

## STYLE 9000EVSP - LE

### SECTION 1: GARLOCK LOW EMISSION PACKING INSTALLATION

These guidelines and instructions are applicable to our valve stem packing products when best sealing is desired for fugitive emission control. Refer to our General Valve Packing Instructions (in Section 2) to find installation instructions for steam or other applications requiring different performance considerations.

#### 1.1 VALVE CONDITION ASSESSMENT

Packing is designed to conform under axial load and generate radial load on stem and inside of the stuffing box. A smooth surface will create best seal with the packing and allow it to consolidate and fill any void properly when loaded by the gland follower. Therefore, it is necessary to assess conditions

of all the parts of the valve involved and fix or replace what is necessary. Here are important features to verify:

» Inspect Stuffing box and stem: Both should be clean and be free of burrs, pitting, scoring or corrosion on surface. The box bottom should be flat. If box bottom is beveled, we recommend the use of a system compatible braided packing ring to be installed at the bottom of the stuffing box (before the bushing if one is necessary). Unless the bushing is already designed to accommodate the bottom beveled angle of the box.

» The valve stem surface should be smooth and not present scratches, pits or scores. Any found shall not exceed 0.002" (.051 mm) depth and/or depth-to-width ratio greater than 1.00.

» Stem surface finish recommended: 16 - 32  $\mu$ inch (0.40 - 0.81  $\mu$ m) AARH.

» Stuffing box inner surface should be smooth and not present scratches, pits or voids found to be deeper than 0.006" (.152 mm). For best FE sealing, a bore finish: 63  $\mu$ inch (1.60  $\mu$ m) AARH or less is recommended. (Bore finish shall not exceed 125  $\mu$ inch (3.20  $\mu$ m) AARH)

» Valve stem warpage/runout must be checked over of the entire length of the stem and shall not exceed 0.001 in/in

» Inspect gland follower and packing bushing or spacer (if applicable). The surface in contact with packing should be flat. The inside diameter (ID) to stem clearance should not exceed .060" (1.52 mm). The outside diameter (OD) to stuffing box bore should not exceed .030" (.76 mm).

» Inspect Gland flange. It should be straight.

» Inspect fasteners. These need to be in new or near new condition to ensure that torque load is transferred properly to gland follower and packing set. Gland bolts and nuts shall run freely on the threads. Before fastening and tightening, an anti-seize lubricant needs to be applied on gland nuts and bolts. Use of hardened flat washers is highly recommended to prevent wear and damage to fasteners and gland flange. The lubricant shall not contain any potential volatile organic compounds (VOC).

**CAUTION: Follow plant safety procedures to ensure valve is out of service and can be handled safely before moving forward with installation. Review below instructions carefully before proceeding with packing replacement.**

#### 1.2 9000 EVSP LE (WITH 1303-FEP END RINGS) INSTALLATION

Read the instructions entirely before beginning installation.

