integrated bearing are balanced, self-closing and equipped with cooling flanges and houses. Parts in contact with the product are made from special titanium alloys as the acetic acid used in the process is highly corrosive. The seals are supplied by EagleBurgmann DRU systems with external coolers. Shaft diameter: \( d = 100 \ldots 480 \, \text{mm} \) \((3.94\ldots 18.90")\), temperature: \( t = \ldots +270 \, ^\circ C \) \((+518 \, ^\circ F)\), pressure: \( p = \ldots 50 \, \text{bar} \) \((725 \, \text{PSI})\).

EagleBurgmann AGSR3L-D gas-lubricated agitator seals in vacuum paddle dryers for liquid crystal manufacturing at Merck KGaA in Darmstadt, Germany. The process medium – organic crystalline substances in various solvents such as toluene and methanol – has a pronounced tendency to form deposits, so a patented flush is used upstream of the dynamic sealing element on the product side to protect the seal and to improve the cleaning efficiency. An EagleBurgmann GSS4012 is used as the barrier and flushing gas system.
A Korean chemical company seals its Bühler GmbH bead mills in their paint production with EagleBurgmann MR1S1F-D24 mechanical seals. The process medium — colored pigments with various solvents — is very abrasive.

EagleBurgmann SMAK sterile coupling applied as frequency-regulated bottom entry drive with rotational speed monitoring for agitator vessels used in pharmaceutical production at SANOFI in France. All metal surfaces in contact with the product are polished with a roughness of <0.4 μm; the elastomers are FDA compliant.

Production of dispersions at BASF Ludwigshafen, Germany. Stainless steel vessel with top entry agitator. Medium: dispersions, temperature: \( t_1 = +50 \, ^\circ C \) (+122 °F), pressure: \( p_1 = 0 \ldots 3 \) bar (44 PSI), rotational speed: \( n = 0 \ldots 30 \) min\(^{-1}\). Seal: EagleBurgmann M451KL-D20/200, barrier fluid system: EagleBurgmann SPA2020/A40, barrier fluid: glycol, barrier pressure: \( p_3 = 5 \) bar (73 PSI).

A paddle dryer from a Dutch manufacturer is deployed in a TDI (toluene diisocyanate) facility in France. After repeated failure of the original competitor seals, the dryer was successfully converted to Espey WKA300 carbon floating ring seals. This reliably prevents the emission of gaseous leakage to the atmosphere. The seal is designed to prevent any contamination of the process with barrier gas. Temperature: \( t = +110 \, ^\circ C \) (+230 °F), pressure: \( p = 1.05 \) bar (15.2 PSI), rotational speed: \( n = 45 \) min\(^{-1}\), barrier gas: nitrogen.

At GlaxoSmithKline in Singapore, four fermenters were converted to EagleBurgmann DF-MR333S1L-D double mechanical seals with DiamondFace coating. This proved necessary after process-related problems caused insufficient lubrication, dry-running and failure of the original seals. With the extremely hard and wear-resistant diamond coating of the sliding faces, significantly longer MTBFs are now being achieved. Pressure: \( p_1 \) (max.) = 1 bar (15 PSIG), \( p_2 \) (max.) = 5 bar (73 PSIG), rotational speed: \( n = 700 \) min\(^{-1}\).

Paddle dryer (Lipp Mischtechnik), frequency-controlled, for producing and drying salicylic acid at Rhodia Syntec. Medium: salicylic acid, various aromatics. Temperature: \( t = +40 \, ^\circ C \ldots +220 \, ^\circ C \) (+104 °F ... +428 °F), pressure: \( p = -1 \ldots 11 \) bar (−15 ... 160 PSI), rotational speed: \( n = 8 \ldots 80 \) min\(^{-1}\). Seals: EagleBurgmann HSMR1AL-D/180 for side entry, one seal on both the drive and non-drive end. Supply system: thermosiphon system, API Plan 53, with circulating pump.
Paddle-dryer (Lödige) for drying active ingredients for the pharmaceutical industry. Operator: Chemische Fabrik Berg. Temperature: $t = +100 \, ^\circ\text{C} \,(+212 \, ^\circ\text{F})$, pressure: $p = \text{vacuum} \ldots 0 \, \text{bar}$, rotational speed: $n = 32 \, \text{min}^{-1}$. Seal: EagleBurgmann M451KL-D21/80 with resublimation barrier with permanent flow of demineralized water. Supply system: EagleBurgmann TS2000/M226-D1, API Plan 53, barrier fluid: glycol/water, barrier pressure: $p_3 = 6 \, \text{bar}$ (87 PSI).

