REDURA® ROD SEALING SYSTEMS
SUPERIOR DESIGNS AND MATERIALS FOR BEST PERFORMANCE
REDURA® ROD SEALING SYSTEMS
DECADES OF EXPERIENCE IN HIGH-PERFORMANCE SEALING SYSTEMS

BURCKHARDT COMPRESSION

As a compressor OEM with more than 170 years of experience, Burckhardt Compression has been setting standards for piston rod packings and packing rings for decades. Patented designs developed in-house and exhaustive material research are the perfect recipe for unique high-performance piston rod sealing systems. This vast in-house tribology and material know-how forms the basis for the comprehensive Redura® product line for rings & packings.

PACKINGS FOR EVERY APPLICATION AND DESIGN

Burckhardt Compression’s sealing philosophy is based on the operational behavior of gastight friction seals. Packing rings are typically subject to a combination of static and dynamic pressure components. This has led to the design of heterogeneous sealing systems, where pressure breakers buffer the dynamic pressure component in order to enable the subsequent sealing elements to reliably seal the gas compression chamber and minimize the leakage rate, which is influenced by the static pressure. Depending on the required performance, the heterogeneous combination of pressure breakers, support rings and true seal elements is employed to provide ideal sealing performance and longest lifetime.

REDURA® ROD PACKINGS & PACKING RINGS

With Redura® Burckhardt Compression provides a comprehensive product line of rings & packings for reciprocating compressors. It stands for reliable, durable and advanced sealing elements. The product line includes standard rings, packings as well as specifically in-house developed, designed and patented products. Redura® rings & packings are characterized by

- Longest MTBO (mean time between overhaul) at lowest leakage
- Highest availability
- Lowest life cycle costs
HIGH-PERFORMANCE SEALING SYSTEMS
FOR EVERY APPLICATION

APPLICATIONS
- Upstream oil & gas
- Gas transport & storage
- Refinery
- Petrochemical/Chemical industry
- Industrial gases
- Food & beverage industry
- Wood & charcoal industry
- Mining industry
- Power stations
- Hydro-electric power plants
- Nuclear power plants

GASES
- Hydrogen, nitrogen, argon, helium
- Hydrocarbons, ethylene, ethylene oxides
- Chlorine, ammonia
- Air, oxygen
- Nitrous oxides, carbon dioxide, carbon monoxide, sulfur dioxide
- Hydrogen sulphide, hydrogen chloride, sulfur hexafluorides, vinyl chlorides

COMPRESSOR DESIGNS AND SIZES
- Lubricated and non-lubricated
- Cooled and non-cooled
- Horizontal, vertical and inclined
- Rod diameters up to 250 mm (9.84 in)
Burckhardt Compression’s sealing philosophy is based on the operational behaviour of gastight friction seals. Since as early as 1993 we have been constantly measuring and analysing pressure distributions of dry running packings. Packings are typically subject to a combination of static and dynamic pressure components.

The two pressure components differ considerably in terms of their influence on the sealing system’s behaviour:
- Dynamic pressure component results in a high degree of wear, failure by fracture or creep
- Static pressure difference is the primary load parameter influencing the leakage rate

The distribution of the two pressure components among various sealing elements is used to optimize sealing systems:
- Pressure relieved or sealing elements with defined wear limit in the vicinity of the compression chamber to buffer the dynamic pressure difference.
- Subsequent gastight sealing elements are used to handle the static pressure.

Sealing systems designed by Burckhardt Compression typically consist of at least two different sealing element designs to ensure optimized pressure distribution.

Standard distribution of two pressure components among the various sealing elements

Optimized pressure distribution of a heterogeneous sealing system distributes dynamic pressure and reduces pressure difference for each element
REDURA® ROD SEALING SYSTEMS
PUSHING THE LIMITS
**REDURA® PACKING RINGS**

