PROCO™ RE SERIES

eccentric reducer expansion joints

The PROCO Series RE-221 Rubber Eccentric Reducer Expansion Joint, often called a "Taper", serves as a reducing element to transition from one pipe size to another. Eccentric in design, the rubber expansion joint body tapers on one side transitioning two different flange sizes. Eccentric Reducer Expansion Joints are often located on the suction side of a pump to reduce cavitation. The PROCO Rubber Eccentric Reducer is engineered to replace metallic or rubber-lined reducers used to provide unequal diameter connections of: piping and/or operating equipment applications such as: Pumps, Chillers, Cooling Towers, Compressors, Blowers, Fans, Absorption Machines, etc. Installed next to mechanical equipment or between the anchor points of a piping system, specify the PROCO Series RE-221 to: (1) Absorb Pipe Movement/Stress, (2) Reduce System Noise, (3) Isolate Mechanical Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-up/Surge Forces. The PROCO Series RE-221 is engineered for tough, demanding, industrial and commercial applications, as found in: Air Conditioning-Heating and Ventilating Systems, Chemical-Petrochemical and Industrial Process Piping Systems, Power Generating Plants, Steel Mills, Marine Services, Pulp/Paper Systems, Water-Waste-water-Sewage and Pollution Control Systems, where metallic reducers used in conjunction with metal hose or expansion joints may have been previously used or specified. Our history in manufacture of expansion joint products dates back to 1930. PROCO Products is a member of the Rubber Expansion Joint Division, Fluid Sealing Association. When a rubber expansion joint is needed to solve a piping system problem, call PROCO.

Traditional design when using a metallic reducer incorporates the use of a flexible element such as an expansion joint or metal hose to absorb the vibrations and movements of the system. The PROCO Series RE-221 Reducer combines the basic shape and dimensions of the metal reducer and the movement-sound reduction vibration-absorbing features of a flexible element into one unit. Here are some of the many advantages:

- **Less System Installation Space:**

  The PROCO RE-221 replaces a metal reducer and a flexible element. Thus less space is required and valves of other equipment can be more conveniently located.

- **Less Installation Cost:**

  The PROCO RE-221 costs less then the metal reducer and flexible element that are replaced. Additionally, standard joints (as listed in Table 1 and the "stock" section in Table 2) can be shipped same day as order placement.

Engineered For Your Application: The PROCO Eccentric Reducer materials consist of rubber and fabric which are formed and cured in a heated compression mold using an exclusive high-pressure press. The thick outer-cover and interior-tube are of an elastomer especially compounded to satisfy the Chemical-Temperature requirement of your application. Available styles include:

- **Style RE-221:**
  Features one Open Arch for maximum movement, and good noise-vibration control. Our most popular style. (See Figure 1)
- **Style-REFA-221:**
  Features one Filled Arch, is generally specified for slurry or abrasive services. Provides noise and vibration control but less movement than Style RE-221. (See Figure 2)

Table 1: Available Styles • Materials • Temperatures • Stock

For Specific Elastomer Recommendations, See:		PROCO™ "Chemical to Elastomer Guide"					
Style Numbers			Type of Elastomer				
RE-221	REFA-221	PROCO™ Material Code	Cover/ Outside	Tube/ Insi de	Maximum[4] Operating Temp. °F	PROCO™ Branding Label Color	F.S.A. Material Class
S	S	/BB	Butyl	Butyl	250°	Black	Special II
X	X	/EE	EPDM	EPDM	250°	Red	Special II
X	X	/NH	Neoprene	Hypalon[1]	230°	Green	Standard II
X[7]	X[7]	/NN[3]	Neoprene	Neoprene	230°	Blue	Standard II
X	X	/NP	Neoprene	Nitrile	230°	Yellow	Standard II
X	X	/NR	Neoprene	Natural[2]	180°	White	Standard I

NOTES:
1. Hypalon is a trademark of E.I. DuPont Dow Elastomers
2. Filled Arch is Tan-Gum, Open Arch is Black-Natural.
3. Material NN meets all requirements of U.S.C.G.
4. In applications where pressure is less than 15 PSIG, temperature may be increased.
5. All products are reinforced with synthetic fabric plies.
6. Material Availability: X=Special Order, S=Standard Stock.
7. Certain sizes in stock, call for availability.
8. To Order, provide: 1. Size (I.D. x I.D. x Length), 2. Style Number, 3. Material Code.

Absorbs Pipe-Wall And Fluid-Borne Noise. The PROCO quiet-operating Series RE-221 is a replacement for "sound transmitting" metallic reducers. Pipe-Wall sound loses energy and is absorbed as the noise carried by the piping enters and exits the rubber section. Fluid-borne noise is absorbed by the volumetric expansion (breathing) of the connector. This action cushions water hammer, and smooths out pumping impulses.

Isolates Vibrations And Motion. Vibration originating from mechanical equipment is absorbed by the PROCO Series RE-221. Rubber connectors should be installed right after and ahead of the equipment generating the vibration, thus isolating the equipment. Most machinery vibrates in a radial direction from the main shaft. For optimum performance the PROCO connector should be installed horizontally and parallel to this shaft. Vertical and perpendicular installations are also acceptable as the PROCO Reducer will accept both axial and lateral movements and vibration. Installations of the Series RE-221 in a system enables isolated equipment to move freely on its vibration mountings. **Note: For maximum vibration transmission reduction, the piping section beyond the rubber connector must be anchored or sufficiently rigid.**

Chemical Or Abrasive Service Capability At Minimal Cost. Expensive, exotic metal or rubber lined reducers for chemical service can be replaced with the PROCO Rubber Reducer. Fabricated with low-cost chemical resistant elastomers such as: Chlorobutyl, EPDM, Hypalon, Neoprene and Nitrile; insures a rubber connector compatible with the fluid being pumped or piped. (See Table 1) Our Neoprene, Natural/Gum and filled arch products should be specified when handling abrasive slurries. Use the PROCO "Chemical to Elastomer Guide" to specify an elastomer for your requirement.

Reduces System Stress And Strain/Compensate For Misalignment. Rigid attachment of piping to critical or mechanical equipment can produce excessive loading. Thermal or mechanically created strain-stress-shock are cushioned and absorbed with the installation of a flexible low "force-to-deflect" PROCO Rubber Reducer. The PROCO Style RE-221 adds a flexible component that is automatically self-correcting for misalignment created by structural movements caused by setting, expansion or ground shifts.

Flange And Retaining Ring Drilling. All PROCO rings are coated to prevent corrosion and dimensionally drilled to ANSI 125/150# standards. In accordance with ANSI, all bolt hole pairs are "straddle" the center line. Hole drilling on center line, other drilling standards or materials such as: 304 or 316 Stainless and Bronze are available on special order.

Less Turbulence Or Material Entrapment. The molded integral flange of the PROCO Rubber Reducer joins the body at a true 90 degree angle. Our product will install snug against the mating pipe flange without voids. Because this flange-body angle is difficult to form, many competitors severely radius this edge angle. The resulting void can create flow turbulence, allow for material entrapment and/or bacteria growth. Avoid these problems by specifying PROCO.

Exclusive Sealing Bead Means A Quick Seal. We have built an "O-Ring" on each flange-face of the Series RE-221. Available only from PROCO, our product seals faster with less torque at installation and less long-term maintenance. For exclusive design features, specify PROCO.

High Pressure With Full Safety Factors. We have assigned conservative pressure ratings to the Series RE-221. However, the ratings meet or exceed the requirements of the Rubber Expansion Joint Division, Fluid Sealing Association, for Series A, B, and C. More importantly, our conservative ratings are fully tested and based on a minimum four-to-one safety factor. With competitive products the safety factor is often calculated or unknown. For pressure protection, specify PROCO.

