Garlock Valve Packing

Valve packing and fugitive emission control products
Valve Packing: Fugitive Emissions Control Products

**STYLE 1303-FEP**

Garlock Style 1303-FEP combines the low emissions performance of engineered sets with the flexibility and convenience that comes with spool stock compression packing.

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Construction</th>
<th>High-purity GRAPH-LOCK® flexible graphite and 0.004&quot; INCONEL® filament</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-328°F (-200°C) to 850°F (455°C) atmosphere; to 1,200°F (650°C) steam**</td>
</tr>
<tr>
<td>pH range</td>
<td>0-14 (except strong oxidizers)</td>
</tr>
<tr>
<td>Pressure</td>
<td>to 4,500 psi (310 bar)</td>
</tr>
</tbody>
</table>

*INCONEL® is a registered trademark of Inco Alloys International, Inc.
** For applications over 1,000°F (538°C), please contact Garlock Applications Engineering

**ADVANTAGES & FEATURES**

<table>
<thead>
<tr>
<th>High performance</th>
<th>Style 1303-FEP has been engineered to deliver compliance to the most stringent VOC (volatile organic compounds) and VHAP (volatile hazardous air pollutant) emission regulations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to use</td>
<td>This single spool stock packing is a quick efficient solution for on the spot field maintenance and repair. It is available in ring sets as well for convenience in planned or scheduled maintenance.</td>
</tr>
<tr>
<td>Safety</td>
<td>This Style has proven itself as class leading sealing solution and is well recognized in hydrocarbon and chemical processing industries. It is a reliable solution, ideally suited for valve stem sealing and is fire safety tested.</td>
</tr>
</tbody>
</table>

**INDEPENDENT LAB TEST RESULTS**

<table>
<thead>
<tr>
<th>API-622 2nd Ed. - Fugitive Emission Test</th>
<th>Average Leakage</th>
<th>Maximum Leakage</th>
<th>Required Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 PPMv</td>
<td>8 PPMv</td>
<td>0</td>
</tr>
</tbody>
</table>

**ENVIRONMENTAL VALUE**

» This Garlock valve stem packing product has been tested to Fugitive Emission Standards ISO-15848-1 and API 622 2nd Ed., demonstrating Garlock’s superior sealing performance.
**Valve Packing: Fugitive Emissions Control Products**

**GARLOCK STYLE 212-ULE VALVE STEM SPOOL PACKING**

Optimized performance and planning with a convenient easy to use spool box product. 212-ULE offers the fire safety and chemical resistance of our other low emission valve stem packing products.

**HOW TO INSTALL 212-ULE**

When packing a valve, pack 2 rings of “Packing B”, then one ring of “Packing A”, then 2 additional rings of “Packing B”, giving you a B-B-A-B-B configuration (or 212). This minimizes valve emissions and reduces torque actuation forces. For stuffing boxes deeper than 5 rings, please order Garlock Style 1998-EZ Bushing.

**IDEAL SET CONFIGURATION**

**212-ULE BOX ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Packing Cross Section</th>
<th>Style B</th>
<th>Style A</th>
<th>Average Stem Diameter</th>
<th>Avg Number of Valves Packed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inches</td>
<td>Ft</td>
<td>Lbs</td>
<td>Ft</td>
<td>Lbs</td>
</tr>
<tr>
<td>1/8</td>
<td>65.5</td>
<td>0.8</td>
<td>16.4</td>
<td>0.3</td>
</tr>
<tr>
<td>3/16</td>
<td>127.6</td>
<td>3.6</td>
<td>31.9</td>
<td>0.9</td>
</tr>
<tr>
<td>1/4</td>
<td>98.2</td>
<td>4.3</td>
<td>24.5</td>
<td>0.9</td>
</tr>
<tr>
<td>5/16</td>
<td>50.7</td>
<td>3.0</td>
<td>12.7</td>
<td>0.8</td>
</tr>
<tr>
<td>3/8</td>
<td>45.2</td>
<td>3.5</td>
<td>11.3</td>
<td>1.0</td>
</tr>
<tr>
<td>7/16</td>
<td>38.6</td>
<td>4.3</td>
<td>9.7</td>
<td>1.0</td>
</tr>
<tr>
<td>1/2</td>
<td>22.3</td>
<td>3.8</td>
<td>5.6</td>
<td>0.7</td>
</tr>
<tr>
<td>9/16</td>
<td>26.5</td>
<td>4.9</td>
<td>6.6</td>
<td>1.2</td>
</tr>
<tr>
<td>5/8</td>
<td>29.5</td>
<td>7.4</td>
<td>7.4</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**ADVANTAGES & FEATURES**