**EACH ONE A CHAMPION IN ITS DISCIPLINE**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>PRESSURE BREAKER</th>
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<tbody>
<tr>
<td><strong>RB 110</strong></td>
<td>Elaborate pressure breaker, compact and robust design for high pressure applications</td>
</tr>
<tr>
<td></td>
<td>In-house developed and patented pressure breaker (type D3)</td>
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<tr>
<td></td>
<td>Withstands the dynamic pressure component and protects the subsequent sealing rings</td>
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<tr>
<td><strong>RB 200</strong></td>
<td>High performance triple circle ring with optimized durability for dry running systems</td>
</tr>
<tr>
<td></td>
<td>In-house developed triple circle ring (type EVO)</td>
</tr>
<tr>
<td></td>
<td>Withstands the dynamic pressure component, and protects the subsequent sealing rings</td>
</tr>
<tr>
<td><strong>RB 210</strong></td>
<td>Robust pressure breaker with optimized contact surface and defined wear limit</td>
</tr>
<tr>
<td></td>
<td>In-house developed crown ring</td>
</tr>
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<td></td>
<td>Withstands the dynamic pressure component, and protects the subsequent sealing rings</td>
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<table>
<thead>
<tr>
<th>DESIGN</th>
<th>PRESSURE BREAKER</th>
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<tbody>
<tr>
<td></td>
<td>3-segment ring, step-cut joint, radial cover ring, 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter</td>
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<tr>
<td></td>
<td>Optimized tension ring geometry and anti-rotation device</td>
</tr>
<tr>
<td></td>
<td>Optimized profile and material</td>
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<tr>
<td></td>
<td>Integrated support ring</td>
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<tr>
<td></td>
<td>30 mm–130 mm (1.18 in–5.12 in) piston rod diameter</td>
</tr>
<tr>
<td><strong>RB 110</strong></td>
<td>3-segment ring, tangential to inner diameter joint, pressure relieved</td>
</tr>
<tr>
<td><strong>RB 200</strong></td>
<td>Optimized contact surface</td>
</tr>
<tr>
<td><strong>RB 210</strong></td>
<td>Defined wear limit</td>
</tr>
<tr>
<td><strong>RB 200</strong></td>
<td>Two phase sealing (contact seal followed by frictionless seal), No cover ring needed</td>
</tr>
<tr>
<td><strong>RB 210</strong></td>
<td>30 mm–250 mm (1.18 in–9.84 in) piston rod diameter</td>
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<table>
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<tr>
<th>APPLICATION</th>
<th>PRESSURE BREAKER</th>
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<tbody>
<tr>
<td><strong>RB 110</strong></td>
<td>Dry running systems</td>
</tr>
<tr>
<td></td>
<td>Lubricated systems</td>
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<tr>
<td></td>
<td>All gases</td>
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<tr>
<td></td>
<td>Multi-purpose ring</td>
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<tr>
<td></td>
<td>Up to 560 bara (8'120 psia; non-metallic)</td>
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<tr>
<td><strong>RB 200</strong></td>
<td>Highly loaded dry running systems</td>
</tr>
<tr>
<td><strong>RB 210</strong></td>
<td>Dry running systems up to 75 bara (1'090 psia)</td>
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<tr>
<td></td>
<td>Lubricated systems up to 560 bara (8'120 psia; non-metallic)</td>
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<tr>
<td></td>
<td>All gas types</td>
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</tbody>
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<tr>
<th>SPECIFIC PROPERTIES</th>
<th>PRESSURE BREAKER</th>
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<tr>
<td></td>
<td>Dynamic pressure distributor</td>
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<tr>
<td></td>
<td>Cooling needed</td>
</tr>
<tr>
<td></td>
<td>Lower running in temperatures</td>
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<tr>
<td></td>
<td>Combined with packing rings, i.e. Redura® RS type for optimized sealing systems</td>
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<tr>
<td><strong>RB 200</strong></td>
<td>Dynamic pressure distributor</td>
</tr>
<tr>
<td></td>
<td>Always support ring required</td>
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<tr>
<td></td>
<td>Cooling needed</td>
</tr>
<tr>
<td></td>
<td>Robust design</td>
</tr>
<tr>
<td><strong>RB 210</strong></td>
<td>Low friction temperatures after running in</td>
</tr>
<tr>
<td></td>
<td>Combined with packing rings, i.e. Redura® RS type for optimized sealing systems</td>
</tr>
</tbody>
</table>

1 **LEAKAGE TIGHTNESS RATING**

Minimum: ★

Maximum: ★★★★★
### PRESSURE BREAKER

- Elaborate pressure breaker, compact and combined with packing rings, i.e. Redura®
- Cooled or non-cooled packings
- Optimized running in, light tight, compact
-Dynamic pressure distributor

### PRESSURE BREAKER PROPERTIES

- Up to 560 bara (8'120 psia; non-metallic)
- Multi-purpose ring
- Dry running systems
- 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter

### SEALS

#### RB 410

- Extremely compact pressure breaker, for cooled or non-cooled packings with compact cross section
- In-house developed and patented twin packing ring
- Withstands the dynamic pressure component, and protects the subsequent sealing rings
- 1-piece ring, step-cut joint, radial cover ring
- 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter
- Dry running systems
- Lubricated systems
- High molecular weight gases
- Compact cross-section (no additional cover ring needed)

#### RS 300

- Well established sealing element for lubricated systems designed to provide remarkable sealing efficiency
- 3/6-piece classic sealing element
- Radial/tangential cut with bridge segment
- Highly efficient piston rod sealing element to handle static pressure and avoid gas leakage
- Sealing ring pair with 6 piece sealing ring and 3 piece cover ring
- 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter
- Lubricated systems
- All gases
- Dynamic pressure distributor
- Cooled and non-cooled packings
- Combined with packing rings, i.e. Redura® RS type for optimized sealing systems

#### RS 310

- Very robust sealing element for dry running systems, specific design for extended life time
- 3/3-piece classic sealing element
- Radial/penguin cut
- Highly efficient piston rod sealing element to handle static pressure and avoid gas leakage
- Sealing ring pair with 3-piece sealing ring and 3-piece cover ring
- Tangential penguin cut
- 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter
- Dry running systems
- All gases
- Pressure distribution among several rings
- Usually combined with support ring
- Special Burckhardt Compression design features allow the complete wear of the segments and therefore a remarkably prolonged lifetime
- Combination with pressure breaker RB 210

### LEAKAGE TIGHTNESS RATING

- **Newly installed:** ***
  - After extensive use: **
- **Newly installed:** **
  - After extensive use: ♠

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1. Leakage tightness is labeled using a scale where *** indicates the highest tightness and ♠ the lowest.
### Specific Application

#### Properties

- Space saving sealing ring, with extremely compact cross section
- High quality support rings prevent mechanical damage of packing rings
- Extremely reliable sealing element with maximum sealing efficiency for low pressure differences

#### Description

- **RS 400**
  - Classical sealing element (TID ring)
  - Highly efficient piston rod sealing element to handle static pressure and avoid gas leakage
  - 3-piece ring with tangential cut to the inner diameter
  - 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter

- **RC 800/810**
  - Back-up ring
  - Prevents the non-metallic sealing rings from extruding into the gap between the piston rod and the packing cup
  - RC 800: endless 1-piece ring design
  - RC 810: multiple piece radial cut
  - 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter

- **RS 900**
  - Sealing element for low pressure differences
  - Plate activated by coil springs
  - Axially preloaded sealing ring pair with double 3-piece sealing ring
  - 30 mm–250 mm (1.18 in–9.84 in) piston rod diameter

#### Design

- **RS 400**
  - Dry running systems
  - Lubricated systems
  - All gases
  - Compact cross-section (no additional cover ring needed) space-saving

- **RC 800/810**
  - Dry running systems
  - Lubricated systems
  - All gases
  - Combination with pressure breaker RB 210 and several RS type sealing rings

- **RS 900**
  - Dry running systems
  - Lubricated systems
  - All gases

#### Application

- **RS 400**
  - Support ring needed
  - Combined with packing rings, i.e. Redura® RB type for optimized sealing systems

- **RC 800/810**
  - 1-piece ring design limits the maximal packing leakage

- **RS 900**
  - Sealing element for low pressure difference needs an additional load to prevent them from being lifted from their sealing surface. Burckhardt Compression uses a coil springs activated plate. Practical experience has shown that this avoids self-locking of the rings
  - Harmonized radial and axial pre-load

#### Leakage Tightness Rating

**Newly installed:**

- **RS 400:** ****
- **RC 800/810:** ****
- **RS 900:** ****

**After extensive use:**

- **RS 400:** **
- **RC 800/810:** **
- **RS 900:** **
“WE HAVE AN EXTREMELY DEMANDING DRY-RUNNING APPLICATION WITH A VERY DIFFICULT GAS. WITH THE IMPLEMENTATION OF THE REDURA® PISTON ROD SEALING SYSTEM BURCKHARDT COMPRESSION WAS ABLE TO SUBSTANTIALLY INCREASE MTBO TO MORE THAN 2 YEARS AND LOWER THE LEAKAGE SIGNIFICANTLY EVEN FOR THIS NON BURCKHARDT COMPRESSOR. BEFORE, SERVICE LIFE ABOVE 8’000 HOURS WAS NOT FEASIBLE”