Visit Our Website:http://www.procoproducts.com
email: sales@procoproducts.com

Protecting Piping And Equipment Systems From Stress/Motion

Water Environment Federation

Fluid Sealing Association FSA

NAPHAD

eccentric reducer expansion joints

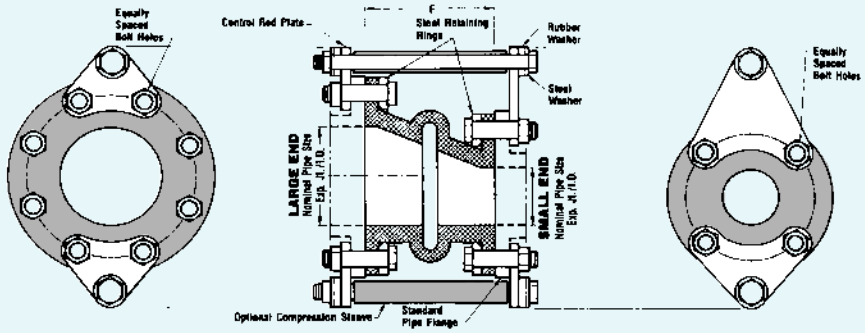

Figure 1: Style RE-221
Single Open Arch

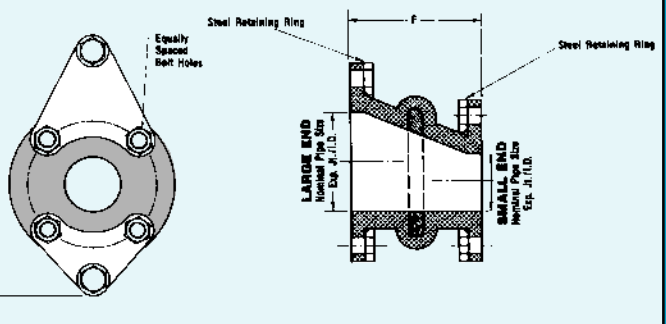

Figure 2: Style REFA-221
Single Filled Arch

Table 2: Sizes • Movements • Pressures • Weights

Eccentric Joint Size	Stock		RE-221 Open Arch Capacity: From Neutral Position						Weight/Pounds			Stock		REFA-221 Filled Arch Capability: From Neutral Position						Weight/Pounds			Pressure	
	/BB Butyl	/NN Neoprene	Axial Compression	Axial Extension	±Lateral Deflection	±Angular Deflection[1]	Torsional Movement[2]	Thrust Factor[3]	Expansion Joint Open Arch	Retaining Ring Set	Control Rod Set	/BB Butyl	/NN Neoprene	Axial Compression	Axial Extension	±Lateral Deflection	±Angular Deflection[1]	Torsional Movement[2]	Thrust Factor[3]	Expansion Joint Filled Arch	Retaining Ring Set	Control Rod Set	Positive Pressure	Vacuum
I.D. x I.D. x Length			Inches	Inches	Inches	Degree	Degree							Inches	Inches	Inches	Degree	Degree					PSIG	In. Hg
2 x 1 x 6*	X	X	.5	.25	.5	18.4°	3°	12.69	3	3	6	X	X	.25	.125	.3	9.5°	1.8°	3.14	3	3	6	200	26
2 x 1.5 x 6*	S	X	.5	.25	.5	15.9°	3°	14.32	3	3	6	X	X	.25	.125	.3	8.1°	1.8°	3.14	3	3	6	200	26
2.5 x 1.5 x 6*	S	X	.5	.25	.5	14.0°	3°	16.04	3	3	7	X	S	.25	.125	.3	6.4°	1.8°	4.97	3	3	7	200	26
3 x 1.5 x 6	S	X	.5	.25	.5	12.5°	3°	17.87	4	4	7	X	X	.25	.125	.3	6.4°	1.8°	7.06	4	4	7	200	26
3 x 2 x 6*	S	S	.5	.25	.5	11.3°	3°	19.79	4	4	7	S	S	.25	.125	.3	5.7°	1.8°	7.06	4	4	7	200	26
3 x 2.5 x 6*	S	X	.5	.25	.5	10.3°	3°	21.81	5	5	7	X	X	.25	.125	.3	5.2°	1.8°	7.06	5	5	7	200	26
4 x 2 x 6*	S	S	.5	.25	.5	9.5°	3°	23.93	5	5	7	S	X	.25	.125	.3	4.8°	1.8°	12.57	5	5	7	200	26
4 x 2 x 8	S	X	.5	.25	.5	9.5°	3°	23.93	6	5	7	X	X	.25	.125	.3	4.8°	1.8°	12.57	6	5	7	200	26
4 x 2 x 9*	X	X	.5	.25	.5	9.5°	3°	23.93	6	5	7	X	X	.25	.125	.3	4.8°	1.8°	12.57	6	5	7	200	26
4 x 2.5 x 6*	S	X	.5	.25	.5	8.7°	3°	26.14	6	6	8	X	S	.25	.125	.3	4.4°	1.8°	12.57	6	6	8	200	26
4 x 2.5 x 8*	X	X	.5	.25	.5	8.7°	3°	26.14	6	6	8	X	X	.25	.125	.3	4.4°	1.8°	12.57	6	6	8	200	26
4 x 3 x 6*	S	S	.5	.25	.5	8.1°	3°	28.46	6	6	8	S	S	.25	.125	.3	4.1°	1.8°	12.57	6	6	8	200	26
4 x 3 x 7	S	X	.5	.25	.5	8.1°	3°	28.46	6	6	8	X	X	.25	.125	.3	4.1°	1.8°	12.57	6	6	8	200	26
5 x 4 x 6*	S	X	.5	.25	.5	6.3°	3°	38.70	9	7	10	X	X	.25	.125	.3	3.2°	1.8°	19.63	11	7	10	190	26
6 x 3 x 6	S	X	.5	.25	.5	6.3°	3°	38.70	8	7	12	S	S	.25	.125	.3	3.2°	1.8°	28.27	9	7	12	190	26
6 x 3 x 8	X	X	.5	.25	.5	6.3°	3°	38.70	9	7	13	X	X	.25	.125	.3	3.2°	1.8°	28.27	11	7	13	190	26
6 x 3 x 12*	S	S	.5	.25	.5	6.3°	3°	38.70	10	7	14	S	S	.25	.125	.3	3.2°	1.8°	28.27	13	7	14	190	26
6 x 4 x 6*	S	X	.5	.25	.5	5.7°	3°	44.41	8	7	11	X	X	.25	.125	.3	2.9°	1.8°	28.27	8	7	11	190	26
6 x 4 x 7	S	X	.5	.25	.5	5.7°	3°	44.41	9	7	12	X	X	.25	.125	.3	2.9°	1.8°	28.27	11	7	12	190	26
6 x 4 x 8	S	X	.5	.25	.5	5.7°	3°	44.41	9	7	11	X	X	.25	.125	.3	2.9°	1.8°	28.27	11	7	11	190	26
6 x 4 x 9	S	X	.5	.25	.5	5.7°	3°	44.41	10	7	11	X	X	.25	.125	.3	2.9°	1.8°	28.27	12	7	11	190	26
6 x 5 x 6*	S	S	.5	.25	.5	5.2°	3°	50.51	8	8	11	S	S	.25	.125	.3	2.6°	1.8°	28.27	9	8	11	190	26
8 x 4 x 6	S	X	.75	.375	.5	7.1°	3°	63.51	8	8	19	X	X	.375	.188	.3	3.6°	1.8°	50.27	9	9	19	190	26
8 x 4 x 15*	X	X	.75	.375	.5	7.1°	3°	63.51	11	9	23	X	X	.375	.188	.3	3.6°	1.8°	50.27	11	9	23	190	26
8 x 6 x 6*	S	S	.75	.375	.5	6.1°	3°	78.42	11	10	18	X	S	.375	.188	.3	3.1°	1.8°	50.27	11	10	18	190	26
8 x 6 x 8	S	X	.75	.375	.5	6.1°	3°	78.42	14	10	18	X	X	.375	.188	.3	3.1°	1.8°	50.27	15	10	18	190	26
8 x 6 x 11	S	X	.75	.375	.5	6.1°	3°	78.42	19	10	20	X	X	.375	.188	.3	3.1°	1.8°	50.27	22	10	20	190	26
10 x 6 x 12	S	X	.75	.375	.5	5.4°	3°	94.90	23	11	28	X	X	.375	.188	.3	2.8°	1.8°	78.54	26	11	28	190	26
10 x 6 x 15*	X	X	.75	.375	.5	5.4°	3°	94.90	25	11	31	X	X	.375	.188	.3	2.8°	1.8°	78.54	29	11	31	190	26
10 x 8 x 8	S	X	.75	.375	.5	4.8°	3°	112.95	19	13	25	S	X	.375	.188	.3	2.4°	1.8°	78.54	22	13	25	190	26
10 x 8 x 9*	X	X	.75	.375	.5	4.8°	3°	112.95	19	13	25	X	X	.375	.188	.3	2.4°	1.8°	78.54	22	13	25	190	26
10 x 8 x 12	X	X	.75	.375	.5	4.8°	3°	112.95	20	13	25	X	X	.375	.188	.3	2.4°	1.8°	78.54	23	13	25	190	26
12 x 6 x 12*	X	X	.75	.375	.5	4.8°	3°	112.95	27	15	31	X	X	.375	.188	.3	2.4°	1.8°	113.10	29	15	31	190	26
12 x 8 x 8	X	S	.75	.375	.5	3.9°	3°	153.77	24	18	24	X	S	.375	.188	.3	1.9°	1.8°	113.10	25	18	24	190	26
12 x 8 x 12	S	S	.75	.375	.5	3.9°	3°	153.77	24	18	24	S	S	.375	.188	.3	1.9°	1.8°	113.10	25	18	24	190	26
12 x 10 x 8*	S	X	.75	.375	.5	3.9°	3°	153.77	24	18	24	S	S	.375	.188	.3	1.9°	1.8°	113.10	25	18	24	190	26
12 x 10 x 9*	X	X	.75	.375	.5	3.9°	3°	153.77	25	18	24	X	X	.375	.188	.3	1.9°	1.8°	113.10	27	18	24	190	26
12 x 10 x 14	S	X	.75	.375	.5	3.9°	3°	153.77	30	18	26	X	X	.375	.188	.3	1.9°	1.8°	113.10	34	18	26	190	26
14 x 10 x 8	S	X	.75	.375	.5	3.6°	2°	201.46	36	19	29	X	S	.375	.188	.3	1.8°	1.2°	153.94	38	19	29	130	26
14 x 10 x 15*	X	X	.75	.375	.5	3.6°	2°	201.46	42	19	33	X	X	.375	.188	.3	1.8°	1.2°	153.94	45	19	33	130	26
14 x 12 x 8*	S	X	.75	.375	.5	3.3°	2°	227.40	40	23	27	X	X	.375	.188	.3	1.7°	1.2°	153.94	40	23	27	130	26
14 x 12 x 9*	X	X	.75	.375	.5	3.3°	2°	227.40	41	23	28	X	X	.375	.188	.3	1.7°	1.2°	153.94	42	23	28	130	26
16 x 14 x 8*	S	X	.75	.375	.5	2.9°	2°	284.00	38	26	37	S	X	.375	.188	.3	1.4°	1.2°	201.06	40	26	37	110	26
16 x 14 x 9*	X	X	.75	.375	.5	2.9°	2°	284.00	39	26	37	X	X	.375	.188	.3	1.4°	1.2°	201.06	41	26	37	110	26
18 x 14 x 8	S	X	.75	.375	.5	2.5°	1°	346.88	43	29	34	S	X	.375	.188	.3	1.2°	0.6°	254.47	43	29	34	110	26
18 x 16 x 10*	X	X	.75	.375	.5	2.5°	1°	346.88	44	29	35	X	X	.375	.188	.3	1.2°	0.6°	254.47	45	29	35	110	26

For Sizes Not Shown: I.D. x I.D. • U-Type, Double or Triple Arch • Contact Factory for Proco Series 100.

NOTES: *This length meets length required by ANSI B-16, B-16.24 and B-16.5. Lengths of all sizes meet F.S.A. specifications.

1. The amount of Angular Movement is based on the maximum allowable Extension Movement from Neutral. Angular Movement can be increased, if it is in conjunction with Compression Movement.
2. Torsional Movement is expressed when the expansion joint is at Neutral.
3. To determine End-Thrust: multiply Thrust Factor by operating pressures of system. This total is End Thrust in P.S.I.G.
4. Pressure rating is based on 170° F Operating Temperature. At higher temperatures, the pressure is slightly reduced. Minimum Burst Pressures is 4:1.

PROCO EXPANSION JOINTS

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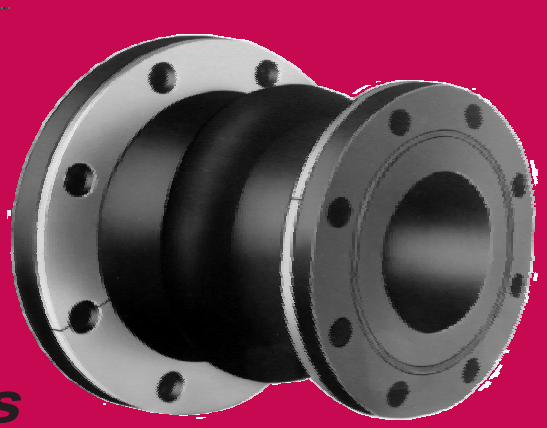
PROCO™ RC SERIES

concentric reducer expansion joints



The PROCO Series RC-221 Rubber Concentric Reducer Expansion Joint, often called a "Taper", serves as a reducing element to transition from one pipe size to another. Concentric in design, each flange-end shares the same common center-line. The PROCO Rubber Reducer is engineered to replace metallic or rubber-lined reducers used to provide unequal diameter connections of: piping and/or operating equipment applications such as: Pumps, Chillers, Cooling Towers, Compressors, Blowers, Fans, Absorption Machines, etc. Installed next to mechanical equipment or between the anchor points of a piping system, specify the PROCO Series RC-221 to: (1) Absorb Pipe Movement/Stress, (2) Reduce System Noise, (3) Isolate Mechanical Vibration, (4) Compensate Alignment/ Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-up/Surge Forces. The PROCO Series RC-221 is engineered for tough, demanding, industrial and commercial applications, as found in: Air Conditioning-Heating and Ventilating Systems, Chemical-Petrochemical and Industrial Process Piping Systems, Power Generating Plants, Steel Mills, Marine Services, Pulp/Paper Systems, Water-Wastewater-Sewage and Pollution Control Systems, where metallic reducers used in conjunction with metal hose or expansion joints may have been previously used or specified. Our history in manufacture of expansion joint products dates back to 1930. PROCO Products is a member of the Rubber Expansion Joint Division, Fluid Sealing Association. When a rubber expansion joint is needed to solve a piping system problem, call PROCO.

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Less Turbulence Or Material Entrapment. The molded integral flange of the PROCO Rubber Reducer joins the body at a true 90 degree angle. Our product will install snug against the mating pipe flange without voids. Because this flange-body angle is difficult to form, many competitors severely radius this edge angle. The resulting void can create flow turbulence, allow for material entrapment and/or bacteria growth. Avoid these problems by specifying PROCO.

Exclusive Sealing Bead Means A Quick Seal. We have built an "O-Ring" on each flange-face of the Series RC-221. Available only from PROCO, our product seals faster with less torque at installation and less long-term maintenance. For exclusive design features, specify PROCO.

High Pressure With Full Safety Factors. We have assigned conservative pressure ratings to the Series RC-221. However, the ratings meet or exceed the requirements of the Rubber Expansion Joint Division, Fluid Sealing Association, for Series A, B, and C. More importantly, our conservative ratings are fully tested and based on a minimum four-to-one safety factor. With competitive products the safety factor is often calculated or unknown. For pressure protection, specify PROCO.

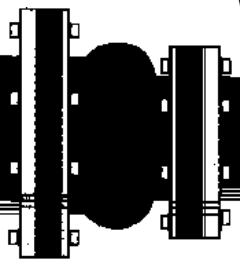
Table 1: Available Styles • Materials • Temperatures • Stock

For Specific Elastomer Recommendations, See: **PROCO™ "Chemical to Elastomer Guide"**

Style Numbers		PROCO™ Material Code	Type of Elastomer		Maximum[4] Operating Temp. °F	PROCO™ Branding Label Color	F.S.A. Material Class
RC-221	RCFA-221		Cover/ Outside	Tube/ Inside			
S	S	/BB	Butyl	Butyl	250°	Black	Special II
X	X	/EE	EPDM	EPDM	250°	Red	Special II
X	X	/NH	Neoprene	Hypalon[1]	230°	Green	Standard II
X[7]	X[7]	/NN[3]	Neoprene	Neoprene	230°	Blue	Standard II
X	X	/NP	Neoprene	Nitrile	230°	Yellow	Standard II
X	X	/NR	Neoprene	Natural[2]	180°	White	Standard I

NOTES:
1. Hypalon is a trademark of E.I. duPont Nemours & Co.
2. Filled Arch is Tan-Gum, Open Arch is Black-Natural.
3. Material NN meets all requirements of U.S.C.G.
4. In applications where pressure is less than 15 PSIG, temperature may be increased.
5. All products are reinforced with synthetic fabric plies.
6. Material Availability: X=Special Order, S=Standard Stock.
7. Certain sizes in stock, call for availability.
8. To Order, provide: 1. Size (I.D. x Length), 2. Style Number, 3. Material Code.

