Compression Packing
The way to more operating efficiency
Table of content

GARLOCK COMPRESSION PACKING 3

CHOOSING THE PACKING 4

PACKING SETS

- GRAPH-LOCK® PURE GRAPHITE SEALS 8
- MODELL 212-ULE (ULTRA-LOW-EMISSIONS) 9
- 8093 DSA PUMP PACKING 10
- 9000 EVSP VALVE STEM PACKING 10
- QUICKSET® 9001 11
- QUICKSET® 9001-M 11

CONSTRUCTION AND APPLICATION EXAMPLES 12

INSTALLATION INSTRUCTIONS 13

REASONS FOR PACKING FAILURE 14

APPLICATION DATA SHEET 15
Garlock Compression Packing: The way to more operating efficiency

Garlock Compression Packing

One of the oldest sealing methods is the use of braided fibers. Due to continual industrial development, the required standards for sealing technologies in general as well as those in the compression packing sector have increased accordingly. Which has resulted in the development of new materials and led to less packing diversity. To satisfy these demands, application oriented research and the use of new fiber technologies have become vital.

The advantages of Garlock Compression Packing at a glance:
» Simple installation and service
» Easy storage
» Long service-life
» Shaft-preserving fiber quality
» Excellent leakproof force distribution

Structure and mesh design

LATTICE BRAID®
LATTICE BRAID® is Garlock’s proprietary name for a diagonal mesh that was originally developed in 1940. Each yarn passes through the packing with a 45° angle thus strengthening the packing as a whole. This makes LATTICE BRAID® an extremely homogenous, flexible and wear-free mesh. Due to its high elasticity, it exhibits no change in its quadratic cross-section even when bent around the tightest of radii.

Twofold Diagonal Mesh (Braided Mesh)
» Coarse, wear-free surface

Threefold Diagonal Mesh
» Tight mesh structure with high volume stability

Fourfold Diagonal Mesh
» Tight mesh structure with high volume stability, smooth surface, high elasticity, very high volume stability.
### Choosing the Packing

<table>
<thead>
<tr>
<th>Style</th>
<th>Description</th>
<th>Areas of application</th>
<th>pH</th>
<th>P (bar)</th>
<th>T (°C)</th>
<th>v (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PACKMASTER 1</td>
<td>The combination of asbestos-free fibers and PTFE offers an economical standard packing for pumps.</td>
<td>Pumps in mild acids and alkalis, air and dry industrial gases, petroleum and synthetic oils, aromatic and aliphatic solutions, cooling water, salt water and steam.</td>
<td>-</td>
<td>4-10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PACKMASTER 6</td>
<td>An adaptable packing made of PTFE-Graphite-Yarn woven in a Lattice Braid® mesh.</td>
<td>For pump and agitator applications with low friction values.</td>
<td>0-14*</td>
<td>20</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>5889</td>
<td>PTFE-Packing with high temperature lubrication for use in rotary service.</td>
<td>Pumps, mixers and agitators for virtually all chemicals.</td>
<td>-</td>
<td>0-14</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5904</td>
<td>PTFE-Fiber Packing with good lubrication and abrasion-resistant properties. Complies with FDA specifications.</td>
<td>Machines used in the food and pharmaceutical industry. Pumps, mixer, agitators and dryers.</td>
<td>-</td>
<td>20</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>1925</td>
<td>This packing combines the wear and temperature resistance properties of impregnated PTFE-Fiber-Yarns with the elasticity of synthetic yarns. A packing that combines highest mechanical stability with the chemical resistance of PTFE.</td>
<td>Excellent properties allow usage at high temperatures, and with abrasive and aggressive media. For pumps, valves and fittings, mixers and agitators in virtually all branches of industry.</td>
<td>-</td>
<td>1-13</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5200</td>
<td>High abrasion-resistant Aramid-Fiber-Packing with PTFE-Impregnation and high temperature lubrication.</td>
<td>For pumps in abrasive media e.g. sand and slurry as well as for chamber rings in coarse media.</td>
<td>-</td>
<td>2-12</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*except in highly oxidizing media

