SEALING SOLUTIONS FOR DRIVE SHAFTS IN THE PROCESS INDUSTRY
# TABLE OF CONTENTS

1. **CHALLENGES FOR SEALING SYSTEMS FOR DRIVE SHAFTS IN THE PROCESS INDUSTRY**  
   3

2. **EVERYTHING FROM A SINGLE SOURCE – YOUR BENEFITS**  
   5

3. **CHOOSING THE RIGHT SEALING SYSTEM**  
   6
   - Selection aid on the basis of technical details
   - Selection aid on the basis of available materials

4. **PRODUCT PORTFOLIO**  
   8
   - Simmerring®  
     8
   - Simmerring® B2PT  
     10
   - Simmerring® BlueSeal  
     12
   - Simmerring® MSS3  
     14
   - Radiamatic® HTS II  
     16
   - Gerromatic  
     18
In our everyday life, we take it for granted that food and beverages are free of germs and have an unadulterated taste. When we use detergents and body care products or take medications, we simply assume that we are holding a high-purity product in our hands. These standards, which are commonplace for us, must be guaranteed for a system manufacturer and operator in the process industry every single day. Due to the many different and often unique features of the systems and processes in the pharmaceutical, food and chemical industries, a sealing system with drive shafts can be challenging. The next page will provide you with an overview. Freudenberg Sealing Technologies has risen to these challenges and developed appropriate sealing solutions that are innovative, functional, and durable.

**FOOD & BEVERAGE INDUSTRY**

The wide variety of different applications in the food and beverage industry, such as bottling plants or mixers, place different demands on the right sealing solution. Radial shaft seals made of specially developed materials such as 70 EPDM 291, 75 Fluoroprene® XP 45 or the high-performance PTFE Y002 conform to the relevant industry-specific standards and can withstand even severe temperature fluctuations and aggressive media. Innovative product designs comply with the Hygienic Design Standards and ensure reliable sealing free of dead space even under extreme application conditions.

**THE CHALLENGES AT A GLANCE:**
- Prevention of flavor transfer
- Conformity according to Hygienic Design
- Temperature variations
- Media that contain grease
- Abrasion
- Aggressive CIP/SIP media
- Compliance with food-specific approvals, such as EU (Reg.) 1935/2004, EU (Reg.) 10/2011, FDA §177.2600, NSF 51, GB 4806 and GB 9685

**PHARMACEUTICAL INDUSTRY**

The purity requirements for the product and the process are extremely high in the pharmaceutical industry. During the synthesis of pharmaceuticals, no germs are allowed to enter the product and no undesirable by-products are allowed to form. Pharma specific applications require radial shaft seals for tablet presses, coaters and filling machines to prevent any contamination. Freudenberg Sealing Technologies has developed radial shaft seals specifically for the pharmaceutical industry that conform to Hygienic Design standards and have pharma-specific approvals.

**THE CHALLENGES AT A GLANCE:**
- High temperatures and pressures
- Powdery media
- Chemical resistance to various educts and solvents
- Conformity according to Hygienic Design
- Abrasion
- Aggressive CIP/SIP media
- Compliance with pharma-specific approvals such as USP Class VI and other relevant approvals such as EU (Reg.) 1935/2004, EU (Reg.) 10/2011, FDA §177.2600, NSF 51, GB 4806 and GB 9685
- The use of solvents
- Compliance with emission values according to the TA Luft regulation

**CHEMICAL INDUSTRY**

The chemical industry also relies on a wide variety of different processes, plants and substances. During chemical processing it is important that no harmful substances can escape from the machines. In addition, the sealing materials must be resistant to particularly aggressive, sometimes toxic chemicals and high pressures. For this purpose, Freudenberg Sealing Technologies has developed customized radial shaft seals made of robust and chemically resistant materials that can withstand these challenges.

**THE CHALLENGES AT A GLANCE:**
- Aggressive and toxic chemicals
- High pressures, temperatures and temperature peaks
- The use of solvents
- Compliance with emission values according to the TA Luft regulation
EVERYTHING FROM A SINGLE SOURCE – YOUR BENEFITS

MATERIAL EXPERTISE
- Extensive expertise in the area of premium quality elastomer and plastic materials
- In-house development and production of high-performance materials with all relevant approvals
- Own accredited test laboratory for analyses
- Extractables and Leachables studies

DESIGN EXPERTISE
- Development and calculation based on the Finite Element Method (FEM)
- Customer-specific solutions according to Hygienic Design

MANUFACTURING EXPERTISE
- Own production sites worldwide
- Production of prototypes without tool costs. Short-term requirements can be met and small series can be made available from original materials by the Freudenberg Xpress® Service

OUR KNOW-HOW on sealing solutions for drive shafts in the process industry

CONSULTING AND SERVICE EXPERTISE
- Expertise on the selection of materials and the hygienic design of sealing solutions
- Application consulting through countless tests (CIP/SIP database) and cooperation with cleaning agent manufacturers
- Global stocking program allows for fast delivery
- Laser marking
- Individual packaging concepts (individual and kit packaging, customer-specific packaging bags)
### CHOOSING THE RIGHT SEALING SYSTEM

#### SELECTION GUIDE ON THE BASIS OF TECHNICAL DETAILS

The values in the table are empirical values and may vary in individual cases.