Visit Our Website: http://www.procoproducts.com
email: sales@procoproducts.com



Protecting Piping And Equipment Systems From Stress/Motion

Water Environment Federation — Fluid Sealing Association FSA — ISD — NAHAD

concentric reducer expansion joints

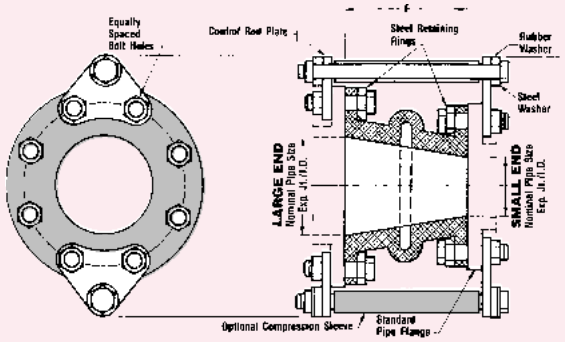


Figure 1: Style RC-221 Single Open Arch

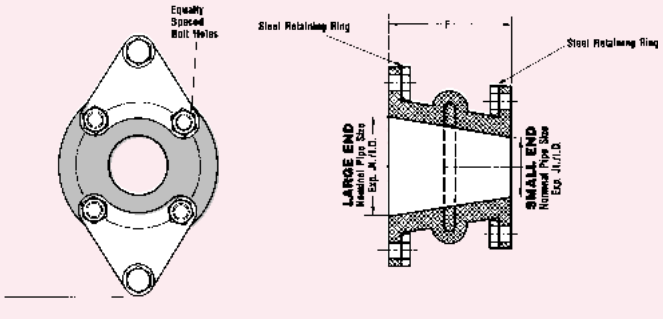


Figure 2: Style RCFA-221 Single Filled Arch

Concentric Joint Size I.D. x I.D. x Length	Stock /BB Butyl	Stock /NN Neoprene	RC-221 Open Arch Capacity: From Neutral Position: Axial Compression Inches	Axial Extension Inches	±Lateral Deflection Inches	±Angular Deflection[1] Degree	Torsional Movement[2] Degree	Thrust Factor[3]	Weight/Pounds: Expansion Joint Open Arch	Retaining Ring Set	Control Rod Set	Stock /BB Butyl	Stock /NN Neoprene	RCFA-221 Filled Arch Capability: From Neutral Position: Axial Compression Inches	Axial Extension Inches	±Lateral Deflection Inches	±Angular Deflection[1] Degree	Torsional Movement[2] Degree	Thrust Factor[3]	Weight/Pounds: Expansion Joint Filled Arch	Retaining Ring Set	Control Rod Set	Pressure: Positive Pressure PSIG	Vacuum In. Hg
2 x 1 x 6 *	S	X	.5	.25	.5	18.4°	3°	12.69	3	3	6	X	X	.25	.125	.3	9.5°	1.8°	3.14	3	3	6	200	26
2 x 1.5 x 6 *	S	X	.5	.25	.5	15.9°	3°	14.32	3	3	6	X	S	.25	.125	.3	8.1°	1.8°	3.14	3	3	6	200	26
2.5 x 1.5 x 6 *	S	X	.5	.25	.5	14.1°	3°	16.04	4	3	7	X	X	.25	.125	.3	7.2°	1.8°	4.97	4	3	7	200	26
2.5 x 2 x 6 *	S	X	.5	.25	.5	12.5°	3°	17.87	3	4	7	S	X	.25	.125	.3	6.4°	1.8°	4.97	3	4	7	200	26
3 x 1 x 6 *	X	X	.5	.25	.5	14.0°	3°	16.04	4	4	7	X	X	.25	.125	.3	6.4°	1.8°	7.06	4	4	7	200	26
3 x 1.5 x 6 *	S	X	.5	.25	.5	12.5°	3°	17.87	4	4	7	S	X	.25	.125	.3	6.4°	1.8°	7.06	4	4	7	200	26
3 x 2 x 6 *	S	S	.5	.25	.5	11.3°	3°	19.79	4	4	7	S	S	.25	.125	.3	5.7°	1.8°	7.06	4	4	7	200	26
3 x 2.5 x 6 *	S	X	.5	.25	.5	10.3°	3°	21.81	5	5	7	X	X	.25	.125	.3	5.2°	1.8°	7.06	5	5	7	200	26
4 x 2 x 6 *	S	S	.5	.25	.5	9.5°	3°	23.93	5	5	7	S	S	.25	.125	.3	4.8°	1.8°	12.57	5	5	7	200	26
4 x 2 x 7 *	S	S	.5	.25	.5	9.5°	3°	23.93	5	5	7	X	S	.25	.125	.3	4.8°	1.8°	12.57	5	5	7	200	26
4 x 2.5 x 6 *	S	S	.5	.25	.5	8.7°	3°	26.14	5	6	8	X	S	.25	.125	.3	4.4°	1.8°	12.57	5	6	8	200	26
4 x 2.5 x 7 *	S	X	.5	.25	.5	8.7°	3°	26.14	6	6	8	X	X	.25	.125	.3	4.4°	1.8°	12.57	6	6	8	200	26
4 x 3 x 6 *	S	X	.5	.25	.5	8.1°	3°	28.46	6	6	8	S	S	.25	.125	.3	4.1°	1.8°	12.57	6	6	8	200	26
4 x 3 x 7 *	S	X	.5	.25	.5	8.1°	3°	28.46	6	6	8	X	S	.25	.125	.3	4.1°	1.8°	12.57	6	6	8	200	26
5 x 3 x 6 *	S	X	.5	.25	.5	7.1°	3°	33.38	6	6	10	X	X	.25	.125	.3	3.6°	1.8°	19.63	6	6	10	190	26
5 x 4 x 6 *	S	X	.5	.25	.5	6.3°	3°	38.70	8	7	10	X	S	.25	.125	.3	3.2°	1.8°	19.63	8	7	10	190	26
5 x 4 x 8 *	S	X	.5	.25	.5	6.3°	3°	38.70	8	7	10	X	X	.25	.125	.3	3.2°	1.8°	19.63	9	7	10	190	26
6 x 2 x 8 *	S	X	.5	.25	.5	7.1°	3°	33.38	8	6	12	X	S	.25	.125	.3	3.6°	1.8°	28.27	9	6	12	190	26
6 x 2.5 x 6 *	S	X	.5	.25	.5	6.7°	3°	35.99	6	7	12	X	X	.25	.125	.3	3.4°	1.8°	28.27	6	7	12	190	26
6 x 3 x 6 *	S	S	.5	.25	.5	6.3°	3°	38.70	7	7	12	S	S	.25	.125	.3	3.2°	1.8°	28.27	7	7	12	190	26
6 x 3 x 8 *	X	X	.5	.25	.5	6.3°	3°	38.70	9	7	13	X	X	.25	.125	.3	3.2°	1.8°	28.27	10	7	13	190	26
6 x 3 x 9 *	S	S	.5	.25	.5	6.3°	3°	38.70	9	7	13	X	S	.25	.125	.3	3.2°	1.8°	28.27	10	7	13	190	26
6 x 4 x 6 *	S	S	.5	.25	.5	5.7°	3°	44.41	8	7	11	S	S	.25	.125	.3	2.9°	1.8°	28.27	8	7	11	190	26
6 x 4 x 8 *	S	X	.5	.25	.5	5.7°	3°	44.41	9	7	11	X	S	.25	.125	.3	2.9°	1.8°	28.27	9	7	11	190	26
6 x 4 x 9 *	S	S	.5	.25	.5	5.7°	3°	44.41	11	7	11	X	X	.25	.125	.3	2.9°	1.8°	28.27	12	7	11	190	26
6 x 5 x 6 *	S	S	.5	.25	.5	5.2°	3°	50.51	9	8	11	S	S	.25	.125	.3	2.6°	1.8°	28.27	9	8	11	190	26
6 x 5 x 9 *	S	S	.5	.25	.5	5.2°	3°	50.51	12	8	12	X	X	.25	.125	.3	2.6°	1.8°	28.27	13	8	12	190	26
8 x 3 x 6 *	S	X	.75	.375	.5	7.8°	3°	56.64	9	9	19	X	S	.375	.188	.3	3.9°	1.8°	50.27	10	9	19	190	26
8 x 4 x 6 *	S	S	.75	.375	.5	7.1°	3°	63.51	10	9	19	S	S	.375	.188	.3	3.6°	1.8°	50.27	10	9	19	190	26
8 x 4 x 8 *	S	X	.75	.375	.5	7.1°	3°	63.51	11	9	20	S	X	.375	.188	.3	3.6°	1.8°	50.27	12	9	20	190	26
8 x 4 x 10 *	X	X	.75	.375	.5	7.1°	3°	63.51	15	9	21	X	X	.375	.188	.3	3.6°	1.8°	50.27	17	9	21	190	26
8 x 4 x 11 *	S	S	.75	.375	.5	7.1°	3°	63.51	15	9	21	X	X	.375	.188	.3	3.6°	1.8°	50.27	17	9	21	190	26
8 x 5 x 6 *	S	X	.75	.375	.5	6.6°	3°	70.77	10	10	18	X	X	.375	.188	.3	3.3°	1.8°	50.27	11	10	18	190	26
8 x 5 x 11 *	S	S	.75	.375	.5	6.6°	3°	70.77	15	10	21	X	X	.375	.188	.3	3.3°	1.8°	50.27	16	10	21	190	26
8 x 6 x 6 *	S	S	.75	.375	.5	6.1°	3°	78.42	12	10	18	S	S	.375	.188	.3	3.1°	1.8°	50.27	12	10	18	190	26
8 x 6 x 8 *	S	S	.75	.375	.5	6.1°	3°	78.42	14	10	18	S	S	.375	.188	.3	3.1°	1.8°	50.27	14	10	18	190	26
8 x 6 x 11 *	S	S	.75	.375	.5	6.1°	3°	78.42	18	10	20	X	S	.375	.188	.3	3.1°	1.8°	50.27	18	10	20	190	26
10 x 5 x 8 *	S	X	.75	.375	.5	5.7°	3°	86.46	19	11	27	X	X	.375	.188	.3	2.9°	1.8°	78.54	21	11	27	190	26
10 x 6 x 8 *	S	X	.75	.375	.5	5.4°	3°	94.90	15	11	26	S	S	.375	.188	.3	2.8°	1.8°	78.54	15	11	26	190	26
10 x 6 x 12 *	S	S	.75	.375	.5	5.4°	3°	94.90	21	11	28	X	S	.375	.188	.3	2.8°	1.8°	78.54	22	11	28	190	26
10 x 8 x 6 *	S	X	.75	.375	.5	4.8°	3°	112.95	14	13	25	S	X	.375	.188	.3	2.4°	1.8°	78.54	14	13	25	190	26
10 x 8 x 8 *	S	S	.75	.375	.5	4.8°	3°	112.95	18	13	25	X	S	.375	.188	.3	2.4°	1.8°	78.54	20	13	25	190	26
10 x 8 x 12 *	S	X	.75	.375	.5	4.8°	3°	112.95	20	13	28	X	X	.375	.188	.3	2.4°	1.8°	78.54	23	13	28	190	26
12 x 6 x 8 *	S	S	.75	.375	.5	4.8°	3°	112.95	19	15	29	S	S	.375	.188	.3	2.4°	1.8°	113.10	22	15	29	190	26
12 x 6 x 14 *	S	X	.75	.375	.5	4.8°	3°	112.95	30	15	31	X	X	.375	.188	.3	2.4°	1.8°	113.10	35	15	31	190	26
12 x 8 x 6 *	S	S	.75	.375	.5	4.3°	3°	132.57	19	17	28	S	S	.375	.188	.3	2.2°	1.8°	113.10	19	17	28	190	26
12 x 8 x 8 *	S	S	.75	.375	.5	4.3°	3°	132.57	24	17	29	S	S	.375	.188	.3	2.2°	1.8°	113.10	24	17	29	190	26
12 x 8 x 14 *	S	X	.75	.375	.5	4.3°	3°	132.57	30	17	30	X	X	.375	.188	.3	2.2°	1.8°	113.10	35	17	30	190	26
12 x 10 x 8 *	S	S	.75	.375	.5	3.9°	3°	153.77	23	18	24	S	S	.375	.188	.3	1.9°	1.8°	113.10	24	18	24	190	26
12 x 10 x 14 *	S	X	.75	.375	.5	3.9°	3°	153.77	35	18	26	X	X	.375	.188	.3	1.9°	1.8°	113.10	38	18	26	190	26
14 x 8 x 8 *	S	X	.75	.375	.5	3.9°	2°	177.09	22	18	29	X	X	.375	.188	.3	1.9°	1.2°	153.94	22	18	29	130	26
14 x 10 x 8 *	S	S	.75	.375	.5	3.6°	2°	201.46	30	19	29	S	S	.375	.188	.3	1.8°	1.2°	153.94	32	19	29	130	26
14 x 10 x 10 *	X	X	.75	.375	.5	3.6°	2°	201.46	31	19	30	X	X	.375	.188	.3	1.8°	1.2°	153.94	25	19	33	130	26
14 x 12 x 8 *	S	S	.75	.375	.5	3.3°	2°	227.40	32	23	27	S	X	.375	.188	.3	1.7°	1.2°	153.94	33	23	27	130	26
16 x 10 x 8 *	S	X	.75	.375	.5	3.3°	2°	227.40	31	21	36	S	X	.375	.188	.3	1.7°	1.2°	201.06	31	21	36	110	26
16 x 10 x 10 *	X	S	.75	.375	.5	3.3°	2°	227.40	34	21	39	X	X	.375	.188	.3	1.7°	1.2°	201.06	35	21	39	110	26
16 x 12 x 8 *	S	X	.75	.375	.5	3.1°	2°	254.92	36	25	36	S	S	.375	.188	.3	1.5°	1.2°	201.06	39	25	36	110	26
16 x 14 x 8 *	S	X	.75	.375	.5	2.9°	2°	284.00	38	26	37	S	S	.375	.188	.3	1.4°	1.2°	201.06	42	26	37	110	26
18 x 12 x 8 *	S	X	.75	.375	.5	2.9°	1°	284.00	37	26	37	S	X	.375	.188	.3	1.4°	0.6°	254.47	37	26	37	110	26
18 x 12 x 12 *	X	X	.75	.375	.5	2.9°	1°	284.00	41	27	42	X	X	.375	.188	.3	1.4°	0.6°	254.47	41	27	42	110	26
18 x 14 x 8 *	S	X	.75	.375	.5	2.7°	1°	314.65	41	27	37	X	S	.375	.188	.3	1.3°	0.6°	254.47	41	27	37	110	26
18 x 16 x 8 *	S	X	.75	.375	.5	2.5°	1°	346.88	40	29	34	X	S	.375	.188	.3	1.2°	0.6°	254.47	40	29	34	110	26

For Sizes Not Shown: I.D. x I.D. • U-Type, Double or Triple Arch • Contact Factory for Proco Series 100.

PROCO EXPANSION JOINTS

2431 Wigwam Dr. (95205)
P.O. Box 590 • Stockton, CA
95201-0590 • USA

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(209) 943-6088
email: sales@procoproducts.com
website: http://www.procoproducts.com

NATIONWIDE AND CANADA

INTERNATIONAL

NOTES: *This length meets length required by ANSI B-16, B-16.24 and B-16.5. Lengths of all sizes meet F.S.A. specifications.