**Garlock Compression Packing: The way to more operating efficiency**

**Leaders in Sealing Integrity**
## Choosing the Packing

<table>
<thead>
<tr>
<th>Style</th>
<th>Description</th>
<th>Areas of application</th>
<th>pH</th>
<th>P (bar)</th>
<th>T (°C)</th>
<th>v (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8921-K</td>
<td>A synthetic packing with Aramid Corners and PTFE Impregnation (Infusion), for use in abrasive media with minimal leakage. Also suitable as a valve packing.</td>
<td>For sand, slurry and salt solutions where a long service life is required.</td>
<td>-</td>
<td>0-12</td>
<td>-110 °C up to +280 °C</td>
<td>-</td>
</tr>
<tr>
<td>8922</td>
<td>An Organic Polymer Fiber Packing developed by Garlock. Before and after the weaving process every fiber is PTFE impregnated, making it a perfect general-purpose packing for pumps and valves.</td>
<td>Pumps and agitators in strong acids, solutions, alkalis, oils, gases, steam, water and mineral oil products.</td>
<td>-</td>
<td>0-12</td>
<td>-110 °C up to +280 °C</td>
<td>-</td>
</tr>
<tr>
<td>1333-G</td>
<td>A packing braided from flexible graphite yarns reinforced with graphite fiber providing greater tensile strength. The use of the graphite filament yarns increase abrasion resistance for rotary services and anti-extrusion resistance for valve applications.</td>
<td>Pumps, valves and agitators in strong acids, solutions, alkalis, oils, gases, steam, water and mineral oil products. Also in high pressure / temperature environments due to its PTFE-free construction.</td>
<td>-</td>
<td>0-14</td>
<td>-240 °C up to +455 °C*2</td>
<td>23</td>
</tr>
<tr>
<td>98</td>
<td>This Carbon Yarn Packing offers the maximum of possibilities and profitability in virtually all high speed chemical applications. Style 98 is also an excellent valve packing.</td>
<td>Pumps, valves and agitators in strong acids and alkalis, boiler and feed water pumps.</td>
<td>-</td>
<td>0-14</td>
<td>-200 °C up to 455 °C*2</td>
<td>20</td>
</tr>
<tr>
<td>1300-E</td>
<td>A packing consisting of expanded and flexible pure graphite for maximum leak-tightness and dimensional stability. Ideal for pump and valve sealing in a wide field of applications.</td>
<td>Boiler and feed water pumps, acid pumps and valves, agitators and mixers.</td>
<td>-</td>
<td>0-14</td>
<td>-200 °C up to 455 °C*2</td>
<td>20</td>
</tr>
<tr>
<td>1303-FEP</td>
<td>This graphite packing is manufactured from a proprietary yarn consisting of several strands of high purity GRAPH-LOCK® contained by an INCONEL filament jacket, making the finished braid non-scoring and thermally conductive.</td>
<td>Pumps, valves and agitators in strong acids and alkalis. Boiler and feed water pumps. » TA-Luft as a 5 ring set » API 622 as a 5 ring set</td>
<td>-</td>
<td>0-14</td>
<td>-200 °C up to 455 °C*2</td>
<td>-</td>
</tr>
</tbody>
</table>