Technical Engineering Manager, Germany
APPLICATION ENGINEERING
TAILOR-MADE SYSTEM DESIGN FOR BEST PERFORMANCE

SYSTEM DESIGN

- Complete rod sealing system design
- Design solutions for every application
- Careful concept evaluation and selection based on individual specifications
- Material selection
- In-house production capabilities for all ring designs and materials

Tailor-made solutions by experienced application engineers utilizing a proprietary, highly sophisticated software program incorporating a vast range of decisive parameters based on decades of field experience.

MATERIALS

For piston rod sealing elements, pressure breakers, anti-extrusion rings, true sealing rings and side loaded elements; the following materials are primarily used:

- PTFE-compounds (with appropriate fillers)
- High temperature polymers (e.g. PEEK, PI with appropriate fillers)
- Polymer blends (dry running applications)
- Synthetic coals
- Own developed materials
- Bronze and sintered metals

For flange and packing cups: Alloyed steel, stainless steel.
The packing cases accommodate the heterogeneous combinations of piston rod sealing elements that float within precisely machined chambers to provide ideal sealing function, minimal friction and longest lifetime.

Thanks to our vast OEM in-house production capabilities the packings comply with the highest quality standards:
- Special material selection for cups and flanges
- Precision-machining of cups and flanges
- Precision-grinding and lapping of the sealing surfaces
- Designed to meet the latest API 618 standards

Plastic sealing elements are influenced by the temperature, not only in terms of physical and mechanical properties but also in terms of tribological characteristics of friction and wear. A rise in counter surface temperature directly increases the wear rate of the sealing element. Therefore effective heat removal is crucial for high sealing efficiency, low wear and longest MTBO.

Various cooling systems are designed and manufactured:
- Enclosed cooling channels
- Open cooling channel
- Longitudinal cooling
- Cooling jacket

Secondary seal to prevent leakage of gas from the main packing or inert gas from the distance piece to the crankcase. For intermediate packings a combination of true sealing rings and side loaded elements is employed.

In case of toxic or explosive gas, additional purging or buffering is applied.

¹not for sale in the US
PACKING RECONDITIONING SERVICE
LOWEST LIFE CYCLE COSTS AND HIGHEST AVAILABILITY

To ensure lowest life cycle costs and highest availability, well maintained packings are decisive for compressor performance.
Due to our comprehensive OEM know-how and in-house packing and sealing element production facilities, Burckhardt Compression can service and repair all packing types for all brands. Packings and rings are always handled by experts.
In addition to our standard service, technology up-grade to the latest developments can be executed based on your needs.

PACKING EXCHANGE SERVICE

Upon request we provide a packing exchange service including stock-keeping of the appropriate Redura® packing rings and logistics services.
We recondition your worn packings, prepare these adequately and supply the restored packings in accordance with your compressor service intervals.

SPECIAL SERVICE

- Thorough examination
- Complete disassembly
- Inspection of individual parts
- Recording of main parts condition
- OEM engineering evaluation if required
- Thorough cleaning (glass bead blasting and/or ultrasonic cleaning if necessary)
- Repair and re-machining
- Lapping and grinding of all sealing surfaces
- Dimensional checking
- Replacement of worn and damaged parts with new Burckhardt Compression quality parts
- Careful reassembly
- Quality inspection including pressure testing and cooling jacket testing if necessary
- Corrosion protection and adequate packing
**REDURA® RINGS & PACKINGS ARE CHARACTERIZED BY**

- Longest MTBO (Mean Time Between Overhaul) at lowest leakage
- Highest availability
- Lowest life cycle costs

**COMPRESSOR COMPONENTS**

- Best performance and longest lifetime
  - Compressor valves
  - Redura® rings & packings
  - Capacity control systems
  - Capital parts
  - Labyrinth piston compressor components
  - Hyper secondary compressor components

**SERVICES**

- The full range
  - Burckhardt Valve Service
  - Spare parts logistics
  - Field service
  - Technical support
  - Revamps & upgrades
  - Component repair
  - Condition monitoring & diagnostics
  - Training

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**Compressors for a Lifetime™**