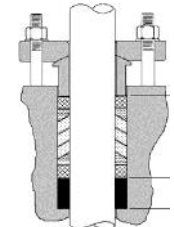
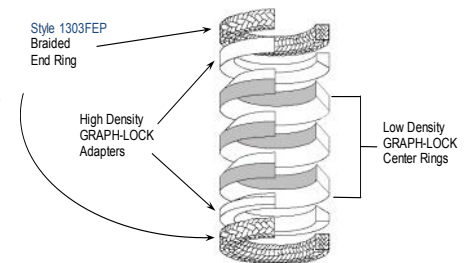
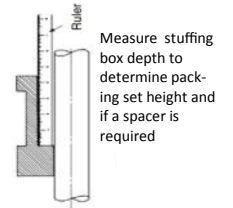
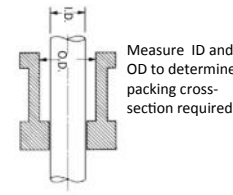
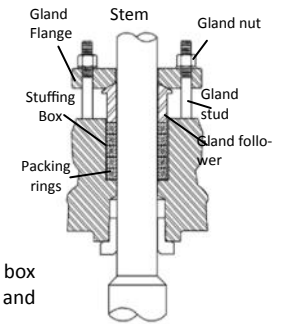
1. Raise the valve to the full open position. Remove all of the old packing from the stuffing box and dispose properly.
2. Inspect stuffing box for wear and cleanliness. Replace worn parts and clean as required to meet stuffing box condition requirements (see section 1.1- valve condition assessment).
3. Verify fit of packing size by measuring stem diameter (inner dimension) and stuffing box bore diameter (outer dimension). Subtract inner dimension from outer dimension and divide by two for the cross sectional size of packing.
4. Measure the depth of the stuffing box. Packing set should be compressed 30 % minimum during install.
5. From the Required Box Depth Chart, determine the number of rings to be used in the set (5, 6, or 7), depending on available stuffing box depth. All the rings in the supplied set should be used whenever possible.
6. Use a bushing\* to fill stuffing box if depth is greater than height of uncompressed packing set. A bushing should also be used if the gland follower is short and gland flange could bottom out leaving no room for future adjustment. To determine bushing height, subtract the Required Box Depth from the actual box depth (Step 4).

\*If help is required for appropriate bushing sizing please consult Garlock representative.

7. Install the bushing, and then install the bottom 1303-FEP ring. Use the gland follower or an extra bushing to compress the braided ring and make sure it sits on the bottom properly. Install the GRAPH-LOCK rings, offsetting the seam of each ring by 90 degrees clockwise from that of the previous ring. Do not lubricate the rings. Push each ring down until it contacts the one below it. The flat top of the GRAPH-LOCK adapter should be approximately flush or close to the edge of the stuffing box. Do not install the top 1303-FEP ring at this time.
8. Apply compression to the lower rings with the gland follower by tightening down on the gland bolts to the Minimum Recommended Torque (see below equation). This will consolidate the packing set and create enough room to enable the top 1303-FEP ring to be installed. Verify that gland follower is equally centered around the stem during tightening process or it will result in side loading the packing and/or possible contact with the stem.
9. Install the top braided ring and apply minimum recommended torque to packing set with gland nuts using a torque wrench\*\*. Alternately tighten the nuts until the desired torque is reached.

\*\*If a torque wrench is not readily available, a work around compromise would be to apply 30% compression minimum.

10. Check to make sure there is a minimum of 0.125" (3.2 mm) gland follower penetration into the stuffing box and that there is sufficient gland follower remaining for future adjustment.
11. Perform a cycle and adjust procedure (see below Section 1.3). Gland nut torque should be re-checked and re-adjusted if necessary within 2 weeks after putting the valve into service.
12. Attach a tag to the valve for recording:
  - a. Final gland nut torque – manufacturers recommended load
  - b. Date of the completed installation
  - c. Date of the follow-up gland nut torque check and measured or re-torque load if applicable.



# Valve stem packing installation instructions

## STYLE 9000EVSP - LE

### 1.3 CYCLE AND ADJUSTMENT PROCEDURE

To ensure an even compressive load throughout set:

The cycle and adjust procedure will reduce the likelihood of gland load loss over time. This procedure bolsters distribution of the compressive load (axial load) throughout the packing set and be converted into radial sealing stress by each packing ring. Optimal radial stress will be reached when gland load remains stable.

1. Install and compress packing set per guidelines and instructions (above).
2. Raise the valve stem to full open (up) position.
3. Check torque on gland stud nuts to establish a reference torque (this will be the torque applied that was calculated by using the recommended torque calculation formula gland load).
4. Actuate the stem through 3 full cycles.
5. Check the stud nut torque. If there has been any torque loss, alternately retighten the nuts to the reference value established above (step 3) or until the desired torque is reached.
6. Repeat steps 4 and 5 until no significant torque loss occurs after actuation.