- except in highly oxidizing media
- 650 °C in steam

---

**Garlock Compression Packing: The way to more operating efficiency**

**Leaders in Sealing Integrity**
Choosing the Packing

<table>
<thead>
<tr>
<th>Style</th>
<th>Description</th>
<th>Areas of application</th>
<th>pH</th>
<th>P (bar)</th>
<th>T (°C)</th>
<th>v (m/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200-PBI</td>
<td>A high-pressure packing comprised of an extruded graphite-compound core with Celanese PBI® fibers, strengthened by integrated INCONEL stainless steel and a tungsten-disulfide coating as anticorrosive.</td>
<td>Valves where high temperature, pressure and chemical stability is required. e.g. in salt applications.</td>
<td>-</td>
<td>-</td>
<td>-220 °C up to +435 °C</td>
<td>-</td>
</tr>
<tr>
<td>5888</td>
<td>A PTFE packing with a high temperature lubrication for use in valves and linear services.</td>
<td>Valves and plungers with virtually all chemicals. » TA-Luft as a 5 ring set</td>
<td>-</td>
<td>0-14</td>
<td>-270 °C up to +260 °C</td>
<td>-</td>
</tr>
<tr>
<td>127-AFP</td>
<td>An excellent valve stem packing for use in high temperatures and pressures. An outer jacket of carbon yarn encapsulates the INCONEL alloy wire reinforcement woven around a flexible core.</td>
<td>Steam in power stations and chemical plants. Good resistance to chemical and petrochemical products.</td>
<td>-</td>
<td>-</td>
<td>-240 °C up to +455 °C</td>
<td>-</td>
</tr>
<tr>
<td>2091</td>
<td>A braided construction of expanded, flexible pure graphite yarn around a reinforced stainless steel wire. It combines the easy installation features of compression packing with the superior sealing properties of expanded pure graphite rings.</td>
<td>Steam with high temperature pressure combinations. Good resistance to chemical and petrochemical products.</td>
<td>-</td>
<td>0-14</td>
<td>-240 °C up to 455 °C</td>
<td>-</td>
</tr>
<tr>
<td>5882</td>
<td>A packing constructed from a high quality carbon fiber core and a PTFE shell. This combination exploits the low friction qualities of PTFE and the structural integrity of high quality carbon fibers, reducing wear whilst retaining the superior qualities of a valve packing.</td>
<td>Control valves, regulator valves where low valve stem friction is called for.</td>
<td>-</td>
<td>0-14</td>
<td>-200 °C up to 288 °C</td>
<td>-</td>
</tr>
</tbody>
</table>

* except in highly oxidizing media
** 650 °C in steam

Garlock Compression Packing: The way to more operating efficiency

Leaders in Sealing Integrity
Choosing the Packing

This chart shows plant engineers and designers the choice of packings for standard as well as custom applications. Together with our engineers, customers can either choose the most suitable packings for their requirements or develop tailor-made solutions.

<table>
<thead>
<tr>
<th>Media</th>
<th>Acids</th>
<th>Bases</th>
<th>Gases</th>
<th>Oils</th>
<th>Solvents</th>
<th>Steam</th>
<th>Water / salt-solutions</th>
<th>Media, where contamination is not an option</th>
<th>Maximum temperature in °C</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mild</td>
<td>mild</td>
<td>air exhaust</td>
<td>mineral</td>
<td>aromatic</td>
<td></td>
<td></td>
<td></td>
<td>260 - 288</td>
<td>rotary ◐</td>
</tr>
<tr>
<td></td>
<td>strong</td>
<td>strong</td>
<td>oxygen</td>
<td>synthetic</td>
<td>aliphatic</td>
<td></td>
<td></td>
<td></td>
<td>260 - 288</td>
<td>reciprocating ↔</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>260 - 288</td>
<td>valve</td>
</tr>
</tbody>
</table>

