

# Installation Instructions for Convoluted Molded PTFE Bellows

TORQUE TABLE LISTING							
SIZE I.D. (IN)	TORQUE (FT/LBS)	SIZE I.D. (IN)	TORQUE (FT/LBS)	SIZE I.D. (IN)	TORQUE (FT/LBS)	SIZE I.D. (IN)	TORQUE (FT/LBS)
1	15	3	30	10	55	20	85
1.25	15	4	35	12	60	22	90
1.5	15	5	40	14	70	24	90
2	20	6	44	16	75	—	—
2.5	25	8	50	18	80	—	—

OPTIONAL PRESSURE RATINGS					
Deg F	LIGHT DUTY	EXTRA HEAVY DUTY	Deg F	LIGHT DUTY	EXTRA HEAVY DUTY
	PRESSURE RATING (psig)			PRESSURE RATING (psig)	
70°	145	290	250°	62	107
100°	120	217	300°	48	85
150°	72	175	350°	44	70
200°	62	125	400°	38	65

**1. Service Conditions:** Make sure the expansion joint ratings for temperature, vacuum, spring rates and movements match the system requirements. Contact PROCO if the system requirements exceed those of the expansion joint selected.

**2. Alignment:** Expansion joints are not designed to make up for piping misalignment error. Pipe misalignment should be no more than 1/8" in any direction. Misalignment of an expansion joint will reduce the rated movements and can cause stress of material properties, thus causing reduced service life.

**3. Limit Rod Bolting:** Limit bolts are factory set at the maximum allowable travel position to prevent over extension. Do not remove or alter nuts at any time. Damage or personal injury can result due to changes in limit rod nut settings.

**4. Anchoring:** Solid anchoring is required whenever the pipeline changes direction. Expansion joints should be located as close as possible to these anchor points. If an anchoring system is not used, any associated pressure thrust can cause excessive movement, ultimately damaging the expansion joint. **(It should be noted that the attached limit rods are designed to limit movement and are not designed to handle pressure thrust.)**

**5. Pipe Support:** Piping must be supported by hangers or anchors so expansion joints do not carry any pipe weight.

**6. Personnel Protection:** It is strongly recommended that safety shields be used for all hazardous service to protect against serious personal injury in the event of expansion joint failure. (See Back Cover.)

**7. Installation:**

a. Store expansion joints with plastic covers in-place to protect PTFE flange surfaces from damage until ready to install.

b. Check to make sure PTFE surfaces are clean and free of foreign sediment. Remove nicks, burrs and deep scratches with a fine emery cloth. If surface irregularities cannot be completely removed, install a PTFE envelope-type gasket to obtain an adequate seal.

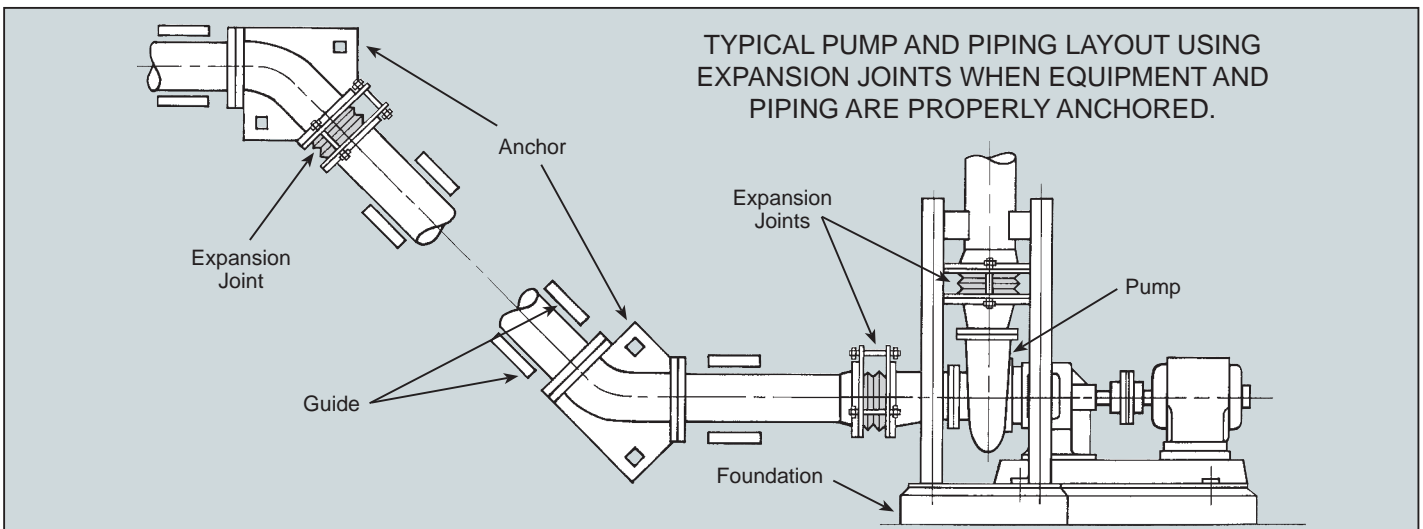
c. Install expansion joints to the prescribed neutral lengths. If expansion joints are used in high temperature processes, it is recommended that units be installed at near extended values. For cold process installations, expansion joints should be installed in a nearly compressed length. These settings will enable the expansion joint to realize full travel capabilities.

d. Thread installation bolts from mating flange side to prevent possible damage to PTFE elements. Extend bolts beyond the expansion joint flange by no more than 1-2 threads. Nuts are not necessary due to threaded flange holes.

e. Tighten flange bolts with a torque wrench. Tighten in an alternate crossing pattern in 20% increments until 80% of final bolt torques have been achieved. Tighten to final torque values (listed in torque table listing) in a clockwise fashion around the flange to ensure bolts carry equal stress burdens.

f. Re-tighten bolts after first cycle of operation. Re-tighten as necessary after every planned maintenance shutdown. All bolts should be re-torqued to the above listed values.

**8. Operations:** After expansion joints are installed, it may be necessary to air blast the exterior to remove foreign debris, such as metal chips, from between the convolutions. The expansion joint should then be covered with a shield to protect from damage and foreign debris during operation. **(Note: Do not weld in immediate vicinity of expansion joint unless it is properly protected.)**



TYPICAL PUMP AND PIPING LAYOUT USING EXPANSION JOINTS WHEN EQUIPMENT AND PIPING ARE PROPERLY ANCHORED.

**ENGINEERING DESIGN NOTES:**

1. It is essential that piping system thrusts be calculated to ensure correct sizing of anchors and pipe supports, plus ensure that allowable thrust forces on adjacent mechanical and rotating equipment are not exceeded. Please use the following formulas:

$$T_p = P \cdot T_f$$

$T_p$  is the pressure thrust (lb<sub>f</sub>),  $P$  is the system operating pressure (Psig) and  $T_f$  is the thrust factor (or bellows effective area [in<sup>2</sup>]). The pressure thrust,  $T_p$ , will act in the axial direction and must be added to the axial

$$R_x = T_p + (F_x \cdot \Delta x)$$

$R_x$  is the pipe support reaction force (lb<sub>f</sub>),  $T_p$  is the pressure thrust (lb<sub>f</sub>),  $F_x$  is the axial spring force of the unit and  $\Delta x$  is the expected or designed axial movement of the unit (See Tables 1-9).

2. It should be noted that axial spring rate values found in Tables 1 through 9 are based on an ambient temperature (70°F) and will decrease as the system temperature rises. In addition, spring rates decrease over