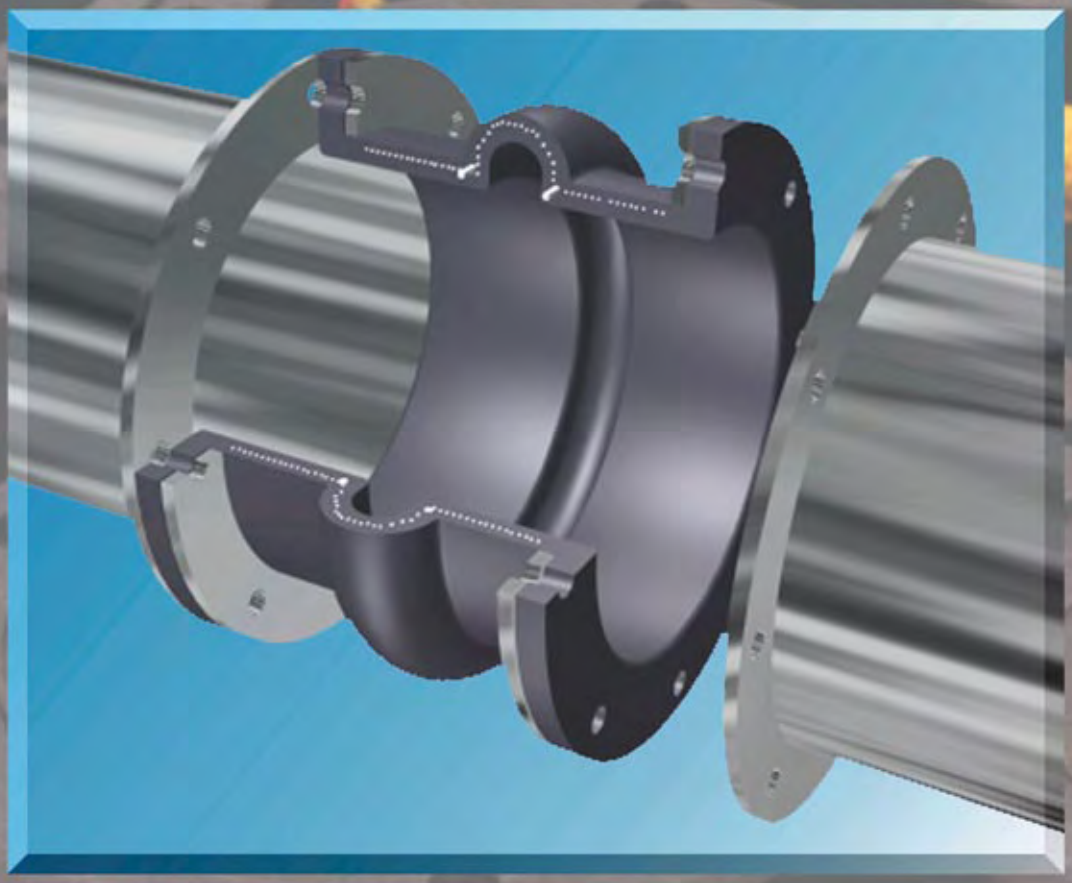
1. The amount of Angular Movement is based on the maximum allowable Extension Movement from Neutral. Angular Movement can be increased, if it is in conjunction with Compression Movement.
2. Torsional Movement is expressed when the expansion joint is at Neutral.
3. To determine End-Thrust: multiply Thrust Factor by operating pressures of system. This total is End Thrust in P.S.I.G.
4. Pressure rating is based on 170°F Operating Temperature. At higher temperatures, the pressure is slightly reduced. Minimum Burst Pressures is 4:1.

Distributed by:

Rev 11/99

PROCO PRODUCTS, INC.

Series 230



The Expansion Joint People

PROCO

SERIES 230/220

spool type wide arch rubber expansion joints

PROCO Series 230, Styles 231, 232, & 233 Non-Metallic Expansion Joints are designed for tough, demanding industrial applications, as found in: Chemical/Petrochemical Plants, Industrial Process Piping Systems, Marine Services, Power Generation Plants, Pulp/Paper Plants, Steel Mills, Water/Wastewater and Pollution Control Systems. Installed next to mechanical equipment or between the anchor points of a piping system, specify the PROCO Series 230 to: (1) Absorb Pipe Movement/Stress, (2) Reduce System Noise, (3) Isolate Mechanical Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-Up Surge Forces. Our history in the manufacture of expansion joints dates back to 1930. When you need an engineered rubber expansion joint solution to a piping problem, call PROCO!

Series 230 Replaces Series 220. The new and improved PROCO Series 230 replaces the PROCO Series 220 rubber expansion joints. (Series 220 products will be available only in short neutral lengths.) This new hand-built product has been completely re-engineered to provide improved strength, flexibility, movement and spring rate capabilities. Manufactured utilizing tire industry technology, the Series 230 combines woven nylon fabric and nylon tire cord into a fabric matrix bonded with elastomer and reinforced with wire to create a product with greater operating performance. The nomenclature for the new PROCO Series 230 is as follows:

Single Arch Series 230, **Style 231**
Double Arch Series 230, **Style 232**
Triple Arch Series 230, **Style 233**

Greater Movements With A Lower/Wider Arch Profile. The movements for the PROCO Series 230 exceed the specification of the Fluid Sealing Association's Rubber Expansion Joint Division Technical Handbook (Sixth Edition), Table V. Due to a new and improved lower, wider profile arch, more axial compression and axial extension coupled with lateral misalignment, angular and torsional movements can be obtained without increasing the face-to-face requirements. Installation of the Series 230 in a piping system will negate the need for long and expensive multi-arch products. For greater movements based on re-engineering and new product construction, specify the PROCO Series 230.

Less Turbulence Or Material Entrapment. The PROCO 230 Series molded integral flange joins the body at a true 90° angle. Our product will install snug against the mating pipe flange without voids. The flange body of the rubber expansion joint is difficult to form and many manufacturers radius the edge angles. The resulting void between the mating flange and the edge angle can create flow turbulence and allow for material entrapment or bacterial growth. You can avoid these problems by specifying PROCO Series 230 rubber expansion joints.

Chemical Or Abrasive Service Capability. Expensive metallic designs for chemical service can be replaced with the more cost-effective PROCO Series 230. Built with low-cost chemical resistant elastomers, such as Chlorobutyl, DuPont Dow Elastomer Hypalon® rubber, EPDM, Natural, Neoprene and Nitrile, assures an expansion joint compatible with fluid being pumped or piped (See Table 1). When handling abrasive products such as any solids or slurries, Natural or Neoprene filled arch products should be specified. Please refer to PROCO "Chemical to Elastomer Guide" for recommendations on elastomer chemical compatibility for piping processes.

Exclusive Sealing Bead Means A Quick Seal. PROCO has built an "O-Ring" on each flange face of the Series 230. Available only from PROCO, the Series 230 seals faster with less torque at installation. For these exclusive features, specify the PROCO Series 230 rubber expansion joints.

Specifications Met. PROCO has assigned conservative pressure ratings to the Series 230 rubber expansion joints. The ratings, however, meet the requirements of the Fluid Sealing Association's Rubber Expansion Joint Division Technical Handbook (Sixth Edition), Series C. The pressure ratings for the Series 230 rubber expansion joints have been fully tested and are based on a minimum four-to-one safety factor. For pressure protection with confidence, specify the PROCO Series 230.

Tested Force Pound And Spring Rate Tables. The Series 230 rubber expansion joints are in accordance with and/or lower than the guidelines for spring rate data as listed in the Fluid Sealing Association's Rubber Expansion Joint Division Technical Handbook (Sixth Edition), Table V. Due to a lower, wider arch profile, the PROCO Series 230 will provide more flexibility than conventional spool-type rubber expansion joints. In addition, the lower/wider arch profile coupled with a modified radial tire cord construction will result in lower flange forces. Lower resultant forces mean reduced stress of related piping system components. PROCO is currently testing each rubber expansion joint size and will list actual test data as opposed to listing hypothetical data normally associated with spring rate tables.

Absorbs Vibration • Noise • Shock. The PROCO Series 230 quiet-operating rubber expansion joints are a replacement for "sound transmitting" metallic expansion joints. Sound loses energy traveling axially through an expansion joint. Water hammer, pumping impulses, water-borne noises and other forms of strain-stress-shock are cushioned and absorbed by the molded elastomer expansion joint, not related to piping. Install the Series 230 in a system to reduce vibration transmission when the piping section beyond the expansion joint is anchored or sufficiently rigid. For quiet, stress-free systems, specify the PROCO Series 230.

Wide Service Range With Low Cost. Engineered to operate up to 200 PSIG or up to 250°F, the PROCO Series 230 can be specified for a wide range of piping system requirements. Compared to competitive products, you will invest less money when specifying the engineered design and industrial quality of the PROCO Series 230.

Large Inventory Means Same-Day Shipment. We maintain the largest inventory of elastomeric expansion joints in the world. Every size cataloged up to 72" is in stock in a variety of elastomers. We can ship the products you need when you need them! In fact, when it comes to rubber expansion joints, **if PROCO doesn't have them in stock ... nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays ... the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

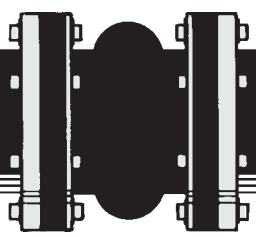
Toll-Free Phone ..... 800 / 344-3246 USA/CANADA
International Calls .... 209 / 943-6088
Fax ..... 209 / 943-0242
E-mail ..... sales@procoproducts.com
Web Site ..... www.procoproducts.com
Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

Table 1: Available Styles • Materials • Temperatures

For Specific Elastomer Recommendations, See: PROCO™ "Chemical To Elastomer Guide"

PROCO Style Numbers		Cover[2] Elastomer	Tube Elastomer	Maximum Operating Temp. °F (°C)	Branding Label Color	F.S.A. Material Class
Filled Arch (Single)[6]	Open Arch (Single)[6]					
FA231/BB	231/BB	Butyl[4]	Butyl[4]	250° (121°)	Black	STD. III
FA231/EE	231/EE	EPDM	EPDM	250° (121°)	Red	STD. III
FA231/NH	231/NH	Neoprene	Hypalon[1]	212° (100°)	Green	STD. II
FA231/NN[5]	231/NN[5]	Neoprene	Neoprene	225° (107°)	Blue	STD. II
FA231/NP	231/NP	Neoprene	Nitrile	212° (100°)	Yellow	STD. II
FA231/NR	231/NR	Neoprene	Natural	180° (68°)	White	STD. I

Notes: 1. Hypalon is a registered trademark of DuPont Dow Elastomers.
2. Expansion joint "cover" can be coated with Hypalon® on special order.
3. All products are reinforced with steel and fabric materials.
4. The term "butyl" is synonymous with chlorobutyl (CIIR).
5. Styles FA231, FA232, FA233 and styles 231, 232, 233 meet all requirements of U.S.C.G.
6. Style numbers above reflect one arch. Products are also available in Styles 232 and 233.



Protecting Piping And Equipment Systems From Stress/Motion

PROCO

STYLE 231/221

single wide arch spool type rubber expansion joints

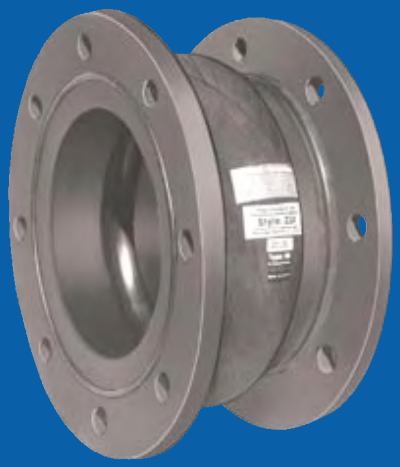


Table 2: Sizes • Movements • Forces • Weights *See Notes Page 7*

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	231 / 221 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Lateral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG/ (Bar)	Vacuum Inches of Hg/ (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
1	(25)	6	(152)	231	1.2 (30)	0.6 (15)	0.6 (15)	50.4	2.0					5.12 (33)	200 (14.0)	26 (660)	2.0 (0.8)	2.0 (0.8)	2.3 (1.0)
1.25	(32)	6	(152)	231	1.2 (30)	0.6 (15)	0.6 (15)	43.1	2.0					6.20 (40)	200 (14.0)	26 (660)	2.5 (1.1)	2.5 (1.1)	2.3 (1.0)
1.5	(40)	6	(152)	231	1.2 (30)	0.6 (15)	0.6 (15)	38.1	2.0					7.44 (48)	200 (14.0)	26 (660)	3.0 (1.4)	2.5 (1.1)	2.3 (1.0)
2	(50)	6	(152)	231	1.4 (35)	0.7 (18)	0.6 (15)	34.2	2.0					12.40 (80)	200 (14.0)	26 (660)	4.0 (1.8)	4.0 (1.8)	2.8 (1.3)
		7	(178)	231															
		8	(203)	231															
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
2.5	(65)	6	(152)	231	1.4 (35)	0.7 (18)	0.6 (15)	27.6	2.0					15.66 (101)	200 (14.0)	26 (660)	4.5 (2.0)	4.5 (2.0)	2.8 (1.3)
		7	(178)	231															
		8	(203)	231															
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
3	(80)	6	(152)	231	1.4 (35)	0.7 (18)	0.6 (15)	23.0	2.0					19.38 (125)	200 (14.0)	26 (660)	5.5 (2.5)	5.5 (2.5)	2.8 (1.3)
		7	(178)	231															
		8	(203)	231															
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
3.5	(90)	6	(152)	221	0.6 (15)	0.3 (8)	0.56 (14)	9.0	2.0					23.18 (150)	200 (14.0)	26 (660)	6.0 (2.7)	6.0 (2.7)	2.8 (1.3)
		7	(178)	221															
		8	(203)	221															
		9	(229)	221															
		10	(254)	221															
		12	(305)	221															
4	(100)	6	(152)	231	1.4 (35)	0.7 (18)	0.6 (15)	18.8	2.0					27.90 (180)	200 (14.0)	26 (660)	8.0 (3.6)	8.0 (3.6)	2.8 (1.3)
		7	(178)	231															
		8	(203)	231															
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															

