

Style 233 Performance Data

Table 4: Sizes • Movements • Design Pressures • Weights

Expansion Joint Size Nom. I.D. Inch / (mm)		Neutral Length Inch / (mm)		233 Movement Capability: ^{1,2} From Neutral Position (Non-Concurrent)					Operating Conditions ³			Weights lbs / (kgs) ⁴		
				Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular Deflection ⁵ (Degrees)	Torsional Rotation ⁶ (Degrees)	Thrust Factor ⁷ In ² / (cm ²)	Positive PSIG (Bar)	Vacuum Inches of Hg / (mm of Hg) ⁸	Expansion Joint	Retaining Ring Set	Control Rod Assembly ⁹
1.5	(40)	14	(356)	2.4 (60)	1.2 (30)	1.4 (36)	67.4	2	7.44 (48)	200 (14.0)	26 (660)	4.0 (1.8)	2.5 (1.1)	6.0 (2.7)
2	(50)	14	(356)	4.1 (105)	2.0 (52)	1.9 (48)	63.9	2	12.40 (80)	200 (14.0)	26 (660)	5.5 (2.5)	4.0 (1.8)	7.0 (3.2)
2.5	(65)	14	(356)	4.1 (105)	2.0 (52)	1.9 (48)	58.5	2	15.66 (101)	200 (14.0)	26 (660)	6.0 (2.7)	4.5 (2.0)	7.0 (3.2)
3	(80)	14	(356)	4.1 (105)	2.0 (52)	1.9 (48)	53.4	2	19.38 (125)	200 (14.0)	26 (660)	7.0 (3.2)	5.5 (4.3)	7.3 (3.4)
4	(100)	14	(356)	4.1 (105)	2.0 (52)	1.9 (48)	45.6	2	27.90 (180)	200 (14.0)	26 (660)	9.0 (4.1)	8.0 (3.6)	8.0 (3.6)
5	(125)	14	(356)	4.7 (120)	2.4 (60)	2.1 (54)	39.2	2	38.13 (246)	190 (13.0)	26 (660)	11.0 (5.0)	8.5 (3.9)	8.0 (3.6)
6	(150)	14 16	(356) (406)	4.7 (120)	2.4 (60)	2.1 (54)	34.2	2	49.91 (322)	190 (13.0)	26 (660)	13.5 (6.1)	9.5 (4.3)	12.0 (5.4)
8	(200)	14 16	(356) (406)	4.7 (120)	2.4 (60)	2.1 (54)	27.0	2	77.97 (503)	190 (13.0)	26 (660)	18.0 (8.2)	14.5 (6.6)	12.0 (5.4)
10	(250)	18	(457)	4.7 (120)	2.4 (60)	2.1 (54)	25.6	2	119.97 (774)	190 (13.0)	26 (660)	31.0 (14.1)	17.0 (7.7)	16.0 (7.2)
12	(300)	18	(457)	4.7 (120)	2.4 (60)	2.4 (60)	25.6	2	161.98 (1045)	190 (13.0)	26 (660)	40.0 (18.1)	24.5 (11.0)	16.0 (7.2)
14	(350)	18 20	(457) (508)	4.7 (120)	2.4 (60)	2.4 (60)	18.9	2	210.18 (1356)	130 (9.0)	26 (660)	48.5 (22.0)	27.0 (12.3)	16.0 (7.2)
16	(400)	18 20	(457) (508)	4.7 (120)	2.4 (60)	2.4 (60)	16.7	2	264.74 (1708)	115 (8.0)	26 (660)	55.0 (24.0)	33.5 (15.2)	20.0 (9.1)
18	(450)	18 20	(457) (508)	4.7 (120)	2.4 (60)	2.4 (60)	14.9	2	325.50 (2100)	115 (8.0)	26 (660)	66.0 (27.7)	34.0 (15.5)	21.0 (9.5)
20	(500)	18 20	(457) (508)	4.7 (120)	2.4 (60)	2.4 (60)	13.5	2	392.62 (2533)	115 (8.0)	26 (660)	78.0 (35.4)	38.0 (17.2)	21.0 (9.5)
24	(600)	20	(508)	6.0 (150)	3.0 (75)	2.7 (69)	14.0	2	562.03 (3626)	100 (7.0)	26 (660)	91.5 (41.5)	48.0 (21.8)	32.0 (14.5)
30	(750)	20	(508)	6.0 (150)	3.0 (75)	2.7 (69)	11.3	2	842.27 (5434)	90 (6.0)	26 (660)	131.0 (59.4)	63.0 (28.6)	32.0 (14.5)
36	(900)	20	(508)	6.0 (150)	3.0 (75)	2.7 (69)	9.5	2	1179.09 (7607)	90 (6.0)	26 (660)	157.0 (71.2)	76.0 (34.5)	43.0 (19.5)
42	(1050)	22	(559)	7.2 (180)	3.6 (90)	3.3 (84)	6.5	2	1628.28 (10505)	80 (5.5)	26 (660)	242.0 (109.8)	100.0 (45.4)	50.0 (22.7)
48	(1200)	22	(559)	7.2 (180)	3.6 (90)	3.3 (84)	5.7	2	2085.53 (13455)	80 (5.5)	26 (660)	257.0 (116.6)	132.0 (59.9)	52.0 (23.6)

Neutral lengths in RED are the recommended minimum lengths.