Glass-lined polymerization reactor (Ekato) for producing ion exchanger granules at Lanxess Bitterfeld-Wolfen, Multi-purpose plant. Medium: styrene copolymer, aromatics. Temperature: $t = +20 \, ^\circ\text{C} \ldots +150 \, ^\circ\text{C} \,(+68 \, ^\circ\text{F} \ldots +302 \, ^\circ\text{F})$, pressure: $p_1 = 0 \ldots 3 \, \text{bar}$ (44 PSI), rotational speed: $n = 15 \ldots 50 \, \text{min}^{-1}$. Seal: EagleBurgmann M481KL-D21/140 with polymerization barrier. Supply system: EagleBurgmann TS2000/M226-D1, API Plan 53. Barrier fluid: white oil. ATEX zone 1.

Pressure nutsche filter (KHS) made from Hastelloy® and steel, for drying various intermediate products at Chemie AG Bitterfeld-Wolfen, Multi-purpose plant. Temperature: $t = -10 \, ^\circ\text{C} \ldots +200 \, ^\circ\text{C} \,(+14 \, ^\circ\text{F} \ldots +392 \, ^\circ\text{F})$, pressure: $p_1 = -1 \ldots 6 \, \text{bar}$ (−15 … 87 PSI), rotational speed: $n = 5 \ldots 6 \, \text{min}^{-1}$. Seal: EagleBurgmann HSMR35AL-D/170, supply system: thermosiphon system, API Plan 53, barrier fluid: white oil. ATEX zone 1.

Plastics production at BASF Ludwigshafen, Germany. Stainless steel vessel with top entry agitator. Medium: pre-product for plastics production. Temperature: $t = +120 \, ^\circ\text{C} \,(+248 \, ^\circ\text{F})$, pressure: $p = 4 \, \text{bar}$ (58 PSI), rotational speed: $n = 147 \, \text{min}^{-1}$. Seal: EagleBurgmann M451KL-D21/80 with resublimation barrier with permanent flow of demineralized water. Supply system: EagleBurgmann TS1016/A007, barrier fluid: white oil."

Sealing of polymerization reactors with an EagleBurgmann HSMR5L-D in the manufacturing of synthetic rubber at Lanxess Germany GmbH. The process medium – monomers, water and polymers – has a tendency to stick. So flushing is used to protect the seal. An EagleBurgmann SPA4029 barrier fluid system is used as supply system.

Glass-lined stirred reactor (EHW Thale) with top entry drive for manufacturing various intermediate products for the pharmaceutical industry, for example. Used at Chemie AG Bitterfeld-Wolfen, Multi-purpose plant. Temperature: $t = -10 \, ^\circ\text{C} \ldots +200 \, ^\circ\text{C} \,(+14 \, ^\circ\text{F} \ldots +392 \, ^\circ\text{F})$, pressure: $p_1 = -1 \ldots 6 \, \text{bar}$ (−15 … 87 PSI), rotational speed: $n = 30 \ldots 100 \, \text{min}^{-1}$. Seal: EagleBurgmann M461KL-D20/100. Supply system: EagleBurgmann TS1016/A007, API Plan 53, barrier fluid: white oil.

Glass-lined polymerization reactor (Ekato) for producing ion exchanger granules at Lanxess Bitterfeld, Energizing Chemistry, Germany. Medium: styrene copolymer, aromatics. Temperature: $t = +20 \, ^\circ\text{C} \ldots +150 \, ^\circ\text{C} \,(+68 \, ^\circ\text{F} \ldots +302 \, ^\circ\text{F})$, pressure: $p_1 = 0 \ldots 3 \, \text{bar}$ (44 PSI), rotational speed: $n = 15 \ldots 50 \, \text{min}^{-1}$. Seal: EagleBurgmann M481KL-D21/140 with polymerization barrier. Supply system: EagleBurgmann TS2000/M226-D1, API Plan 53. Barrier fluid: white oil. ATEX zone 1.

Glass-lined stirred reactor (EHW Thale) with top entry drive for manufacturing various intermediate products for the pharmaceutical industry, for example. Used at Chemie AG Bitterfeld-Wolfen, Multi-purpose plant. Temperature: $t = -10 \, ^\circ\text{C} \ldots +200 \, ^\circ\text{C} \,(+14 \, ^\circ\text{F} \ldots +392 \, ^\circ\text{F})$, pressure: $p_1 = -1 \ldots 6 \, \text{bar}$ (−15 … 87 PSI), rotational speed: $n = 30 \ldots 100 \, \text{min}^{-1}$. Seal: EagleBurgmann M461KL-D20/100. Supply system: EagleBurgmann TS1016/A007, API Plan 53, barrier fluid: white oil.

