Valve stem packing installation instructions

STYLE 9001 QUICK-SET®

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 the General Valve Packing Instructions in Section 2 to find installation instructions for all 9001-QS product configurations intended 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 μinch (0.40 - 0.81 μm) 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 box finish: 63 μinch (1.60 μm) AARH or less is recommended. (Bore finish shall not exceed 125 μinch (3.20 μm) AARH)
- Valve stem warpage/runout must be checked over 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” (.152 mm). The outside diameter (OD) to stuffing box bore shall 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).

1.2 9001 QUICK-SET 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 to compare with the cross sectional size of packing.
4. Measure the depth of the stuffing box. Packing set should be compressed 30 % minimum during install.
5. All the rings in the supplied set should be used.
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 adapter ring. Make sure the braided ring sits flat and properly on the bottom. Do not heavily compress the ring. 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. Install the last (second) 1303-FEP adapter ring. The flat top of this last ring should be approximately flush or close to the edge of the stuffing box.
8. Apply compression to the lower rings with the gland follower by tightening down on the gland nuts to the Minimum Recommended Torque (see below equation) using a torque wrench**. Alternately tighten the nuts until the desired torque is reached. This will consolidate the packing set. 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.
   **If a torque wrench is not readily available, a work around compromise would be to apply 30% compression minimum.
9. 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.
10. 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.

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.
Valve stem packing installation instructions

(SECTION 1 STYLE 9001 QUICK-SET® 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.

STYLE 9001 QUICK-SET®

SECTION 2: GENERAL 9001-QUICKSET® VALVE STEM PACKING INSTALLATION INSTRUCTIONS

These general instructions are applicable to all 9001-QS 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 for 9001 QUICK-SET® LE (9001-QS WITH 1303-FEP END RINGS), when fugitive emission control is the most important consideration.

1. Open the valve to full open (or as close as possible) position.
2. 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 63 (micro inches) AARH maximum on the box bore.
3. Select a properly sized QuickSet. Verify the correct cross section (CS) by measuring outside diameter (OD = stuffing box bore) and inside diameter (ID = stem diameter). Calculate required CS = (OD - ID)² / 2.
4. A standard Quickset is a five ring set. The set will need to be compressed a minimum 30% during install. The compressed height of packing set will therefore be 70% of uncompressed set height. The set will be compressed appropriately during tightening, when the mark hits the edge of the top of the stuffing box.
5. Check the gland stud nuts with a pen. This mark should be at distance measured from the top edge of the stuffing box, marked safely before moving forward with installation. Review below instructions carefully before proceeding with packing replacement.

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. Install the QuickSet, seating each ring properly, and staggering the ring joints by 90 degrees. Do not lubricate the packing. Then install braided bushing ring(s) if any are required.
2. After the last ring is installed, bring down the gland follower against the top ring.
3. Apply 30% compression to the packing set. A guideline can be set by marking the follower with a pen. This mark should be at distance measured from the top edge of the stuffing box and equal to the differential between calculated compressed QuickSet height and measured uncompressed set height. The set will be compressed appropriately during tightening, when the mark hits the edge of the top of the stuffing box.
4. Check the torque on the gland stud nuts to establish the referenced torque (or tightness) value. If possible, record the gland nut torque values and actuate the valve through five complete cycles (ending with the stem in the down position). Retighten the gland bolt nuts to the previously recorded torque value after each full actuation.
5. A minimum of 1/8" gland penetration into the stuffing box is necessary with sufficient gland follower remaining for future adjustments.

EQUATION FOR RECOMMENDED TORQUE - GLAND LOAD* FOR FUGITIVE EMISSION SERVICE (SECTION 1.2)

Where:

\[
\text{Torque} = 111.3 \left( D^2 - d^2 \right) / B
\]

B = Number of gland bolts
D = Bore diameter (inches)
d = Stem Diameter (inches)
\( \phi \) = Gland bolt diameter (inches)

*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 (www.garlock.com).

NOTE: If the stuffing box bottom is beveled, a braided packing ring will need to be installed prior to installing the QuickSet or a carbon bushing.

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

Garlock Sealing Technologies • 1666 Division Street · Palmyra, New York 14522 • Tel 1.800.448.6688 - 1.315.597.4811 • www.garlock.com

Instr: 9001QS LE –GENERAL- Rev. 01-17