Weight table

<table>
<thead>
<tr>
<th>mm</th>
<th>Inch</th>
<th>PKM1 PKM6</th>
<th>5889</th>
<th>5904</th>
<th>1925</th>
<th>5200</th>
<th>STP 9822</th>
<th>STP 8921-K</th>
<th>1333-G</th>
<th>98</th>
<th>1300-E</th>
<th>1303-FEP</th>
<th>1200-PBI</th>
<th>5888 / 5898</th>
<th>127- AFP</th>
<th>2091</th>
<th>5882</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1/8</td>
<td>56,0</td>
<td>-</td>
<td>40,0</td>
<td>26,0</td>
<td>71,0</td>
<td>49,0</td>
<td>63,0</td>
<td>-</td>
<td>68,1</td>
<td>66,0</td>
<td>52,3</td>
<td>57,3</td>
<td>58,4</td>
<td>59,0</td>
<td>-</td>
<td>44,4</td>
</tr>
<tr>
<td>5</td>
<td>3/16</td>
<td>32,0</td>
<td>-</td>
<td>17,5</td>
<td>18,0</td>
<td>32,0</td>
<td>22,0</td>
<td>38,0</td>
<td>-</td>
<td>39,7</td>
<td>42,0</td>
<td>36,0</td>
<td>24,0</td>
<td>31,5</td>
<td>22,3</td>
<td>40,0</td>
<td>24,8</td>
</tr>
<tr>
<td>6</td>
<td>1/4</td>
<td>15,0</td>
<td>12,0</td>
<td>11,4</td>
<td>13,0</td>
<td>16,0</td>
<td>15,0</td>
<td>18,0</td>
<td>12,5</td>
<td>20,8</td>
<td>20,0</td>
<td>22,0</td>
<td>15,4</td>
<td>14,6</td>
<td>15,0</td>
<td>17,0</td>
<td>16,0</td>
</tr>
<tr>
<td>8</td>
<td>5/16</td>
<td>11,2</td>
<td>8,0</td>
<td>6,7</td>
<td>10,0</td>
<td>10,0</td>
<td>13,0</td>
<td>9,5</td>
<td>14,3</td>
<td>15,0</td>
<td>13,5</td>
<td>11,5</td>
<td>8,7</td>
<td>8,9</td>
<td>10,0</td>
<td>13,5</td>
<td>10,6</td>
</tr>
<tr>
<td>10</td>
<td>3/8</td>
<td>8,0</td>
<td>5,2</td>
<td>5,4</td>
<td>6,6</td>
<td>8,0</td>
<td>6,8</td>
<td>9,5</td>
<td>7,9</td>
<td>9,9</td>
<td>11,0</td>
<td>9,0</td>
<td>8,7</td>
<td>6,7</td>
<td>6,8</td>
<td>9,0</td>
<td>7,4</td>
</tr>
<tr>
<td>11</td>
<td>7/16</td>
<td>5,5</td>
<td>4,6</td>
<td>3,8</td>
<td>4,8</td>
<td>6,0</td>
<td>6,0</td>
<td>8,5</td>
<td>9,5</td>
<td>9,9</td>
<td>11,0</td>
<td>10,0</td>
<td>7,0</td>
<td>6,0</td>
<td>5,5</td>
<td>7,0</td>
<td>6,1</td>
</tr>
<tr>
<td>12</td>
<td>1/2</td>
<td>4,0</td>
<td>3,5</td>
<td>3,2</td>
<td>3,6</td>
<td>4,8</td>
<td>4,5</td>
<td>5,1</td>
<td>5,0</td>
<td>6,2</td>
<td>5,8</td>
<td>5,5</td>
<td>3,9</td>
<td>4,2</td>
<td>3,9</td>
<td>4,0</td>
<td>5,5</td>
</tr>
<tr>
<td>14</td>
<td>9/16</td>
<td>3,6</td>
<td>2,4</td>
<td>2,4</td>
<td>3,0</td>
<td>3,6</td>
<td>3,4</td>
<td>4,2</td>
<td>3,9</td>
<td>4,7</td>
<td>5,0</td>
<td>4,5</td>
<td>3,6</td>
<td>3,3</td>
<td>3,2</td>
<td>3,4</td>
<td>4,5</td>
</tr>
<tr>
<td>16</td>
<td>5/8</td>
<td>2,9</td>
<td>2,0</td>
<td>1,9</td>
<td>2,5</td>
<td>2,9</td>
<td>2,6</td>
<td>3,2</td>
<td>3,2</td>
<td>4,3</td>
<td>3,8</td>
<td>3,5</td>
<td>2,7</td>
<td>2,8</td>
<td>2,7</td>
<td>3,0</td>
<td>3,5</td>
</tr>
<tr>
<td>18</td>
<td>11/16</td>
<td>2,4</td>
<td>1,7</td>
<td>1,6</td>
<td>2,1</td>
<td>2,4</td>
<td>2,3</td>
<td>2,7</td>
<td>2,5</td>
<td>3,5</td>
<td>3,2</td>
<td>2,5</td>
<td>2,3</td>
<td>2,4</td>
<td>2,4</td>
<td>2,5</td>
<td>-</td>
</tr>
<tr>
<td>19</td>
<td>3/4</td>
<td>2,1</td>
<td>1,5</td>
<td>1,3</td>
<td>1,8</td>
<td>2,0</td>
<td>2,0</td>
<td>2,3</td>
<td>3,1</td>
<td>2,7</td>
<td>1,9</td>
<td>2,0</td>
<td>1,9</td>
<td>2,1</td>
<td>-</td>
<td>2,1</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>13/16</td>
<td>1,9</td>
<td>1,3</td>
<td>1,2</td>
<td>-</td>
<td>-</td>
<td>1,8</td>
<td>2,1</td>
<td>1,8</td>
<td>-</td>
<td>2,4</td>
<td>2,3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2,3</td>
</tr>
<tr>
<td>22</td>
<td>7/8</td>
<td>1,5</td>
<td>1,1</td>
<td>1,0</td>
<td>1,4</td>
<td>1,5</td>
<td>1,3</td>
<td>1,5</td>
<td>1,5</td>
<td>2,1</td>
<td>2,0</td>
<td>1,8</td>
<td>1,5</td>
<td>1,4</td>
<td>1,3</td>
<td>1,8</td>
<td>1,8</td>
</tr>
<tr>
<td>25</td>
<td>1</td>
<td>1,25</td>
<td>0,8</td>
<td>0,8</td>
<td>1,1</td>
<td>1,2</td>
<td>0,8</td>
<td>1,4</td>
<td>1,2</td>
<td>1,4</td>
<td>1,7</td>
<td>1,4</td>
<td>1,1</td>
<td>1,2</td>
<td>0,9</td>
<td>1,2</td>
<td>1,4</td>
</tr>
</tbody>
</table>