### EQUATION FOR RECOMMENDED TORQUE - GLAND LOAD\*

$$\text{Torque} = 111.3 (D^2 - d^2) (\emptyset) / B$$

Where:

T = Torque on each bolt (FT-LBS)

D = Bore diameter (inches)

d = Stem Diameter (inches)

$\emptyset$  = Gland bolt diameter (inches)

B = Number of gland bolts

\*The torque calculated by this equation will yield a gland load of 8500 psi.

A detailed explanation of the torque calculation can be found in Low Emission Packing Owner's Manual - Appendix A. This document is available on-line

**CAUTION: Follow plant safety procedures to ensure valve is out of service and can be handled safely before moving forward with installation. Review below instructions carefully before proceeding with packing replacement.**

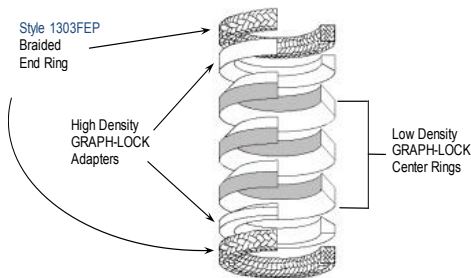
## SECTION 2: GENERAL 9000EVSP SIMPLIFIED VALVE STEM PACKING INSTALLATION INSTRUCTIONS

These general instructions are applicable to 9000 EVSP valve stem packing products used in steam or other applications not requiring fugitive emission control.

Refer to our Low Emission packing installation instructions in Section 1, when fugitive emission control is most important consideration.

Note: Before installation of the #9000 EVSP Simplified set, open the valve to full open (or as close as possible) position.

1. Remove all of the old packing from the stuffing box. Clean box and stem thoroughly and examine stem for wear and scoring. Replace stem if wear is excessive. Recommended surface finishes are 32 (micro inches) AARH on the stem, and 125 (micro inches) AARH maximum on the box bore.
2. Measure the depth of the stuffing box. From the Required Box Depth Chart, determine the number of rings to be used in the set (5, 6, or 7), depending on available stuffing box depth. 7-ring sets should be used whenever possible.
3. To determine bushing height, subtract the Required Box Depth from the box depth (Step 1). If bushing length is calculated to be less than two cross-sections, extra rings of packing should be used to fill the excess space.



4. NOTE: If the stuffing box bottom is beveled, install a braided ring first, and then install the bushing.
5. Install the bushing, and then install the bottom braided ring and all GRAPH-LOCK rings (flat GRAPH-LOCK adapter should be approximately flush to the top of the stuffing box if calculations were done properly). Do not install the top braided ring at this time. Without measurement, compress the packing with the follower enough to enable the top braided ring to be installed.
6. Install the top braided ring and compress to a penetration distance of :
  - a. 1 cross-section for a 7-ring set
  - b. 3/4 cross-section for a 6-ring set,
  - c. or 1/2 cross-section for a 5-ring set.
7. Check the torque on the gland stud nuts to establish the referenced torque (or tightness) value.
8. Actuate the stem through two or three closing stem revolutions (or through a closing stem travel of 1 to 1-1/2 cross-sections).
9. Check the stud nut torque (or tightness) and restore to referenced torque value.
10. Repeat Steps 8 and 9 at least 5 times, or until no significant amount of stud nut torque decay is noted after the stem actuation.

The above guidelines will yield a 30% compression factor. Additional compression may be required if excessive packing ring to stem/box bore surface clearances exist.

### Required Box Depth Chart

Packing Cross-Section	Required Box Depth / Set		
	7-Ring	6-Ring	5-Ring
1/8"	.750	.625	.500
3/16"	1.125	.937	.750
1/4"	1.500	1.250	1.000
5/16"	1.875	1.563	1.250
3/8"	2.250	1.875	1.500
7/16"	2.625	2.188	1.750
1/2"	3.000	2.500	2.000
9/16"	3.375	2.813	2.250
5/8"	3.750	3.125	2.500
11/16"	4.125	3.438	2.750
3/4"	4.500	3.750	3.000
13/16"	4.875	4.063	3.250
7/8"	5.250	4.375	3.500
15/16"	5.625	4.688	3.750
1"	6.000	5.000	4.000