UNDERCURRENT TESTING

See Notes Page 7

Table 2: Sizes • Movements • Forces • Weights

See Notes Page 7

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	231 / 221 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Latreral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] in2 / (cm2)	Positive PSIG/ (Bar)	Vacuum Inches of Hg/ (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
5	(125)	6	(152)	231	1.4 (35)	0.7 (18)	0.6 (15)	15.2	2.0	UNDER CURRENT STRING				38.13 (246)	190 (13.0)	26 (660)	9.0 (4.1)	8.5 (3.9)	4.0 (1.8)
		7	(178)	231															
		8	(203)	231															
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
6	(150)	6	(152)	231	1.4 (35)	0.7 (18)	0.6 (15)	12.8	2.0					49.91 (322)	190 (13.0)	26 (660)	11.0 (5.0)	9.5 (4.3)	4.0 (1.8)
		7	(178)	231															
		8	(203)	231															
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
8	(200)	6	(152)	231	1.4 (35)	0.7 (18)	0.6 (15)	9.7	2.0					77.97 (503)	190 (13.0)	26 (660)	15.0 (6.8)	14.5 (6.6)	8.0 (3.6)
		7	(178)	231															
		8	(203)	231															
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
		14	(356)	231															
10	(250)	6	(152)	221	0.7 (18)	0.4 (10)	0.5 (13)	4.1	2.0					116.97 (755)	190 (13.0)	26 (660)	23.0 (10.4)	17.0 (7.7)	10.0 (4.5)
		7	(178)	221															
10	(250)	8	(203)	231	1.6 (40)	0.8 (20)	0.8 (20)	9.1	2.0					119.97 (774)	190 (13.0)	26 (660)	23.0 (10.4)	17.0 (7.7)	10.0 (4.5)
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
		14	(356)	231															
12	(300)	6	(152)	221	0.7 (17)	0.4 (10)	0.5 (13)	3.4	2.0					157.74 (1018)	190 (13.0)	26 (660)	26.5 (12.0)	24.5 (11.0)	10.0 (4.5)
		7	(178)	221															
12	(300)	8	(203)	231	1.6 (40)	0.8 (20)	0.8 (20)	7.6	2.0					161.18 (1045)	190 (13.0)	26 (660)	34.0 (15.4)	24.5 (11.0)	10.0 (4.5)
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
		14	(356)	231															
14	(350)	8	(203)	231	1.6 (40)	0.8 (20)	0.8 (20)	6.5	2.0					210.18 (1356)	130 (9.0)	26 (660)	40.0 (18.1)	27.0 (12.3)	12.0 (5.4)
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
		14	(356)	231															

See Notes Page 7

PROCO

Table 2: Sizes • Movements • Forces • Weights

See Notes Page 7

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	231 / 221 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Latreral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG/ (Bar)	Vacuum Inches of Hg/ (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
16	(400)	8	(203)	231	1.6 (40)	0.8 (20)	0.8 (20)	5.7	2.0	UNDERCURRENT TESTING				264.74 (1708)	115 (8.0)	26 (660)	47.0 (21.3)	33.5 (15.2)	15.0 (6.8)
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
		14	(356)	231															
18	(450)	8	(203)	231	1.6 (40)	0.8 (20)	0.8 (20)	5.1	2.0					325.50 (2100)	115 (8.0)	26 (660)	56.0 (25.4)	34.0 (15.5)	16.0 (7.2)
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
		14	(356)	231															
20	(500)	8	(203)	231	1.6 (40)	0.8 (20)	0.8 (20)	5.7	2.0					392.62 (2533)	115 (8.0)	26 (660)	67.0 (30.4)	38.0 (17.3)	16.0 (7.2)
		9	(229)	231															
		10	(254)	231															
		12	(305)	231															
		14	(356)	231															
22	(550)	8	(203)	221	0.8 (20)	0.5 (13)	0.5 (13)	2.6	2.0					483.08 (3117)	100 (7.0)	26 (660)	70.0 (31.8)	44.0 (20.0)	19.0 (8.6)
		9	(229)	221															
22	(550)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	5.2	2.0					481.12 (3104)	100 (7.0)	26 (660)	70.0 (31.8)	44.0 (20.0)	19.0 (8.6)
		12	(305)	231															
		14	(356)	231															
24	(600)	8	(203)	221	0.8 (20)	0.5 (13)	0.5 (13)	2.3	2.0					562.82 (3631)	100 (7.0)	26 (660)	79.0 (35.8)	48.0 (21.8)	19.0 (8.6)
		9	(229)	221															
24	(600)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	4.8	2.0					562.03 (3626)	100 (7.0)	26 (660)	79.0 (35.8)	48.0 (21.8)	20.0 (9.0)
		12	(305)	231															
		14	(356)	231															
26	(650)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	4.4	2.0					649.14 (4188)	90 (6.0)	26 (660)	100.0 (45.4)	51.0 (23.1)	20.0 (9.0)
		12	(305)	231															
		14	(356)	231															
28	(700)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	4.1	2.0					742.45 (4790)	90 (6.0)	26 (660)	102.0 (46.3)	55.0 (25.0)	28.0 (12.6)
		12	(305)	231															
		14	(356)	231															
30	(750)	9	(229)	221	0.9 (23)	0.6 (15)	0.5 (13)	2.2	2.0					798.58 (5152)	90 (6.0)	26 (660)	117.0 (53.1)	63.0 (28.6)	29.5 (13.3)
30	(750)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	3.8	2.0					842.27 (5434)	90 (6.0)	26 (660)	117.0 (53.1)	63.0 (28.6)	29.5 (13.3)
		12	(305)	231															
		14	(356)	231															

See Notes Page 7

231/221 continued

PROCO

Table 2: Sizes • Movements • Forces • Weights

See Notes Page 7

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	231 / 221 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Latreral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG / (Bar)	Vacuum Inches of Hg / (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
32	(800)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	3.6	2.0					948.29 (6118)	90 (6.0)	26 (660)	120.0 (54.4)	68.0 (30.8)	33.0 (14.9)
		12	(305)	231															
		14	(356)	231															
34	(850)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	3.4	2.0					1060.51 (6842)	90 (6.0)	26 (660)	122.0 (55.3)	72.0 (32.7)	43.0 (19.5)
		12	(305)	231															
		14	(356)	231															
36	(900)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	3.2	2.0					1179.09 (7607)	90 (6.0)	26 (660)	143.0 (64.9)	76.0 (34.5)	43.0 (19.5)
		12	(305)	231															
		14	(356)	231															
38	(950)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	3.0	2.0					1303.86 (8412)	90 (6.0)	26 (660)	162.0 (73.5)	86.0 (39.0)	43.0 (19.5)
		12	(305)	231															
		14	(356)	231															
40	(1000)	10	(254)	231	2.0 (51)	1.0 (25)	1.0 (25)	2.9	2.0					1434.99 (9258)	90 (6.0)	26 (660)	173.0 (78.5)	100.0 (45.5)	43.0 (19.5)
		12	(305)	231															
		14	(356)	231															
42	(1050)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	3.3	2.0					1628.28 (10505)	80 (5.5)	26 (660)	193.0 (87.5)	100.0 (45.5)	44.0 (20.0)
		14	(356)	231															
44	(1100)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	3.1	2.0					1774.44 (11448)	80 (5.5)	26 (660)	198.0 (89.8)	104.0 (37.2)	44.0 (20.0)
		14	(356)	231															
46	(1150)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	3.0	2.0					1926.81 (12431)	80 (5.5)	26 (660)	205.0 (93.0)	127.0 (57.6)	44.0 (20.0)
		14	(356)	231															
48	(1200)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.9	2.0					2085.53 (13455)	80 (5.5)	26 (660)	211.0 (95.7)	132.0 (59.9)	44.0 (20.0)
		14	(356)	231															
50	(1250)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.8	2.0					2250.45 (14519)	80 (5.5)	26 (660)	240.0 (108.8)	134.0 (60.0)	44.0 (20.0)
		14	(356)	231															
52	(1300)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.6	2.0					2421.72 (15624)	80 (5.5)	26 (660)	256.0 (116.1)	136.0 (61.7)	60.0 (27.0)
		14	(356)	231															
54	(1350)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.6	2.0					2599.35 (16770)	80 (5.5)	26 (660)	265.0 (120.1)	150.0 (68.0)	63.0 (28.6)
		14	(356)	231															
56	(1400)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.5	2.0					2931.67 (18914)	80 (5.5)	26 (660)	288.0 (130.6)	165.0 (70.8)	63.0 (28.6)
		14	(356)	231															
58	(1450)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.4	2.0					3011.34 (19428)	80 (5.5)	26 (660)	300.0 (136.1)	190.0 (86.2)	66.2 (30.0)
		14	(356)	231															
60	(1500)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.3	2.0					3208.97 (20703)	80 (5.5)	26 (660)	310.0 (140.6)	200.0 (90.7)	68.3 (31.2)
		14	(356)	231															
66	(1650)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.1	2.0					3839.51 (24771)	80 (5.5)	26 (660)	350.0 (158.7)	240.0 (108.8)	71.0 (32.2)
		14	(356)	231															
68	(1700)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	2.0	2.0					4062.24 (28208)	70 (5.0)	26 (660)	368.8 (166.9)	227.0 (103.0)	76.3 (34.6)
		14	(356)	231															

UNDERCURRENT TESTING

See Notes Page 7

231/221 continued

PROCO

Table 2: Sizes • Movements • Forces • Weights *See Notes Below*

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	231 / 221 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Latreral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG/ (Bar)	Vacuum Inches of Hg/ (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
72	(1800)	12	(305)	231	2.4 (61)	1.2 (30)	1.1 (28)	1.9	2.0	UNDER CURRENT TESTING				4526.62 (29244)	70 (5.0)	26 (660)	390.0 (176.9)	290.0 (131.5)	87.0 (39.4)
		14	(356)	231															
78	(1950)	12	(305)	231	2.3 (57)	1.2 (30)	1.0 (25)	1.8	2.0					5410.60 (34907)	85 (6.0)	26 (660)	410.0 (186.0)	315.0 (142.9)	103.0 (46.7)
		14	(356)	231															
84	(2100)	12	(305)	231	2.3 (57)	1.2 (30)	1.0 (25)	1.6	2.0					6221.13 (40136)	85 (6.0)	26 (660)	440.0 (200.0)	350.0 (158.0)	113.0 (51.3)
		14	(356)	231															
90	(2250)	12	(305)	231	2.3 (57)	1.2 (30)	1.0 (25)	1.6	2.0					7088.11 (45730)	85 (6.0)	26 (660)	448.0 (203.1)	363.0 (164.6)	125.0 (56.7)
		14	(356)	231															
96	(2400)	12	(305)	231	2.3 (57)	1.2 (30)	1.0 (25)	1.4	2.0					8011.85 (51689)	85 (6.0)	26 (660)	466.0 (211.3)	367.0 (170.5)	125.0 (56.7)
		14	(356)	231															
102	(2550)	12	(305)	231	2.3 (57)	1.2 (30)	1.0 (25)	1.3	2.0					8992.02 (58013)	85 (6.0)	26 (660)	485.8 (220.0)	395.0 (179.1)	137.0 (62.1)
		14	(356)	231															
108	(2700)	12	(305)	231	2.3 (57)	1.2 (30)	1.1 (28)	1.2	2.0					10028.75 (64702)	85 (6.0)	26 (660)	510.0 (231.3)	425.0 (192.7)	139.0 (63.0)
		14	(356)	231															
120	(3000)	12	(305)	231	2.3 (57)	1.2 (30)	1.0 (25)	1.1	2.0					12271.84 (79173)	85 (6.0)	26 (660)	540.0 (244.9)	565.0 (256.2)	151.0 (65.8)
		14	(356)	231															

Neutral lengths underlined are the recommended minimum lengths.
Metric Conversion Formula: Nominal I.D.: in. x 25 = mm; Dimensions: in. x 25.4 = mm; Pressure: PSIG x .069 = Bar

NOTES:
1. The degree of angular movement is based on the maximum rated extension.
2. Torsional movement is expressed when the expansion joint is at its neutral length.
3. To determine "end thrust", multiply thrust factor by operating pressure of system.
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 or working pressure for 10 minutes is available upon request.
5. Weights are approximate and vary due to OAL.
6. Control rod unit weight consists of one rod with washers, nuts and two control rod plates. Multiply number of control rods needed for application (as specified in the Fluid Sealing Association's Technical Handbook) to determine correct weights.

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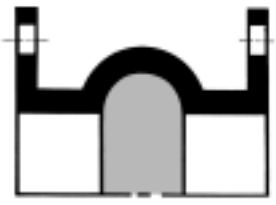
Filled Arch Rubber Expansion Joints

Known as Style FA231 or Style FA221 the Series FA230 Rubber Expansion Joints are designed to eliminate flow turbulence and collection of solids in the arch core. Filled Arch Rubber Expansion Joints can be found in applications such as sludge, slurries or other heavy solids where material entrapment, high flow velocity or high abrasion conditions exist. Filled arch products are manufactured with seamless tube and are built as an integral part of the carcass. Although the tube is made of a low durometer filler stock, movement ratings of the Style FA231 or Style FA221 are 50% less than those movements listed in the table above. PROCO can manufacture any size listed in the table above.