*650 °C in steam

in m / kg
Garlock Compression Packing: The way to more operating efficiency

GRAPH-LOCK® Pure Graphite Seals

Pure graphite packing rings are pre-pressed special packings for high stress valve stem sealing. Pure graphite is a binder-free sealing material with exceptional chemical and physical properties. The main application areas are the sealing of steam, hot water, heat transfer oils, acids, alkalis, solvents, oxygen and gases.

<table>
<thead>
<tr>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
</tr>
<tr>
<td>pH</td>
</tr>
<tr>
<td>Pressure</td>
</tr>
</tbody>
</table>

* 500 °C in atmosphere, 650 °C in steam, 3000 °C in an inert environment.

<table>
<thead>
<tr>
<th>Surface finish</th>
<th>Individual tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td>Rₚ ≤ 0.5 μm, Rₚ_max ≤ 2.0 μm</td>
</tr>
<tr>
<td></td>
<td>maximum stroke</td>
</tr>
<tr>
<td></td>
<td>= 1/1000 of shaft-ø</td>
</tr>
<tr>
<td>Housing</td>
<td>Rₚ ≤ 2.0 μm, Rₚ_max ≤ 0.8 μm</td>
</tr>
</tbody>
</table>
Garlock Compression Packing: The way to more operating efficiency

Modell 212-ULE (Ultra-Low-Emissions)

Braided valve stem packing
This modern packing set consists of two different compression packings that are available either in prefabricated sets or in dispensing boxes with color coded braid. The spool boxes reduce storage costs and production outage without compromising sealing performance. Outage planning is easier than ever now that each 212-ULE box indicates how many typical valves can be repacked by one box.