<table>
<thead>
<tr>
<th>PRODUCT FAMILY</th>
<th>PRESSURE</th>
<th>SPEED</th>
<th>TEMPERATURE</th>
<th>WITHOUT TOOLING</th>
<th>HYGIENIC DESIGN</th>
<th>AVAILABLE</th>
<th>SATIATED FOR CIP/SIP PROCESSES</th>
<th>DRY RUNNING PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simmerring®</td>
<td>0.3 bar</td>
<td>up to 10 bar</td>
<td>-60 °C to +200 °C</td>
<td>Special design</td>
<td>No</td>
<td>Very good</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Simmerring® B2PT</td>
<td>0.5 bar</td>
<td>up to 30 m/s</td>
<td>-60 °C to +200 °C</td>
<td>Special design</td>
<td>No</td>
<td>Good</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Simmerring® MSS3</td>
<td>0.5 bar</td>
<td>up to 40 m/s</td>
<td>-60 °C to +200 °C</td>
<td>Special design</td>
<td>No</td>
<td>Good</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Gerromatic</td>
<td>0.5 bar</td>
<td>up to 25 m/s</td>
<td>-60 °C to +200 °C</td>
<td>Special design</td>
<td>No</td>
<td>Excellent</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

#### SELECTION GUIDE BASED ON AVAILABLE MATERIALS

<table>
<thead>
<tr>
<th>MATERIAL NAME</th>
<th>CROSS-LINKING / FILLER</th>
<th>COLOR</th>
<th>CONFORMITIES / APPROVALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 EPDM 291</td>
<td>70 EPDM 335</td>
<td>black</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
<tr>
<td>70 EPDM 115</td>
<td>70 EPDM 291</td>
<td>black</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
<tr>
<td>70 NBR 438</td>
<td>75 Fluoroprene® XP 45</td>
<td>light blue</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
<tr>
<td>PTFE E210</td>
<td>75 Fluoroprene® XP 45</td>
<td>beige</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
<tr>
<td>PTFE G232</td>
<td>Quantum®</td>
<td>brown</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
<tr>
<td>PTFE G224</td>
<td>Quantum®</td>
<td>blue</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
<tr>
<td>PTFE G136</td>
<td>Quantum®</td>
<td>white</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
<tr>
<td>Quantum®</td>
<td>Quantum®</td>
<td>brown</td>
<td>FDA, NSF 51, 3-A® Sanitary Standards, ADI Free, GB 4806 / GB 9685, USP Class VI Ch. 88 (In Vivo)</td>
</tr>
</tbody>
</table>

#### Sealing Solutions for Drive Shafts in the Process Industry

- **Simmerring®** (See page 8)
- **Simmerring® B2PT** (See page 10)
- **Simmerring® BlueSeal** (See page 12)
- **Simmerring® MSS3** (See page 14)
- **Gerromatic** (See page 18)

- **Excellent**
- **Good**
- **Very good**
- **Relatively good**
- **No**
Our customers appreciate the Simmerring® as a flexible, highly resilient and reliable radial shaft seal. It is available in special designs made of elastomer materials for use in the process industry that have been developed and certified for direct contact with foods and pharmaceuticals.

**BENEFITS AT A GLANCE:**
- High media resistance
- Many tools available in standard dimensions
- Adaptable to customer-specific requirements

**INSTALLATION SPACE**
Schematic diagram – valid for all Simmerring® designs

**AVAILABLE MATERIALS**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>CONFORMITIES / APPROVALS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FOOD &amp; BEVERAGE INDUSTRY</td>
</tr>
<tr>
<td>70 EPDM 291</td>
<td>black peroxide</td>
</tr>
<tr>
<td>70 EPDM 335</td>
<td>black peroxide</td>
</tr>
<tr>
<td>70 NBR 438</td>
<td>black peroxide</td>
</tr>
<tr>
<td>75 Fluorex® XP 45</td>
<td>light blue peroxide</td>
</tr>
</tbody>
</table>

**DESIGN FORMS**

- **BAUM:** Friction-optimized standard design with a rubberized outer sleeve
- **BAUMSL:** BAUM with a protective lip for heavily soiled environments
- **BAC:** Partially or fully encapsulated Simmerring® for even higher hygiene requirements
Sealing Solutions for Drive Shafts in the Process Industry

The Simmerring® B2PT PTFE radial shaft seal was developed for higher pressures and can be used under extreme thermal and chemical loads, in dry running, inadequate lubrication or stick-slip free operations. The metal housing is made of 1.4571 (V4A) stainless steel and the sealing lip is made of a high-performance PTFE compound. The design and PTFE compound can be adapted to meet customer-specific requirements.