Metric Conversion Formula: Nominal I.D. : in. x 25 = mm; Neutral length: in. x 25.4 = mm



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Expansion Joint Size Nom. I.D. Inch / (mm)		Neutral Length Inch / (mm)		233 Movement Capability: ^{1, 2} From Neutral Position (Non-Concurrent)					Operating Conditions ³			Weights lbs / (kgs) ⁴		
				Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular Deflection ⁵ (Degrees)	Torsional Rotation ⁶ (Degrees)	Thrust Factor ⁷ In ² / (cm ²)	Positive PSIG (Bar)	Vacuum Inches of Hg / (mm of Hg) ⁸	Expansion Joint	Retaining Ring Set	Control Rod Assembly ⁹
54	(1350)	22	(559)	7.2 (180)	3.6 (90)	3.3 (84)	5.0	2	2599.53 (16770)	80 (5.5)	26 (660)	325.0 (147.4)	150.0 (162.7)	70.0 (31.8)
60	(1500)	24	(610)	7.2 (180)	3.6 (90)	3.3 (84)	4.5	2	3208.97 (20703)	80 (5.5)	26 (660)	413.0 (187.3)	200.0 (90.7)	76.0 (34.5)
66	(1650)	24	(610)	7.2 (180)	3.6 (90)	3.3 (84)	4.1	2	3839.51 (24771)	80 (5.5)	26 (660)	482.0 (218.6)	240.0 (108.8)	79.0 (35.8)
72	(1800)	24	(610)	7.2 (180)	3.6 (90)	3.3 (84)	3.8	2	4526.62 (29244)	70 (5.0)	26 (660)	551.0 (249.9)	290.0 (131.5)	100.0 (45.4)
78	(1950)	24	(610)	6.75 (169)	3.75 (94)	3.0 (75)	5.2	2	5410.60 (34907)	85 (6.0)	26 (660)	868.0 (393.7)	315.0 (142.9)	118.0 (53.5)
84	(2100)	24	(610)	6.75 (169)	3.75 (94)	3.0 (75)	4.6	2	6221.13 (40136)	85 (6.0)	26 (660)	942.0 (427.3)	350.0 (158.0)	130.0 (59.0)
96	(2400)	24	(610)	6.75 (169)	3.75 (94)	3.0 (75)	4.0	2	8011.85 (51689)	85 (6.0)	26 (660)	1495.0 (678.1)	367.0 (170.5)	144.0 (65.3)
108	(2700)	24	(610)	6.75 (169)	3.75 (94)	3.0 (75)	3.4	2	10029.75 (64702)	85 (6.0)	26 (660)	1682.0 (762.9)	425.0 (192.7)	169.0 (76.7)
120	(3000)	24	(610)	6.75 (169)	3.75 (94)	3.0 (75)	3.0	2	12271.84 (79173)	85 (6.0)	26 (660)	2093.0 (949.4)	565.0 (256.2)	183.0 (83.0)

NOTES:

- Concurrent Movements - Concurrent movements are developed when two or more movements in a pipe system occur at the same time. If multiple movements exceed single arch design there may be a need for additional arches. To perform calculation for concurrent movement when a pipe system design has more than one movement, please use the following formula:

$$\frac{\text{Actual Axial Compression} + \text{Actual Axial Extension} + \text{Actual Lateral (X)} + \text{Actual Lateral (Y)}}{\text{Rated Axial Compression} + \text{Rated Axial Extension} + \text{Rated Lateral (X)} + \text{Rated Lateral (Y)}} = / < 1$$
 Calculation must be equal to or less than 1 for expansion joint to operate within concurrent movement capability.
- Filled Arch Rubber Expansion Joints - Known as Style FA 233. The Series FA230 rubber expansion joints should be selected when there are 20% or more solids being conveyed in the pipe system. The filled arch products are manufactured with seamless tube filled with a lower durometer rubber in the arch core. The filled arch product will have a 50% reduced movement capability from the information provided in Table 4.
- Pressure rating is based on 170° F operating temperature with a 4:1 safety factor. At higher temperatures, the pressure rating is reduced slightly. Hydrostatic testing at 1.5 times rated maximum catalogue pressure or design working pressure of pipe system for 10 minutes is available upon request.
- Weights are approximate and vary due to length.
- The degree of angular movement is based on the maximum rated extension.
- Torsional movement is expressed when the expansion joint is at neutral length.
- Calculation of Thrust (Thrust Factor). When expansion joints are installed in the pipeline, the static portion of the thrust is calculated as a product of the area of the I.D. of the arch of the expansion joint times the maximum pressure (design, test or surge) that will occur in the line. The result is a force expressed in pounds. **Take Design, surge or test pressure X thrust factor to calculate end thrust.**
- Parts listed at 26" Hg / 660 mm Hg vacuum have a design rating of 30" Hg / 762 mm Hg (full vacuum). Vacuum rating is based on neutral installed length, without external load. Products should not be installed "extended" on vacuum applications.
- Limit rod unit weight consists of one rod with washers, nuts and two limit rod plates. Multiply number of limit rods needed for the application (as specified in the Fluid Sealing Association's Technical Handbook, Seventh Edition or table 4 in this manual) to determine correct weights.

"Effective Area"

Thrust Factor=

$$T = \frac{\pi}{4} (D)^2 (P)$$

T= Thrust
P= PSI (Design, Test or Surge)
D= Arch I.D.