Glass-lined polymerization reactor (Ekato) for producing ion exchanger granules at Lanxess Bitterfeld-Wolfen, Multi-purpose plant. Medium: styrene copolymer, aromatics. Temperature: $t = +20 \, ^\circ\text{C} \ldots +150 \, ^\circ\text{C} \,(+68 \, ^\circ\text{F} \ldots +302 \, ^\circ\text{F})$, pressure: $p_1 = 0 \ldots 3 \, \text{bar}$ (44 PSI), rotational speed: $n = 15 \ldots 50 \, \text{min}^{-1}$. Seal: EagleBurgmann M481KL-D21/140 with polymerization barrier. Supply system: EagleBurgmann TS2000/M226-D1, API Plan 53. Barrier fluid: white oil. ATEX zone 1.

Pressure nutsche filter (KHS) made from Hastelloy® and steel, for drying various intermediate products at Chemie AG Bitterfeld-Wolfen, Multi-purpose plant. Temperature: $t = -10 \, ^\circ\text{C} \ldots +200 \, ^\circ\text{C} \,(+14 \, ^\circ\text{F} \ldots +392 \, ^\circ\text{F})$, pressure: $p_1 = -1 \ldots 6 \, \text{bar}$ (−15 … 87 PSI), rotational speed: $n = 5 \ldots 6 \, \text{min}^{-1}$. Seal: EagleBurgmann HSMR35AL-D/170, supply system: thermosiphon system, API Plan 53, barrier fluid: white oil. ATEX zone 1.
The idea behind TotalSealCare is quite simple. Divided into seven modules one will find everything that makes up the best service. From full servicing of all installed seals, to stock management and on to engineering, training and electronic documentation.

Advantages: reduced costs, increased plant availability and greater reliability.

And the best thing about this is that our customers only choose the services they actually need. Because the modules are individually combinable, TotalSealCare can compile a service offer that corresponds to requirements and needs. Custom-tailored and unique in its flexibility and transparency.

Consulting & engineering
After all seals are established and analyzed in a system, we prepare standardization concepts based on an as-is status. The anticipated results are to reduce the number of seal types, the sizes and materials used and to improve the key figures of the system. We advise on the codes of practice and statutory regulations and indicate the actions that need to be taken.

Maintenance
In the plant or in the service center, qualified fitters and technicians look after all aspects of seal maintenance: installation, startup, servicing, conversion, overhaul and repair. We record and document functionally relevant data (fault causes, measures for repair, costs). This means it is possible to assess seal operating times and maintenance costs on a continuous basis, thereby defining measures for extending service intervals.

On-site service
Our on-site service includes components of overhaul service, conversions and service container. We deploy a service unit directly on the customers’ premises: equipped with the basic suite of seals, or a stock of seals discussed in advance, and staffed by qualified personnel. On-site, our work includes producing the necessary gaskets, ensuring that the documentation is complete and advising our customers on selecting and installing seals. Our range of services is rounded off by complete conversions (e.g. in accordance with TA-Luft).

Inventory management
Based on the customers’ individual requirements and the applicable quality regulations, we develop a concept for inventory management of complete seals and spare parts. We also optimize stocking on site or in the EagleBurgmann service center. This means for our customers reduces administration overhead and they can concentrate on their key operations.

Seminars & training
The EagleBurgmann Academy offers an extensive range of continuing education programs in seal technology. For service and maintenance personnel, skilled staff and engineers from various branches of the industry, such as refining, chemicals, power generation, foodstuffs, paper and pharmaceuticals. Our range includes group seminars, individual training and seminars specifically tailored to specific requirements. These seminars are held at our premises or a location of customers’ choice.

Technical analysis & support
A team of seal specialists is responsible for rectifying process malfunctions or “bad actors”. We use the latest methods such as thermography or data logging to diagnose positions that are critical to the operation of the system and work out measures to rectify this. In our research and development centers, we perform realistic tests on test rigs or in original pumps. The objective is to extend the MTBF and increase system serviceability through individual and constructive solutions.

Service agreements
Our customers are offered specific agreements that can be combined from the six service modules. Whether for individual seal systems, critical process elements, specific system areas or an extensive seal service for complete plants: the modular structure of our service makes it possible to satisfy individual requirements. With our tried-and-tested monitoring instrument, SealCare Pro, we can also record all seal-related data for documentation and evaluation purposes.
EagleBurgmann, a joint venture of the German Freudenberg Group and the Japanese Eagle Industry Group, is one of the internationally leading companies for industrial sealing technology. Our products are used everywhere where safety and reliability are important: in the oil and gas industry, refining technology, the petrochemical, chemical and pharmaceutical industries, food processing, power, water, mining, pulp & paper, aerospace and many other spheres. Every day, more than 6,000 employees in more than 60 subsidiaries contribute their ideas, solutions and commitment towards ensuring that customers all over the world can rely on our seals. Our modular TotalSealCare service underlines our strong customer orientation and offers tailor-made services for every application.