FA231
Single Filled Arch

PROCO

STYLE

232/222

double wide arch spool type rubber expansion joints

Table 3: Sizes • Movements • Forces • Weights *See Notes Page 9*

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	232 / 222 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Lateral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG/ (Bar)	Vacuum Inches of Hg/ (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
1.5	(40)	10	(254)	232	2.4 (61)	1.2 (30)	1.2 (30)	58.0	2.0					7.44 (48)	200 (14.0)	26 (660)	3.0 (1.4)	2.5 (1.1)	2.3 (1.0)
2	(50)	10	(254)	232	2.8 (70)	1.4 (34)	1.2 (30)	53.8	2.0					12.40 (80)	200 (14.0)	26 (660)	4.0 (1.8)	4.0 (1.8)	2.8 (1.3)
2.5	(65)	10	(254)	232	2.8 (70)	1.4 (34)	1.2 (30)	47.4	2.0					15.66 (101)	200 (14.0)	26 (660)	4.5 (2.0)	4.5 (2.0)	2.8 (1.3)
3	(80)	10	(254)	232	2.8 (70)	1.4 (34)	1.2 (30)	42.2	2.0					19.36 (125)	200 (14.0)	26 (660)	6.0 (2.7)	5.5 (2.5)	2.8 (1.3)
4	(100)	10	(254)	232	2.8 (70)	1.4 (34)	1.2 (30)	34.2	2.0					27.90 (180)	200 (14.0)	26 (660)	8.5 (3.9)	8.0 (3.5)	2.8 (1.3)
5	(125)	10	(254)	232	2.8 (70)	1.4 (34)	1.2 (30)	28.6	2.0					38.13 (246)	190 (13.0)	26 (660)	9.5 (4.3)	8.5 (3.9)	4.0 (1.8)
6	(150)	10	(254)	232	2.8 (70)	1.4 (34)	1.2 (30)	24.4	2.0					49.91 (322)	190 (13.0)	26 (660)	11.5 (5.2)	9.5 (4.3)	4.0 (1.8)
		12	(305)	232	2.8 (70)	1.4 (34)	1.2 (30)	24.4	2.0					49.91 (322)	190 (13.0)	26 (660)	11.5 (5.2)	9.5 (4.3)	4.0 (1.8)
8	(200)	10	(254)	232	2.8 (70)	1.4 (34)	1.2 (30)	18.8	2.0					77.97 (503)	190 (13.0)	26 (660)	16.0 (7.3)	14.5 (6.6)	8.0 (3.6)
		12	(305)	232	2.8 (70)	1.4 (34)	1.2 (30)	18.8	2.0					77.97 (503)	190 (13.0)	26 (660)	16.0 (7.3)	14.5 (6.6)	8.0 (3.6)
10	(250)	12	(305)	222	1.4 (35)	0.8 (20)	1.0 (25)	8.2	2.0					116.97 (755)	190 (13.0)	26 (660)	28.3 (12.8)	17.0 (7.7)	10.0 (4.5)
		14	(356)	232	3.2 (80)	1.6 (40)	1.6 (40)	17.8	2.0					119.97 (774)	190 (13.0)	26 (660)	29.0 (13.2)	17.0 (7.7)	10.0 (4.5)
12	(300)	12	(305)	222	1.4 (35)	0.8 (20)	1.0 (25)	6.8	2.0					157.74 (1018)	190 (13.0)	26 (660)	36.0 (16.3)	24.5 (11.0)	10.0 (4.5)
		14	(356)	232	3.2 (80)	1.6 (40)	1.6 (40)	14.9	2.0					161.98 (1045)	190 (13.0)	26 (660)	36.0 (16.3)	24.5 (11.0)	10.0 (4.5)
14	(350)	12	(305)	222	1.4 (35)	0.8 (20)	1.0 (25)	5.8	2.0					204.61 (1320)	140 (9.5)	26 (660)	44.0 (20.0)	27.0 (12.3)	12.0 (5.4)
		14	(356)	232	3.2 (80)	1.6 (40)	1.6 (40)	12.9	2.0					210.18 (1356)	130 (9.0)	26 (660)	44.0 (20.0)	27.0 (12.3)	12.0 (5.4)
		16	(406)	232	3.2 (80)	1.6 (40)	1.6 (40)	12.9	2.0					210.18 (1356)	130 (9.0)	26 (660)	44.0 (20.0)	27.0 (12.3)	12.0 (5.4)
16	(400)	12	(305)	222	1.6 (40)	1.0 (25)	1.0 (25)	7.0	2.0					257.54 (1662)	110 (7.5)	26 (660)	53.0 (24.0)	33.5 (15.2)	15.0 (6.8)
		14	(356)	232	3.2 (80)	1.6 (40)	1.6 (40)	11.3	2.0					264.74 (1708)	115 (8.0)	26 (660)	53.0 (24.0)	33.5 (15.2)	15.0 (6.8)
		16	(406)	232	3.2 (80)	1.6 (40)	1.6 (40)	11.3	2.0					264.74 (1708)	115 (8.0)	26 (660)	53.0 (24.0)	33.5 (15.2)	15.0 (6.8)
18	(450)	12	(305)	222	1.6 (40)	1.0 (25)	1.0 (25)	6.2	2.0					316.59 (2043)	110 (7.5)	26 (660)	61.0 (27.7)	34.0 (15.5)	16.0 (7.2)
		14	(356)	232	3.2 (80)	1.6 (40)	1.6 (40)	10.1	2.0					325.50 (2100)	115 (8.0)	26 (660)	61.0 (27.7)	34.0 (15.5)	16.0 (7.2)
		16	(406)	232	3.2 (80)	1.6 (40)	1.6 (40)	10.1	2.0					325.50 (2100)	115 (8.0)	26 (660)	61.0 (27.7)	34.0 (15.5)	16.0 (7.2)
20	(500)	12	(305)	222	1.6 (40)	1.0 (25)	1.0 (25)	5.6	2.0					381.69 (2463)	110 (7.5)	26 (660)	73.0 (33.1)	38.0 (17.3)	16.0 (7.2)
		14	(356)	232	3.2 (80)	1.6 (40)	1.6 (40)	9.1	2.0					392.62 (2533)	115 (8.0)	26 (660)	73.0 (33.1)	38.0 (17.3)	16.0 (7.2)
		16	(406)	232	3.2 (80)	1.6 (40)	1.6 (40)	9.1	2.0					392.62 (2533)	115 (8.0)	26 (660)	73.0 (33.1)	38.0 (17.3)	16.0 (7.2)

UNDERCUT RESISTANT

See Notes Page 9

PROCO

Table 3: Sizes • Movements • Forces • Weights

See Notes Below

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	232 / 222 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Latreral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG / (Bar)	Vacuum Inches of Hg / (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
24	(600)	14	(356)	222	1.6 (40)	1.0 (25)	1.0 (25)	4.7	2.0	UNDER CURRENT TESTING				562.82 (3631)	100 (7.0)	26 (660)	88.0 (40.0)	48.0 (21.8)	20.0 (9.1)
		16	(406)	232	4.0 (102)	2.0 (51)	2.0 (51)	9.5	2.0					562.03 (3626)	100 (7.0)	26 (660)	88.0 (40.0)	48.0 (21.8)	20.0 (9.1)
30	(750)	14	(356)	222	1.9 (48)	1.0 (25)	1.0 (25)	4.3	2.0					798.58 (5152)	90 (6.0)	26 (660)	127.0 (57.6)	63.0 (28.6)	29.5 (13.3)
		16	(406)	232	4.0 (102)	2.0 (51)	2.0 (51)	7.6	2.0					842.27 (5434)	90 (6.0)	26 (660)	127.0 (57.6)	63.0 (28.6)	29.5 (13.3)
34	(850)	14	(356)	222	1.9 (48)	1.0 (25)	1.0 (25)	3.8	2.0					1007.86 (8502)	90 (6.0)	26 (660)	134.0 (60.8)	72.0 (32.7)	43.0 (19.5)
		16	(406)	232	4.0 (102)	2.0 (51)	2.0 (51)	6.7	2.0					1060.51 (6842)	90 (6.0)	26 (660)	134.8 (60.8)	72.0 (32.7)	43.0 (19.5)
36	(900)	14	(356)	222	1.9 (48)	1.0 (25)	1.0 (25)	3.6	2.0					1217.14 (7852)	90 (6.0)	26 (660)	156.0 (70.8)	76.0 (34.5)	43.0 (19.5)
		16	(406)	232	4.0 (102)	2.0 (51)	2.0 (51)	6.3	2.0					1179.09 (7607)	90 (6.0)	26 (660)	156.0 (70.8)	76.0 (34.5)	43.0 (19.5)
42	(1050)	14	(356)	222	2.2 (56)	1.5 (38)	1.2 (30)	3.1	2.0					1673.13 (10775)	80 (5.5)	26 (660)	211.0 (95.7)	100.0 (45.4)	44.0 (20.0)
		16	(406)	232	4.8 (120)	2.4 (61)	2.2 (56)	6.5	2.0					1628.28 (10505)	80 (5.5)	26 (660)	211.0 (95.7)	100.0 (45.4)	44.0 (20.0)
48	(1200)	14	(356)	222	2.2 (56)	1.5 (38)	1.2 (30)	2.7	2.0					2134.86 (13773)	80 (5.5)	26 (660)	222.0 (100.7)	132.0 (59.9)	44.0 (20.0)
		16	(406)	232	4.8 (120)	2.4 (61)	2.2 (56)	5.7	2.0					2085.53 (13455)	80 (5.5)	26 (660)	222.8 (101.0)	132.0 (59.9)	44.0 (20.0)

Larger diameters available upon request.

Neutral lengths underlined are the recommended minimum lengths.

Metric Conversion Formula: Nominal I.D.: in. x 25 = mm; Dimensions: in. x 25.4 = mm; Pressure: PSIG x .069 = Bar

NOTES:

1. The degree of angular movement is based on the maximum rated extension.
2. Torsional movement is expressed when the expansion joint is at neutral length.
3. To determine "end thrust", multiply thrust factor by operating pressure of system.
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 or working pressure for 10 minutes is available upon request.
5. Weights are approximate and vary due to OAL.
6. Control rod unit weight consists of one rod with washers, nuts and two control rod plates. Multiply number of control rods needed for application (as specified in the Fluid Sealing Association's Technical Handbook) to determine correct weights.

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Filled Arch Rubber Expansion Joints

Known as Style FA232 or Style FA222 the Series FA230 Rubber Expansion Joints are designed to eliminate flow turbulence and collection of solids in the arch core. Filled Arch Rubber Expansion Joints can be found in applications such as sludge, slurries or other heavy solids where material entrapment, high flow velocity or high abrasion conditions exist. Filled arch products are manufactured with seamless tube and are built as an integral part of the carcass. Although the tube is made of a low durometer filler stock, movement ratings of the Style FA232 or Style FA222 are 50% less than those movements listed in the table above. PROCO can manufacture any size listed in the table above.