Benefits 212-ULE
» Environmentally friendly performance and packaging
» Double corrosion resistance
» User friendly dispensing box or prefabricated sets
» Pack stuffing boxes without specialized seal sets
» „Fire-tested“ API 589
» Low stem friction
» ISO 15848
» API 622
» TA-Luft

Ideal for
» Valves
» Critical service
» Efficient outage planning
» Hydrocarbon processing industry
» Chemical processing industry

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-200 °C to 650 °C in steam, 455 °C in ambient air</td>
</tr>
<tr>
<td>pH</td>
<td>0 – 14 (except in highly oxidizing media)</td>
</tr>
<tr>
<td>Pressure</td>
<td>310 bar</td>
</tr>
</tbody>
</table>
Garlock Compression Packing: The way to more operating efficiency

8093 DSA Pump Packing

Suitable for high-speed installation and adjustment to obtain ‘minimum-leakage’. By combining the properties of flexible graphite rings and braided packings, the Garlock 8093 DSA is the ideal fusion of these two separate conventional sealing systems.

Benefits 8093 DSA Pump Packing
» High chemical resistance
» Easy installation, no equipment modification required
» No wear of shaft or sleeve
» Split seal design makes on site installation possible even in difficult situations
» Minimum leakage
» Eliminates flush water

Technical Data
- Maximum temperature: 260 °C (455 °C with Graphit Gasket)
- pH: 0-14, except in highly oxidizing media
- Shaft speed: 20 m/s
- Pressure: 35 bar

9000 EVSP Valve Stem Packing

Valve stem packing for emission reduction
The Cup and Cone configuration of adapter and sealing rings allows a high radial expansion of both inner and outer diameters, a compression with low force requirements, which reduces valve stem friction. A readjustment of the packing by proven volume-loss (by packing or valve stem damage) is possible.

Sealing structure
» Three low density Cup and Cone GRAPH-LOCK® sealing rings
» Two high density Cup and Cone GRAPH-LOCK® adapter rings
» Two pure graphite scraper and anti-extrusion braided end rings

Benefits 9000 EVSP Valve Stem Packing
» Complies with VOC regulations to API 622
» Fire safe according to API 607 and API 589
» Also available in nuclear quality
» Low friction

Technical Data
- Maximum temperature: 650 °C in steam (455 °C in atmosphere)
- pH: 0-14, except in highly oxidizing media
- Pressure: 690 bar
QUICKSET® 9001

QUICKSET® 9001 combines the advantages of the 9000 EVSP Valve Stem Packing in an improved, even more compact design. This set is primarily designed for control valves where simplified installation and a minimum of friction is required.

QUICKSET® combines two tested, emission-reducing materials within this set: 1303-FEP Packing and 9000 EVSP. The system consists of 5 rings. Three low density pure graphite rings are held by two preformed high density 1303-FEP adapter rings. The reduction of all the rings is based on the Cup and Cone design similar to that of the 9000 EVSP. The varying graphite densities allow for both selective component compression and controlled radial expansion.

Benefits QUICKSET® 9001
- One-step-installation
- Low emission performance
- Minimum coefficient of friction
- Retorquable
- Complies with VOC regulations to API 622
- Fire safe according to API 607 and API 589

<table>
<thead>
<tr>
<th>Technical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum temperature</td>
</tr>
<tr>
<td>pH</td>
</tr>
<tr>
<td>Pressure</td>
</tr>
</tbody>
</table>

QUICKSET® 9001-M

This valve packing is a modification of the successful QUICKSET® 9001. A proprietary diffusions blocker fulfills TA-Luft regulations, while maintaining minimum friction due to Garlock’s proprietary ‘cup and cone’ design.

Benefits QUICKSET® 9001-M
- Minimum emission (TA-Luft)
- One-step-installation
- Minimum coefficient of friction

<table>
<thead>
<tr>
<th>Technical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum temperature</td>
</tr>
<tr>
<td>pH</td>
</tr>
<tr>
<td>Pressure</td>
</tr>
</tbody>
</table>
Construction and Application Examples

Packing cross section
The packing cross section should always be in relation with the shaft diameter.
The following formula is recommended:
- Pumps: $s = 1.4 \text{ to } 1.6 \sqrt{d}$
- Valves: $s = 1.0 \text{ to } 1.4 \sqrt{d}$

Number of packing rings
Normally 4-6 packing rings should be used. However, when operating conditions call for special solutions a higher number of rings can be utilized. In this case each ring should be pre-pressed.