**BENEFITS AT A GLANCE:**
- Very good thermal and chemical resistance
- Adaptable to customer-specific requirements

**AVAILABLE MATERIALS**

<table>
<thead>
<tr>
<th>MATERIAL NAME</th>
<th>FILLER</th>
<th>COLOR</th>
<th>TEMPERATURE</th>
<th>PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantum® F18245</td>
<td>PTFE</td>
<td>brown</td>
<td>-40 °C to +260 °C</td>
<td>Suited for CIP/SIP</td>
</tr>
<tr>
<td>Quantum® F53722</td>
<td>PTFE</td>
<td>white- opaque</td>
<td>-150 °C to +260 °C</td>
<td>Suited for CIP/SIP, Excellent wear properties</td>
</tr>
</tbody>
</table>

**INSTALLATION SPACE**

Schematic diagram – valid for all Simmerring® B2PT designs

**DESIGN FORMS**

- **B2PT**
  - Designed for extreme thermal and chemical loads

- **B2PT Hygienic**
  - For increased hygiene requirements

- **B2PT Split**
  - Comes with an additional dust lip
The Simmerring® BlueSeal is particularly well suited for applications with low lubrication, high speeds, extreme temperature conditions or aggressive media. The design and PTFE compound can be adapted specifically to the conditions in the customer’s application.

**BENEFITS AT A GLANCE:**
- High thermal and chemical resistance
- Friction optimized PTFE lip design
- Adaptable to customer-specific requirements

**AVAILABLE MATERIALS**
- FDA
- NSF 51
- 3-A® SANITARY STANDARDS
- ADI FREE
- GB 4806 / GB 9685
- USP CLASS VI CH. 88 (IN VIVO)
- USP CHAPTER 87 (IN VITRO)

**INSTALLATION SPACE**
Schematic diagram – valid for all Simmerring® BlueSeal designs

**DESIGN FORMS**
- BlueSeal BA
  - Standard version
- BlueSeal B1
  - Standard version with a metallic adhesive part
- BlueSeal B1 Reverse
  - With a metallic outer sheath
- BlueSeal BA Reverse Hygienic Design
  - Version with a PTFE outer sheath in “Reverse Lip Design”
The Simmerring® MSS3 is based on the design of the proven standard Simmerring® and is available with or without a dust lip. The additional PTFE lip provides protection against aggressive media and is suited for direct contact with food and pharmaceuticals using Freudenberg food contact approved PTFE compounds.

**BENEFITS AT A GLANCE:**
- Combination of non-food & beverage standard catalog articles with a food grade PTFE lip
- Available very quickly
- Adaptable to customer-specific requirements
- Many tools available in standard dimensions

**DESIGN FORMS**

**MSS3**
Modified standard design BA with a special fleece glued on or a PTFE disk as a protective lip for the finest dirt accumulation

**MSS3 Hygienic Design**
A PTFE disk covers the Simmerring® hygienically without any dead space

**INSTALLATION SPACE**
Schematic diagram – valid for all Simmerring® MSS3 designs

**AVAILABLE MATERIALS**

**MATERIAL NAME**
- 70 EPDM 291 black peroxide
- 70 EPDM 335 black peroxide
- 70 NBR 438 black peroxide
- 75 Fluoroprene® XP 45 light blue peroxide
- Quantum® PTFE F18245 brown Special
- Quantum® PTFE FS13722 white-opaque Glass

**APPROVALS / CONFORMITIES**
- EU (REG.) 1935/2004
- EU (REG.) 2023/2006
- FDA
- NSF 51
- 3-A® SANITARY STANDARDS
- ADI FREE
- GB 4806 / GB 9685
- USP CLASS VI CH. 88 (IN VIVO)
- USP CHAPTER 87 (IN VITRO)
- EU (REG.) 10/2011

**MATERIAL APPROVALS / CONFORMITIES**
- PHARMA
- FOOD & BEVERAGE INDUSTRY
- SUITABLE FOR CIP/SIP
- OUTSTANDING RESISTANCE TO WATER AND AQUEOUS SYSTEMS
- SUITABLE FOR CIP/SIP
- VERY GOOD WEAR PROPERTIES
- SUITABLE FOR CIP/SIP
- EXCELLENT RESISTANCE AT HIGHER TEMPERATURES AND/OR WITH GREASY CONTENTS
The Radiamatic® HTS II is a high-performance radial shaft seal made of PTFE that was developed specifically for the process industry. In addition to its high resistance, it is characterized by low friction and contact pressure forces of the lip on the shaft. The contact pressure is generated by the back-forming forces in the sealing lip joint in conjunction with the plastic memory effect of PTFE. This arrangement minimizes friction and at the same time provides excellent sealing. All versions with two sealing lips are also available as Hygienic Design versions.