FA232
Double Filled Arch

PROCO

STYLE 233/223

triple wide arch spool type rubber expansion joints

Table 4: Sizes • Movements • Forces • Weights *See Notes Page 11*

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	233 / 223 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Latreral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG/ (Bar)	Vacuum Inches of Hg/ (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
1.5	(40)	12	(305)	223	1.3 (33)	0.7 (18)	1.5 (38)	41.5	2.0					6.20 (40)	200 (14.0)	26 (660)	4.0 (1.8)	2.5 (1.1)	6.0 (2.7)
		14	(356)	233	3.5 (90)	1.8 (45)	1.9 (48)	67.4	2.0					7.44 (48)	200 (14.0)	26 (660)	4.0 (1.8)	2.5 (1.1)	6.0 (2.7)
2	(50)	12	(305)	223	1.3 (33)	0.7 (18)	1.5 (38)	33.5	2.0					7.79 (50)	200 (14.0)	26 (660)	5.5 (2.5)	4.0 (1.8)	7.0 (3.2)
		14	(356)	233	4.1 (105)	2.0 (51)	1.9 (48)	63.9	2.0					12.40 (80)	200 (14.0)	26 (660)	5.5 (2.5)	4.0 (1.8)	7.0 (3.2)
2.5	(65)	12	(305)	223	1.3 (33)	0.7 (18)	1.5 (38)	27.9	2.0					14.73 (95)	200 (14.0)	26 (660)	6.0 (2.7)	4.5 (2.0)	7.0 (3.2)
		14	(356)	233	4.1 (105)	2.0 (51)	1.9 (48)	58.5	2.0					15.66 (101)	200 (14.0)	26 (660)	6.0 (2.7)	4.5 (2.0)	7.0 (3.2)
3	(80)	12	(305)	223	1.3 (33)	0.7 (18)	1.5 (38)	23.8	2.0					17.52 (113)	200 (14.0)	26 (660)	7.0 (3.2)	5.5 (4.3)	7.3 (3.4)
		14	(356)	233	4.1 (105)	2.0 (51)	1.9 (48)	53.4	2.0					19.38 (125)	200 (14.0)	26 (660)	7.0 (3.2)	5.5 (4.3)	7.3 (3.4)
4	(100)	12	(305)	223	1.3 (33)	0.7 (18)	1.5 (38)	22.5	2.0					26.66 (172)	200 (14.0)	26 (660)	9.0 (4.1)	8.0 (3.6)	8.0 (3.6)
		14	(356)	233	4.1 (105)	2.0 (51)	1.9 (48)	45.6	2.0					27.90 (180)	200 (14.0)	26 (660)	9.0 (4.1)	8.0 (3.6)	8.0 (3.6)
5	(125)	12	(305)	223	1.7 (43)	0.8 (20)	1.5 (38)	18.3	2.0					36.43 (235)	190 (13.0)	26 (660)	11.0 (5.0)	8.5 (3.9)	8.0 (3.6)
		14	(356)	233	4.1 (105)	2.0 (51)	1.9 (48)	39.2	2.0					38.13 (246)	190 (13.0)	26 (660)	11.0 (5.0)	8.5 (3.9)	8.0 (3.6)
6	(150)	12	(305)	223	1.7 (43)	0.8 (20)	1.5 (38)	15.4	2.0					47.71 (308)	190 (13.0)	26 (660)	13.5 (6.1)	9.5 (4.3)	10.0 (4.5)
		14	(356)	233	4.1 (105)	2.0 (51)	1.9 (48)	34.2	2.0					49.91 (322)	190 (13.0)	26 (660)	13.5 (6.1)	9.5 (4.3)	10.0 (4.5)
		16	(406)	233	4.1 (105)	2.0 (51)	1.9 (48)	34.2	2.0					49.91 (322)	190 (13.0)	26 (660)	13.5 (6.1)	9.5 (4.3)	12.0 (5.4)
8	(200)	12	(305)	223	2.2 (56)	1.1 (28)	1.5 (38)	15.0	2.0					82.28 (530)	190 (13.0)	26 (660)	18.0 (8.2)	14.5 (6.6)	12.0 (5.4)
		14	(356)	233	4.1 (105)	2.0 (51)	1.9 (48)	27.0	2.0					77.97 (503)	190 (13.0)	26 (660)	18.0 (8.2)	14.5 (6.6)	12.0 (5.4)
		16	(406)	233	4.1 (105)	2.0 (51)	1.9 (48)	27.0	2.0					77.97 (503)	190 (13.0)	26 (660)	18.0 (8.2)	14.5 (6.6)	12.0 (5.4)
10	(250)	14	(356)	223	2.2 (56)	1.1 (28)	1.5 (38)	12.1	2.0					116.97 (755)	190 (13.0)	26 (660)	31.0 (14.1)	17.0 (7.7)	15.0 (6.8)
		16	(406)	223	2.2 (56)	1.1 (28)	1.1 (28)	12.1	2.0					116.97 (755)	190 (13.0)	26 (660)	31.0 (14.1)	17.0 (7.7)	15.0 (6.8)
		18	(457)	233	4.7 (120)	2.4 (61)	2.4 (61)	25.6	2.0					119.97 (774)	190 (13.0)	26 (660)	31.0 (14.1)	17.0 (7.7)	16.0 (7.2)
12	(300)	14	(356)	223	2.2 (56)	1.1 (28)	1.5 (38)	10.1	2.0					157.74 (1018)	190 (13.0)	26 (660)	40.0 (18.1)	24.5 (11.0)	16.0 (7.2)
		16	(406)	223	2.2 (56)	1.1 (28)	1.1 (28)	10.1	2.0					157.74 (1018)	190 (13.0)	26 (660)	40.0 (18.1)	24.5 (11.0)	16.0 (7.2)
		18	(457)	233	4.7 (120)	2.4 (61)	2.4 (61)	5.6	2.0					161.98 (1045)	190 (13.0)	26 (660)	40.0 (18.1)	24.5 (11.0)	16.0 (7.2)
14	(350)	16	(406)	223	2.2 (56)	1.1 (28)	1.5 (38)	9.1	2.0					204.61 (1320)	130 (9.0)	26 (660)	48.5 (22.0)	27.0 (12.3)	16.0 (7.2)
		18	(457)	233	4.7 (120)	2.4 (61)	2.4 (61)	9.1	2.0					210.18 (1356)	130 (9.0)	26 (660)	48.5 (22.0)	27.0 (12.3)	16.0 (7.2)

UNDERCUT ENTIRE

See Notes Page 11

PROCO

Table 4: Sizes • Movements • Forces • Weights

See Notes Below

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		EXPANSION JOINT STYLE	233 / 223 Movement Capability: From Neutral Position					Spring Rate Capability Based on 1" of Movement at Zero Pressure Conditions					Operating [4] Conditions		Weights [5] lbs / (kgs)		
					Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Force lbs per 1" rated Compression	Force lbs per 1" rated Extension	Force lbs per 1" rated Latreral Deflection	Force ft-lbs per 1° rated Angular	Thrust Factor [3] In2 / (cm2)	Positive PSIG/ (Bar)	Vacuum Inches of Hg/ (mm of Hg)	Expansion Joint Assembly	Retaining Ring Set	Control [6] Rod Assembly
14	(350)	20	(508)	233	4.7 (120)	2.4 (61)	2.4 (61)	18.9	2.0					210.18 (1356)	130 (9.0)	26 (660)	48.5 (22.0)	27.0 (12.3)	20.0 (9.1)
16	(400)	16	(406)	223	4.0 (102)	2.0 (51)	2.0 (51)	10.5	2.0					257.54 (1662)	115 (8.0)	26 (660)	55.0 (24.9)	33.5 (15.2)	20.0 (9.1)
		18	(457)	233	4.7 (120)	2.4 (61)	2.4 (61)	16.7	2.0					264.74 (1708)	115 (8.0)	26 (660)	55.0 (24.9)	33.5 (15.2)	20.0 (9.1)
		20	(508)	233	4.7 (120)	2.4 (61)	2.4 (61)	16.7	2.0					264.74 (1708)	115 (8.0)	26 (660)	55.0 (24.9)	33.5 (15.2)	20.0 (9.1)
18	(450)	16	(406)	223	4.0 (102)	2.0 (51)	2.0 (51)	9.3	2.0					316.59 (2043)	115 (8.0)	26 (660)	66.0 (29.9)	34.0 (15.5)	21.0 (9.5)
		18	(457)	233	4.7 (120)	2.4 (61)	2.4 (61)	14.9	2.0					325.50 (2100)	115 (8.0)	26 (660)	66.0 (29.9)	34.0 (15.5)	21.0 (9.5)
		20	(508)	233	4.7 (120)	2.4 (61)	2.4 (61)	14.9	2.0					325.50 (2100)	115 (8.0)	26 (660)	66.0 (29.9)	34.0 (15.5)	21.0 (9.5)
20	(500)	18	(457)	233	4.7 (120)	2.4 (61)	2.4 (61)	13.5	2.0					392.62 (2533)	115 (8.0)	26 (660)	78.0 (35.4)	38.0 (17.3)	21.0 (9.5)
		20	(508)	233	4.7 (120)	2.4 (61)	2.4 (61)	13.5	2.0					392.62 (2533)	115 (8.0)	26 (660)	78.0 (35.4)	38.0 (17.3)	21.0 (9.5)
24	(600)	18	(457)	223	4.8 (120)	2.4 (61)	2.2 (55)	14.0	2.0					562.82 (3631)	100 (7.0)	26 (660)	91.5 (41.5)	48.0 (21.8)	32.0 (14.5)
		20	(508)	233	6.0 (150)	3.0 (75)	2.7 (69)	14.0	2.0					562.03 (3626)	100 (7.0)	26 (660)	91.5 (41.5)	48.0 (21.8)	32.0 (14.5)
30	(750)	18	(457)	223	4.8 (120)	2.4 (61)	2.2 (55)	11.3	2.0					798.58 (5152)	90 (6.0)	26 (660)	131.0 (59.4)	63.0 (28.6)	32.0 (14.5)
		20	(508)	233	6.0 (150)	3.0 (75)	2.7 (69)	11.3	2.0					842.27 (5434)	90 (6.0)	26 (660)	131.0 (59.4)	63.0 (28.6)	32.0 (14.5)
36	(900)	18	(457)	223	4.8 (120)	2.4 (61)	2.2 (55)	9.5	2.0					1217.14 (7873)	90 (6.0)	26 (660)	157.0 (71.2)	76.0 (34.5)	43.0 (19.5)
		20	(508)	233	6.0 (150)	3.0 (75)	2.7 (69)	9.5	2.0					1179.09 (7607)	90 (6.0)	26 (660)	157.0 (71.2)	76.0 (34.5)	43.0 (19.5)

UNDER CURRENT TESTING

Larger diameters available upon request.

Neutral lengths underlined are the recommended minimum lengths.

Metric Conversion Formula: Nominal I.D.: in. x 25 = mm; Dimensions: in. x 25.4 = mm; Pressure: PSIG x .069 = Bar

NOTES:

1. The degree of angular movement is based on the maximum rated extension.
2. Torsional movement is expressed when the expansion joint is at neutral length.
3. To determine "end thrust", multiply thrust factor by operating pressure of system.
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 or working pressure for 10 minutes is available upon request.
5. Weights are approximate and vary due to OAL.
6. Control rod unit weight consists of one rod with washers, nuts and two control rod plates. Multiply number of control rods needed for application (as specified in the Fluid Sealing Association's Technical Handbook) to determine correct weights.

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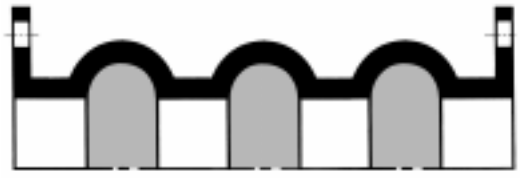
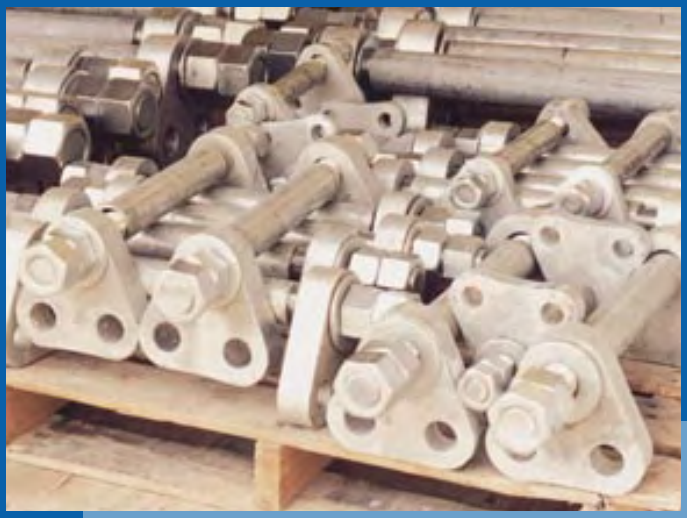
Filled Arch Rubber Expansion Joints

Known as Style FA233 or Style FA223, the Series FA230 Rubber Expansion Joints are designed to eliminate flow turbulence and collection of solids in the arch core. Filled Arch Rubber Expansion Joints can be found in applications such as sludge, slurries or other heavy solids where material entrapment, high flow velocity or high abrasion conditions exist. Filled arch products are manufactured with seamless tube and are built as an integral part of the carcass. Although the tube is made of a low durometer filler stock, movement ratings of the Style FA233 or Style FA223 are 50% less than those movements listed in the table above. PROCO can manufacture any size listed in the table above.



FA233
Triple Filled Arch



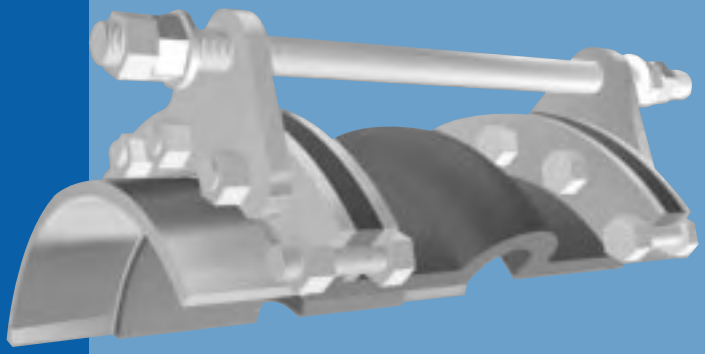


Figure 1: Limit Rod

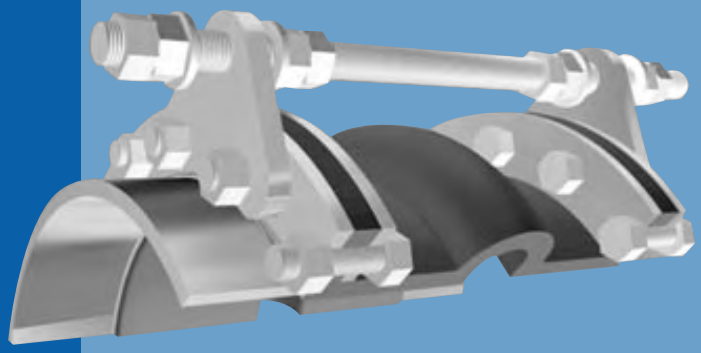


Figure 2: Control Rod

Definition — A control unit assembly is a system of two or more control rod units (limit rods, tie rods or compression sleeves) placed across an expansion joint from flange to flange to minimize possible damage caused by excessive motion of a pipeline. The failure of an anchor or some other piece of equipment in a pipeline can cause excessive motion. The control unit assemblies can be set at the maximum allowable expansion and/or contraction of the rubber expansion joint. When used in this manner, control units are an additional safety factor and can minimize possible damage to adjacent equipment.

Use of Control Units with Rubber Expansion Joints
Rubber expansion joints must be installed between two fixed anchor points in a piping system. The pipe system must be rigidly anchored on both sides of the expansion joint to control expansion or contraction of the line. Piping anchors must be capable of withstanding the line thrusts generated by internal pressure or wide temperature fluctuations. When proper anchoring cannot be provided, ***CONTROL UNITS ARE REQUIRED.***

Listed below are three (3) control unit configurations supplied by PROCO and are commonly used with rubber expansion joints in piping systems.