- **Easy to use**
  Style 212-ULE is easy to cut and install. It is conveniently supplied in a dispenser box package with color coded instructions.

- **Lower your costs**
  Cut inventory dollars and reduce outage schedules without sacrificing performance. Outage planning is easier than ever with 212-ULE box showing the amount of typical valve that can be repacked. A few boxes of different cross section sizes allow for quick response and efficient coverage of outage requirements.

- **Low stem friction**
  Style 212-ULE combines two packing types to lower friction while maintaining optimal sealing performance.

**INDEPENDENT LAB TEST RESULTS**

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Average Leakage</th>
<th>Maximum Leakage</th>
<th>Required Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>API-622 2nd Ed. - Fugitive Emission Test</td>
<td>1 PPMv</td>
<td>5 PPMv</td>
<td>0</td>
</tr>
</tbody>
</table>

**SPECIFICATIONS**

- **Temperature**
  -328°F (-200°C) to 1,200°F (650°C) steam
  850°F (455°C) atmosphere

- **pH range**
  0-14 (except strong oxidizers)

- **Pressure, Max**
  to 4,500 psig (310 bar)

*NOTE: For applications over 1,000°F (538°C), please contact Garlock Applications Engineering*
Valve Packing: Fugitive Emissions Control Products

9000-EVSP LE

Style 9000 EVSP LE is configured to optimize performance in fugitive emission application. This field proven set design allows a precise fit and an easy installation.

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>GRAPH-LOCK® rings of high-purity diamond texturized graphite tape, in cup and cone configuration; end rings made from Garlock 1303-FEP</td>
</tr>
<tr>
<td>Temperature</td>
<td>-328°F (-200°C) to 850°F (455°C) atmosphere to 1,200°F (650°C) steam</td>
</tr>
<tr>
<td>pH range</td>
<td>0-14 (except strong oxidizers)</td>
</tr>
<tr>
<td>Pressure</td>
<td>to 10,000 psi plus (690 bar)</td>
</tr>
</tbody>
</table>

ADVANTAGES & FEATURES

Forgiveness

Our ring set with patented cup and cone design, delivers higher precision fit to optimize field performance.

Cost effectiveness

The EVSP design permits a controlled radial expansion to create an effective seal against both valve stem and bore. This engineered set can be used to seal older more worn valves. Emission compliance can be achieved without necessarily replacing valves or the maintenance expense of bringing the valves back to manufacturer’s specifications.

Safety

This Style is fire safety tested and chemical resistant. It is well recognized in hydrocarbon and chemical processing industries as a reliable and ideally suited solution for low emission valve stem sealing.

ENVIRONMENTAL VALUE

» This Garlock valve stem packing product has proven itself to be an efficient and reliable solution to improve air quality by lowering VOC (volatile organic compounds) and VHAP (volatile hazardous air pollutant) emissions.