**BENEFITS AT A GLANCE:**
- Low contact forces of the sealing lip ensure low friction and therefore low heat input
- Anti-adhesive
- The media only comes into contact with food-grade PTFE compounds
- High media and temperature resistance
- Secure fit through clamping ring technology

**AVAILABLE MATERIALS**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>COLOR</th>
<th>FILLER</th>
<th>TEMP. RANGE</th>
<th>PROPERTIES</th>
</tr>
</thead>
</table>
| PTFE Y002 | beige | Special | -80°C to +200°C / -112°F to +392°F | • Good dry running properties
• For soft mating surfaces
• Conditionally suitable for water
| PTFE G224 | blue  | Special | -80°C to +200°C / -112°F to +392°F | • Needs hard mating surfaces
• Suitable for use with water

**INSTALLATION SPACE**

Schematic diagram – valid for all Radiamatic® HTS II designs

**RADIAMATIC® HTS II**

**DESIGN FORMS**

- **HTS II 9535**
  With standard lip for a variety of applications

- **HTS II 9539 VL**
  Hygienic Design – dead space free version due to a protruding sealing lip

- **HTS II 9536 SL**
  With an additional dust lip for heavily soiled environments or alternating pressure-vacuum operation

- **HTS II 9538 DL**
  Double lip version to meet the highest demands on tightness

- **HTS II 9541 with a twist**
  With dynamic return capability for increased demands on tightness
The development of the PTFE radial shaft seal Gerromatic combines analogies from nature with the precision of today’s manufacturing processes. Like a water strider, the wave-shaped sealing lip is capable of distributing even high pressure in such a way that the structure is maintained. The seemingly effortless gliding of a water runner with minimal effort and friction can be transferred to a certain extent to the hard contact of the sealing lip with the shaft. The result is minimal heat generation and therefore minimal influence on the process material.

**BENEFITS AT A GLANCE:**
- Highest tightness for wet running
- High operating pressure up to 10 bar possible
- Excellent wear behavior
- Gentle to the process due to low frictional heat of the seal
- High media and temperature resistance
- Flexible adaptation to the installation space without any tool costs
- Secure, self-retaining fit in the housing

**INSTALLATION SPACE**
Schematic diagram – valid for all Gerromatic designs

**AVAILABLE MATERIALS**

<table>
<thead>
<tr>
<th>MATERIAL NAME</th>
<th>COLOR</th>
<th>FILLER</th>
<th>TEMPERATURE</th>
<th>PROPERTIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTFE G61</td>
<td>beige</td>
<td>Special</td>
<td>-80 °C to +200 °C / -112 °F to +392 °F</td>
<td>Good dry running properties for soft mating surfaces; Conditionally suitable for water</td>
</tr>
<tr>
<td>PTFE G69 VL</td>
<td>blue</td>
<td>Special</td>
<td>-80 °C to +200 °C / -112 °F to +392 °F</td>
<td>Needs hard mating surfaces; Suited for use with water</td>
</tr>
<tr>
<td>PTFE G62 SL</td>
<td>white</td>
<td>Glass</td>
<td>-80 °C to +200 °C / -112 °F to +392 °F</td>
<td>Needs hard mating surfaces; Suited for use with water</td>
</tr>
<tr>
<td>PTFE G68</td>
<td>white</td>
<td>Glass</td>
<td>-80 °C to +200 °C / -112 °F to +392 °F</td>
<td>For soft mating surfaces</td>
</tr>
<tr>
<td>PTFE GL22</td>
<td>beige</td>
<td>Glass</td>
<td>-80 °C to +200 °C / -112 °F to +392 °F</td>
<td>Good dry running properties for soft mating surfaces</td>
</tr>
</tbody>
</table>

**METAL MATERIAL**
- Stainless Steel 1.4571 (V4A)
- Special materials available on request

**APPROVALS / CONFORMITIES**
- EU (REG.) 1935/2004
- EU (REG.) 2023/2006
- FDA
- NSF 51
- 3-A® SANITARY STANDARDS
- ADI FREE
- GB 4806 / GB 9685
- USP CLASS VI CH. 88 (IN VIVO)
- USP CHAPTER 87 (IN VITRO)
- EU (REG.) 10/2011

**MATERIAL NAME**
- PTFE Y002
- PTFE G224
- PTFE G233
- PTFE GL16
- PTFE GL22

**COLOR**
- beige
- blue
- white

**FILLER**
- Special
- Glass
- Glass
- Glass