

Travel Required

The axial expansion or contraction of pipe is determined by the change in temperature. In order to select the correct travel refer to Table 1 which includes tabulated values of linear change in inches per 100 feet of pipe run for steel and stainless steel pipe. The values are based on an installation temperature of 70°F.

$$\text{Thermal Expansion or contraction (inches)} = \text{Length of run between anchors (feet)} \times \text{Linear change from Table 1} \div 100$$

During installation if the temperature is substantially different from 70°F it may be necessary to preset the expansion joint. Refer to Installation Preset in the Installation Procedure on Pages 14 and 15 to determine the preset required.

Anchor Forces

Piping systems incorporating Type 3501-3506 expansion joints must include structural reactions or main anchors as shown in the application diagrams that are sufficient to withstand the full pressure thrust based on the effective area of the expansion joint, and the spring force produced by the deflection of the bellows.

$$\text{Main Anchor Force (lbs.)} = \text{Pressure Force Table 2 (lbs)} + \left\{ \text{Spring Rate (lb./in.) Column 2, Tables 5-8} \times \text{Axial Travel (inches)} \right\}$$

The pressure force must be based on the highest pressure anticipated during service and testing.

Piping systems incorporating dual anchor base expansion joints (3505 & 3506) multiple single joints (3501 & 3502) in long runs, and pressure balanced joints (3501PB & 3502PB) must include structural reactions or intermediate anchors as shown in the application diagrams. Intermediate anchors react the force produced by the bellows spring constant.

$$\text{Intermediate Anchor Force (lbs.)} = \left\{ \text{Spring Rate (lb./in.) Column 2 Tables 5-8} \right\} \times \left\{ \text{Axial Travel (inches)} \right\}$$

Table 1 Thermal Expansion of Pipe per 100 feet

Linear thermal expansion of pipe per 100 feet between 70°F and the tabulated temperature.

Saturated Vacuum (Hg)	Pressure (psig)	Temperature		Carbon Steel Pipe	Austenitic Stainless Steel
		°F	°C		
		-50	-46	-0.84	-1.24
		0	-18	-0.49	-0.72
		25	-4	-0.32	-0.46
29.7		32	0	-0.27	-0.40
29.6		50	10	-0.14	-0.21
29.2		70	21	0	0
28.0		100	38	0.23	0.34
26.0		125	52	0.42	0.62
22.4		150	66	0.61	0.90
16.3		175	80	0.80	1.18
6.0		200	93	0.99	1.46
0		212	100	1.10	1.60
	4	225	107	1.21	1.75
	5	250	121	1.40	2.03
	31	275	135	1.61	2.32
	52	300	149	1.82	2.61
	82	325	163	2.04	2.90
	120	350	177	2.26	3.20
	169	375	191	2.48	3.50
	232	400	205	2.70	3.80
	311	425	219	2.93	4.10
	407	450	232	3.16	4.41
	525	475	246	3.39	4.71
	664	500	260	3.62	5.01
1	2	3	4	5	6