Fugitive Emissions Standard compliance: ISO-15848-1

* Patent #4,328,974
Valve Packing:
Fugitive Emissions Control Products

**9001-QUICKSET® LE - LOW EMISSION**

» This QUICKSET® version is configured to offer the best fugitive emissions sealing performance in shallow stuffing boxes

» The field proven Garlock “cup and cone” design permits a controlled radial expansion to create an effective seal against both valve stem and bore

» This engineered set is well suited to seal older or more worn valves. Emissions compliance can often be achieved without the expenses of bringing the valves back to manufacturer’s specifications

**SPECIFICATIONS**

| Construction | Die-formed cup and cone rings combined with die-formed, high-density Style 1303-FEP end rings with active and passive corrosion inhibitors. |
| Temperature | -328°F (-200°C) to 850°F (455°C) atmosphere to 1,200°F (650°C) steam |
| pH range | 0-14 (except strong oxidizers) |
| Pressure | to 10,000 psi plus (690 bar) |

**STANDARD COMPLIANCE**

API-622 2nd Edition: <100 PPMv, No-adjustment

Fire tested to API-589, API-607 4th Edition

**STYLE 1998 EZ BUSHING**

“Bushing on a Spool”

» Style 1998 EZ-Bushing was designed for use as a bushing material with the convenience of being readily available in bulk form and custom cut to length on site

» This not only minimizes downtime but also reduces inventory investment of custom machined bushings

» Low stem friction

» Environmentally friendly packaging

» Pack stuffing boxes without ordering special carbon or stainless bushings

» Easily removed from stuffing box

» Easy to use dispensing box

**SPECIFICATIONS**

| Construction | INCONEL® reinforced |
| Temperature | to 850°F (455°C) |
| pH range | 2-11 |

*NOTE: Recommended for use as a bushing material only*

QUICKSET® 9001 Typical Ring Arrangement

Also available with 1303-DRY adapter rings to optimize oxidation resistance at higher temperatures

For technical assistance, call 1-877-GARLOCK or email questions to: gst.packingapps@garlock.com

Leaders in Sealing Integrity
Valve Packing: Power Generation, Steam

STYLE 5882
The power generation industry is challenged with achieving leak free valve sealing combined with responsive and smooth valve actuation. Our 5882 Series product offering addresses these industry needs with an easy to install, stable, low friction valve stem packing.

OPTIMIZING FRICTION & STRUCTURAL STABILITY
Low friction products offerings:
» Garlock Style 5882 is constructed from a high quality carbon fiber core and a PTFE shell, optimizing the low friction qualities of PTFE and the structural integrity of high quality carbon fiber. Packing is available in spool stock and die formed ring sets for end user convenience.
» Style 5882 LSP is a combination set of GRAPH-LOCK® and Style 5882 rings for nuclear applications.

ADVANTAGES

<table>
<thead>
<tr>
<th>Low Friction</th>
<th>Up to 20% lower friction than leading competing products made from innovative materials and technology.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customizable: Material &amp; Bushings</td>
<td>All standard sizes available. These products can be formed to almost any dimensions. We offer custom fabricated carbon bushings for optimizing box depth and set performance.</td>
</tr>
<tr>
<td>Simplified Planning</td>
<td>Planning for an outage? Formed sets provide you with a convenient way to know you have exactly what you need.</td>
</tr>
<tr>
<td>Quality</td>
<td>Use of highest quality and purity materials combined with our workmanship allows us to provide consistent and reliable products for safety and performance.</td>
</tr>
</tbody>
</table>

BENEFITS
» Potential cost reduction by reducing size of required actuator
» In service solution for undersized actuators in trouble applications
» Convenience of die formed or mandrel cut spool stock

LOW FRICTION TEST RESULTS
» Gland stress of 3560 psi
» Representative 1.5 cycle from 250 cycle test. Full test results available through Garlock Engineering
» No pressure

CONFIGURATIONS
» Continuous
   – Style 5882 Spool
» Discrete
   – Style 5882 die formed, bevel cut rings
   – Style 5882 LSP
   · Die formed engineered graphite
   · Style 5882 end rings

IDEAL FOR:
AOV (Air Operated Valves)
» Steam
» Water
» Process Control
» Air

SPECIFICATIONS

<table>
<thead>
<tr>
<th>Construction</th>
<th>PTFE fiber over braided carbon core</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-200°F (-130°C) to 550°F (288°C)</td>
</tr>
<tr>
<td>pH range</td>
<td>0-14</td>
</tr>
<tr>
<td>Pressure</td>
<td>to 3500 psi (242 bar) in valves**</td>
</tr>
</tbody>
</table>

Actuation Force [lb]

<table>
<thead>
<tr>
<th>Competitor 1</th>
<th>Competitor 2</th>
<th>Garlock Style 5882</th>
</tr>
</thead>
</table>
Valve Packing: Power Generation, Steam

**STYLE 1298**
Your premium sealing solution for steam pressure service.

» This packing will offer a steady performance over a wide range of temperature and pressure for your power generation application. It will stay conformable, flexible and will seal even under high glen load pressure.