Standard Installation

Cooling, Flushing, Lubrication

GYLON® Anti-extrusion discs
The GYLON® discs between the individual packing rings stop the extrusion of packing and lubricant.

Flushing

Chamber ring deployment
» For use of packing with a risk of probable extrusion.
The top and bottom ring protect the soft packing against extrusions.
» For bridging larger sealing gaps
Installation Instructions

Preparation
All old packing rings and residual material must be removed before commencing with a new installation. The stuffing box and shaft must be completely clean. Shafts and sleeves must be checked for wear and scoring, and if excessive, replacement is mandatory. If the sealing gap between shaft and housing is large then an anti-extrusion ring should be employed.

Valves
The following formula is recommended for the calculation of the correct packing-ring-length:
La = (d + s) x \pi x 1,03 (see sketch) and, where possible, a diagonal 45° cut should be used. Each ring should be individually pre-pressed and subsequently as set pressed by the gland follower into the end position. If compression is not possible, then a maximum of 4 rings (joints staggered and kept at least a 90° apart) should be employed. Finally the packing can be pressed by the gland follower (if necessary, where a deep stuffing box is involved, a mounting bush can be utilized). Using the same procedure, the rest of the required rings can then be pressed into position.

The required surface pressure should be approx. 2 x medium pressure, but at least 10 N/mm². Whilst tightening the gland, the stem should be repeatedly turned back and forth in order to determine valve stem forces.

Pumps
The joints of the packing rings should be pressed together whilst parallel to each other. An angle of 20° is recommended whereby the length should be calculated using the following formula:
Lp = (d + 1,5 x s) \times \pi (see sketch).
Each ring should be installed one at a time with the joints upfront. When pumps are sealed using compression packings it is both desirable and necessary that a minimal leakage should occur freely. This permits adequate cooling and lubrication. At the start therefore, the gland bolts should only be finger-tight allowing relatively high leakage so that a sudden rise in temperature can be avoided. During this approximate 15 minute run in procedure the gland bolts should be gradually tightened so that leakage is reduced to a tolerable level. The temperature of shaft and stuffing box should be monitored continually. If temperatures rise too fast then the gland must be loosened immediately. Leakage amounts are highly dependent on service data and the quality of the packing in use.
Reasons for Packing Failure

It is not always clear why a packing fails, however by carefully checking the used rings the causes can often be found.

**You find that...**

- ...one or more rings in the set are missing.
- ...parts of the packing are found between shaft and gland follower.
- ...compared to the installation data, the packing now exhibits a smaller radial thickness.
- ...the radial thickness of the packing is uneven.
- ...axial surface swelling of one more rings.
- ...the end rings are intact, the top rings however severely damaged or the packing rings show wear on their outer diameters.

**The reason is:**

- The play between shaft and housing is too large, allowing an extrusion of the packing into the handling system. Installing end rings is recommended or mounting bushings in the stuffing box.
- The play between shaft and gland follower is too large. Installing the correct anti-extrusion rings should solve the problem.
- The shaft bearings are faulty, causing the shaft to run out of true and damage the packing.
- Shaft and bore axis are offset, and this imbalance causes severe wear and scoring.
- One or more rings have been cut too short causing the following ring to be pressed into the empty space.
- Bad end ring installation. The gland pressure required for the sealing is unable to be distributed evenly through the packing set (insufficient gland pressure).
Application Data Sheet

Service
Of course you can contact Garlock for an application-specific seal construction any time. To get this service as fast as possible, please order our application data sheet, which also can be found on our website www.garlock.com.
Note:
Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent study and evaluation for suitability. For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property damage and/or serious personal injury. Performance data published in this brochure has been developed from field testing, customer field reports and/or in-house testing. While the utmost care has been used in compiling this brochure, we assume no responsibility for errors. Specifications subject to change without notice. This edition cancels all previous issues. Subject to change without notice GARLOCK is a registered trademark for packings, seals, gaskets, and other products of Garlock. © Garlock Inc 2016. All rights reserved worldwide.