

Title: O-Ring-Installation And Flange Assembly Procedure

**O-RING INSTALLATION AND FLANGE ASSEMBLY PROCEDURE**  
**FOR**  
**LIGO VACUUM EQUIPMENT**

Hanford, Washington  
 and  
 Livingston, Louisiana

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REV LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE
1	RES 11/13/97	KES 11/13/97	REVISED PER DED 0564
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PROCESS SYSTEMS INTERNATIONAL, INC.				SPECIFICATION	
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**1.0 PURPOSE**

This procedure controls the final installation of Viton O-rings and flanges on vacuum equipment.

**2.0 GENERAL**

Installation of the O-rings should be done in class 100 clean room areas. Handling and assembly should be done wearing the appropriate clean room protective clothing and clean gloves. The vessel receiving the O-rings should be clean and dry.

The O-ring grooves and mating flat face flange should be inspected for local contamination including dirt, water, metal chips, detergent or washing process residue etc.

Spot Cleaning

Spot cleaning of small local dirty areas (such as the bottom of the O-ring groove) may be done using lint free wipers and isopropyl alcohol or a CO<sub>2</sub> cleaning gun.

Vacuum Baked O-Rings

Each size flange has two O-ring grooves. Each groove has a specific O-ring (PSI part number) designed for an exact fit. These part numbers are referenced in O-ring Spec. V049-2-045.

The O-rings that are to be used for final flange assembly must be vacuum baked (by PSI) to remove volatile compounds prior to installation. Before installing the O-ring, the assembler must verify that the O-ring has been vacuum baked by PSI. The O-ring package will state that the O-ring is baked. O-rings will be given a different part number after baking.

**3.0 RESPONSIBILITIES**

The manufacturing group and site contractors are responsible for installation of O-rings and flanges.

PSI Q.A. is responsible for monitoring that procedures are being followed.

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**4.0 PROCEDURE**

**4.1 O-ring Installation**

Due to the large flange diameters, three people are required to hold the O-ring in position during installation. The O-rings are easily inserted into the groove by starting at the top and working down. They fit snugly on their ID and are held in place by the groove dovetail. Care should be taken not to roll or twist the O-ring during installation.

**4.2 Mating Flange Installation**

Note: When positioning the flanges for mate-up, the machined surfaces should be protected with cleaned aluminum sheet or virgin powder-free heavy plastic. The protective material is removed when the flanges are close to their final aligned position.

After the O-rings are installed, the mating flange is carefully positioned parallel to the O-ring flange. Two centering pins are used in one bolt holes to align the flange for bolting. This technique will assure flange alignment and prevent O-ring damage. The bolts are inserted with a washer under the head and under the nut. All bolts should be installed hand-tight. The mating flange should be in contact with the O-rings but not compressing the O-rings. After contact with the O-rings is made, it is important not to move the mating flange to preclude rolling or twisting the O-ring.

**4.3 Torquing the Flange**

Bolt tightening for 7/8 in. bolts is to be done in a cross-flange "star" pattern. The recommended final torque value is 220 ft-lbs. The bolts should be torqued in ~25% increments:

Torque %	25%	50%	75%	100%
	55 ft-lbs	110 ft-lbs	165 ft-lbs	220 ft-lbs

The last step in the bolt tightening procedure is a final torque check done in a sequential fashion going around the flange. The cross-flange "star" pattern is not required for the final torque check.

**4.4 Tagging**

After the final torque check has been done, the assembled flanged joint should be tagged with a label indicating the date of assembly, final torque value, and assembler's signature. The metal tag shall be attached to a flange bolt using stainless steel wire.



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