» The combination of high ends components used in the style 1298 allows the packing to conform to stem and bore to seal efficiently for a longer period. The Individually impregnated yarns enhance sealability, resistance to chemical and eliminate possible stem scoring to improve the equipment operation and life.

» Remains dimensionally stable at high temperatures

» Great resistance to chemical and solvent

» Improve equipment operation and life.

**SPECIFICATIONS**

| Construction | PBI yarn with encapsulated wire reinforced (Inconel) braided over a flexible LATTICE BRAID® carbon yarn core |
| Temperature  | to 850°F (455°C) atmosphere  
               to 1,200°F (650°C) steam |
| pH range     | 0-12 (except strong oxidizers) |
| Pressure     | to 4,500 psi (310 bar) |

**STYLE 1200PBI**
A field proven product designed for steam pressure service in the power generation industry.

» Constructed with Inconel wire encapsulated in fiber that improves equipment operation and life.

» The flexible surface allows for the packing to conform to stem and bore to seal efficiently for a longer period.

» Remains dimensionally stable at high temperatures

» Excellent resistance to chemicals and solvents.

**SPECIFICATIONS**

| Construction | PBI yarn with encapsulated wire reinforced (Inconel) braided over extruded plastic core with wire reinforcement (Inconel) |
| Temperature  | to 850°F (455°C) atmosphere  
               to 1,200°F (650°C) steam |
| pH range     | 0-12 |
| Pressure     | to 2,500 psi plus (172 bar) |

Inconel is a registered trademark of Special Metals Corporation group of companies

For technical assistance, call 1-877-GARLOCK or email questions to: gst.packingapps@garlock.com

Leaders in Sealing Integrity
Valve Packing Performance Enhancement
Accessories

HIGH PURITY CARBON BUSHINGS
Our testing has determined that the optimal number of rings to seal a valve stem is between 5 and 7. Any less than 5 rings increases the chance of leaks, any more than 7 puts too much drag on the stem. Garlock uses high purity carbon bushings or Style 1998 EZ-Bushing to shorten deep stuffing boxes like those that are typically found in older valves. When combined with our radially expanding valve stem solutions, our high purity bushings allow excellent sealing with low actuation force which enables old, manual valves to be fit with air actuators and seal like new. Further, our bushings are made to such exacting material and dimensional standards that they can even be certified for nuclear service.

Bushings can also be made from 1303-DRY. While this approach adds some friction to the stem, it is an ideal choice when the valve stuffing box depth cannot be determined prior to repacking.

LIVE LOADING HARDWARE
Even with its densified graphite construction, an EVSP set can consolidate by up to 2% over its service life. While this is not an issue for valves that can be easily monitored and adjusted, it does pose a problem for valves that are off the routine maintenance path. Additionally some service conditions, like severe temperature swings or frequent opening and closing, can accelerate consolidation. Garlock’s solution for those types of applications is Live Loading. Live Loading can compensate for packing consolidation of up to 3% and, when used with EVSP, can virtually eliminate the need for adjustment. It does not however, put a constant compressive force on the seal. If you use live loading with a braided packing like 1303-FEP, it will significantly extend the time between adjustments but adjustments will still be required.

We stock a wide range of spring washers so we can respond to most needs within 48 hours.

RECOMMENDED IN THE FOLLOWING CONDITIONS:
» Valves with difficult access
» High degree of thermal cycling
» "Critical" to operation of facility
» Frequently actuated
» Control valves
» Controlled emissions levels
» High levels of packing consolidation

WARNING:
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.

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