Figure 1 — Known as a "LIMIT ROD", this control unit configuration will allow an expansion joint to extend to a predetermined extension setting. Nuts shall be field set to no more than the maximum allowable extension movement of a rubber expansion joint. Refer to Tables 2, 3, or 4 in this manual. ***Consult the systems engineer for proper nut settings prior to system operation.***

Figure 2 — Known as a "CONTROL ROD", this control unit configuration is used to allow specified pipe expansion (expansion joint axial compression) and pipe contraction (expansion joint axial extension) movements. Nuts shall be field set to no more than the maximum allowable extension or compression of a rubber expansion joint. Refer to Tables 2, 3 or 4 in this Manual.

Internal and external nuts can also be field set to allow for no movement in the horizontal plane. This setting will allow the rubber to move laterally while keeping expansion joint thrust forces low on adjacent equipment. Spherical washers can also be furnished (upon request) to combat any potential "nut to plate" binding during offset. ***Consult the systems engineer for proper nut settings prior to system operation.***

Figure 3 — Known as a "COMPRESSION SLEEVE", this configuration is used to allow for specified pipe expansion (expansion joint axial compression) and pipe contraction (expansion joint extension) movements. Nuts shall be field set to no more than the maximum allowable extension of a rubber expansion joint. Refer to Tables 2, 3, or 4 in this manual. PROCO will manufacture each compression sleeve to allow for no axial movement unless otherwise specified by the purchaser. Compression sleeves shall be field trimmed to meet required allowable axial movement as set forth by system requirements. Spherical washers can also be furnished (upon request) to combat any potential "nut to plate" binding during offset. ***Consult the systems engineer for proper sleeve lengths prior to system operation.***

Important Control Rod Considerations — The number of rods, control rod diameters and control rod plate thicknesses are important considerations when specifying control units for an application. As a minimum, specifying engineers or purchasers shall follow the guidelines as set forth in Appendix C of the Fluid Sealing Association's Rubber Expansion Joint Division Technical Handbook (Sixth Edition). PROCO engineers its control unit assemblies to system requirements. Our designs incorporate an allowable stress of 65% of material yield for each rod and plate (rod and plate material to be specified by purchaser). Therefore, it is important to provide pressure and temperature ratings to PROCO when requesting control units for rubber expansion joints. It is also important to provide adjacent mating flange thickness or mating specifications to insure correct rod lengths are provided.

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Also available with spherical washer

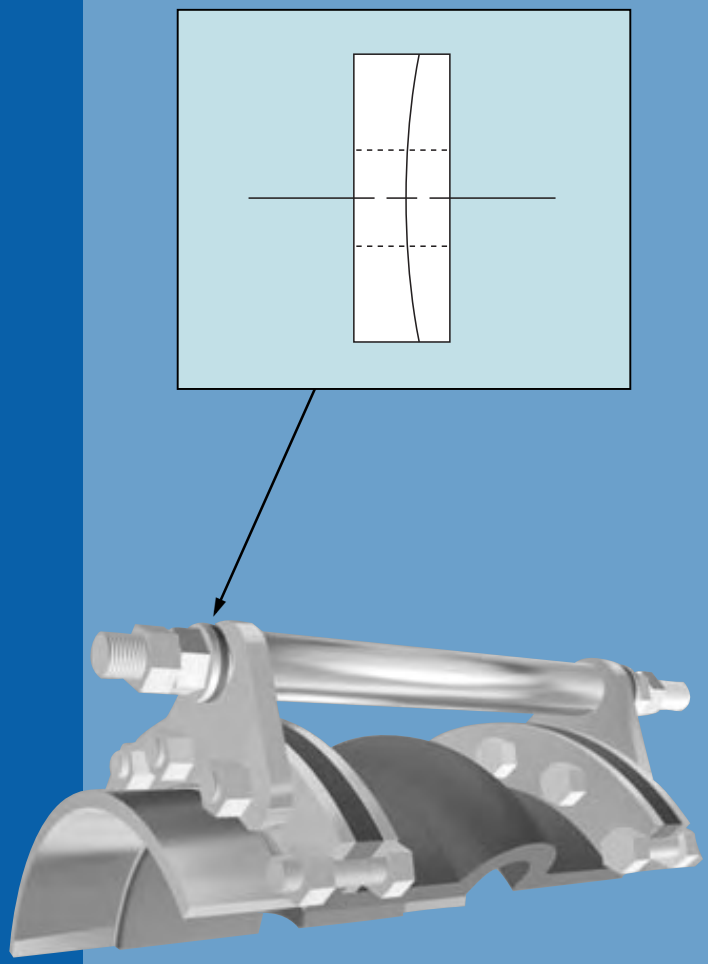


Figure 3: Compression Sleeves

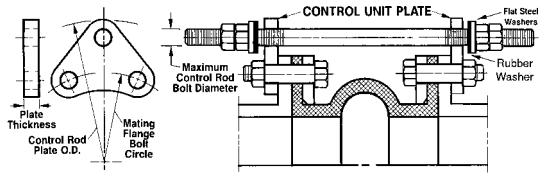


Table 5: Control Unit Plate Detail *See Notes Below*

NOMINAL SIZE Inch / (mm)		CONTROL ROD [1] PLATE O.D. Inch / (mm)		MAXIMUM [2] PLATE THK Inch / (mm)		MAXIMUM [3] ROD DIAMETER Inch / (mm)	
1	(25)	8.375	(212.7)	0.625	(15.9)	0.625	(15.9)
1.25	(32)	8.750	(222.3)	0.625	(15.9)	0.625	(15.9)
1.5	(40)	9.125	(231.8)	0.375	(9.5)	0.625	(15.9)
2	(50)	10.125	(257.2)	0.500	(12.7)	0.625	(15.9)
2.5	(65)	11.125	(282.6)	0.500	(12.7)	1.000	(25.4)
3	(80)	11.625	(295.3)	0.500	(12.7)	1.000	(25.4)
3.5	(90)	12.625	(320.7)	0.625	(15.9)	1.000	(25.4)
4	(100)	13.125	(333.4)	0.625	(15.9)	1.000	(25.4)
5	(125)	14.125	(358.8)	0.500	(12.7)	1.000	(25.4)
6	(150)	15.125	(384.2)	0.500	(12.7)	1.000	(25.4)
8	(200)	19.125	(485.8)	0.625	(15.9)	1.000	(25.4)
10	(250)	21.625	(549.3)	0.750	(19.1)	1.000	(25.4)
12	(300)	24.625	(625.5)	0.750	(19.1)	1.000	(25.4)
14	(350)	26.625	(676.3)	0.750	(19.1)	1.000	(25.4)
16	(400)	30.125	(765.2)	1.000	(25.4)	1.250	(31.8)
18	(450)	31.625	(803.3)	1.000	(25.4)	1.250	(31.8)
20	(500)	34.125	(866.8)	1.000	(25.4)	1.250	(31.8)
22	(550)	36.125	(917.6)	1.000	(25.4)	1.250	(31.8)
24	(600)	38.625	(981.1)	1.000	(25.4)	1.250	(31.8)
26	(650)	40.875	(1038.2)	1.000	(25.4)	1.250	(31.8)
28	(700)	44.125	(1120.8)	1.250	(31.8)	1.500	(38.1)
30	(750)	46.375	(1177.9)	1.500	(38.1)	1.500	(38.1)
32	(800)	49.375	(1254.1)	1.250	(31.8)	1.500	(38.1)
34	(850)	52.375	(1330.3)	1.500	(38.1)	1.750	(44.5)
36	(900)	54.625	(1387.5)	1.750	(44.5)	1.750	(44.5)
38	(950)	57.375	(1457.3)	1.500	(38.1)	1.750	(44.5)
40	(1000)	58.375	(1482.7)	1.500	(38.1)	1.500	(38.1)
42	(1050)	61.625	(1565.3)	1.500	(38.1)	1.750	(44.5)
44	(1100)	63.875	(1622.4)	1.500	(38.1)	1.750	(44.5)
46	(1150)	65.875	(1673.2)	1.500	(38.1)	1.750	(44.5)
48	(1200)	68.125	(1730.4)	1.750	(44.5)	1.750	(44.5)
50	(1250)	70.375	(1787.5)	1.500	(38.1)	1.750	(44.5)
52	(1300)	73.625	(1870.1)	1.750	(44.5)	2.000	(50.8)
54	(1350)	75.875	(1927.2)	2.000	(50.8)	2.000	(50.8)
56	(1400)	78.375	(1990.7)	2.000	(50.8)	2.000	(50.8)
58	(1450)	80.625	(2047.9)	2.000	(50.8)	2.000	(50.8)
60	(1500)	82.625	(2098.7)	2.000	(50.8)	2.000	(50.8)
66	(1650)	89.625	(2276.5)	2.000	(50.8)	2.000	(50.8)
68	(1700)	91.875	(2333.6)	2.000	(50.8)	2.000	(50.8)
72	(1800)	96.125	(2441.6)	2.000	(50.8)	2.000	(50.8)
78	(2000)	103.125	(2619.4)	2.000	(50.8)	2.250	(57.2)
84	(2150)	109.875	(2790.8)	2.250	(57.2)	2.250	(57.2)
90	(2300)	117.125	(2975.0)	2.500	(63.5)	2.500	(63.5)
96	(2450)	124.625	(3165.9)	2.750	(69.9)	2.750	(69.9)
102	(2500)	131.375	(3336.5)	2.500	(63.5)	2.750	(69.9)
108	(2750)	138.125	(3508.4)	2.500	(63.5)	2.750	(69.9)
120	(3050)	152.125	(3864.0)	2.500	(63.5)	3.000	(76.2)
132	(3350)	166.625	(4232.2)	2.500	(63.5)	3.250	(82.6)
144	(3650)	180.750	(4591.1)	2.500	(63.5)	3.500	(88.9)

***Metric Conversion:** Nominal I.D.: in. x 25 = mm; Dimensions: in. x 25.4 = mm; Pressure: PSIG x .069 = Bar*

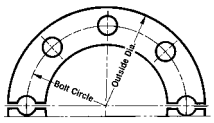
Number of Control Units is dependent upon pressure and temperature of system. Refer to Fluid Sealing Association's - REJ Division Manual, Appendix C (Sixth Edition) for ***minimum*** number of control units (per pressure rating) required for a rubber expansion joint when specified.

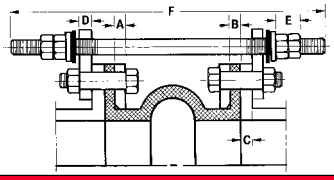
Values listed in this table are maximum values based on PROCO'S engineering data.

1. Control rod plate O.D. installed dimension is based on a **maximum** O.D. PROCO would supply. (Figures 2 and 3.)
2. Plate thickness is based on a **maximum** width PROCO would use to design a control rod plate.
3. Control rod diameter is based on a **maximum** diameter PROCO would use to design a control rod.

Series 230 Drilling Chart

Split Retaining Ring





A - Retaining Ring Thickness
B - Rubber Flange Thickness
C - Adjacent Mating Flange Thickness
D - Control Unit Plate Thickness
E - Double Nut Thickness is determined by Control Rod Diameter
F - Control Rod Bolt Length is determined by A through E + OAL [1]

Table 6: Standard Drilling for PROCO Series 230/220 Rubber Expansion Joints — Thickness of Materials for PROCO Series 230/220 Rubber Expansion Joints

NOMINAL PIPE SIZE EXPANSION JOINT I.D. Inch / (mm)		125/150# Flange Dimensions [2]						Material Thickness' for Bolt Length Requirements			
		FLANGE O.D. Inch / (mm)		BOLT CIRCLE Inch / (mm)		NO. OF HOLES	SIZE OF HOLES	RETAINING RING THICKNESS Inch / (mm)	RUBBER FLANGE THICKNESS Inch / (mm)	ADJACENT MATING FLANGE THICKNESS	MAX. CONTROL [3] ROD PLATE THICKNESS Inch / (mm)
1	(25)	4.25	(107.95)	3.13	(79.50)	4	0.625 (15.9)	0.375 (9.53)	0.472 (11.99)		0.625 (15.9)
1.25	(32)	4.63	(117.60)	3.50	(88.90)	4	0.625 (15.9)	0.375 (9.53)	0.472 (11.99)		0.625 (15.9)
1.5	(40)	5.00	(127.00)	3.88	(98.55)	4	0.625 (15.9)	0.375 (9.53)	0.472 (11.99)	C	0.375 (9.5)
2	(50)	6.00	(152.40)	4.75	(120.65)	4	0.750 (19.1)	0.375 (9.53)	0.472 (11.99)	U	0.500 (12.7)
2.5	(65)	7.00	(177.80)	5.50	(139.70)	4	0.750 (19.1)	0.375 (9.53)	0.472 (11.99)	S	0.500 (12.7)
3	(80)	7.50	(190.50)	6.00	(152.40)	4	0.750 (19.1)	0.375 (9.53)	0.472 (11.99)	T	0.500 (12.7)
3.5	(90)	8.50	(215.90)	7.00	(177.80)	8	0.750 (19.1)	0.375 (9.53)	0.472 (11.99)	O	0.625 (15.9)
4	(100)	9.00	(228.60)	7.50	(190.50)	8	0.750 (19.1)	0.375 (9.53)	0.472 (11.99)	M	0.625 (15.9)
5	(125)	10.00	(254.00)	8.50	(215.90)	8	0.875 (22.2)	0.375 (9.53)	0.551 (14.00)	E	0.500 (12.7)
6	(150)	11.00	(279.40)	9.50	(241.30)	8	0.875 (22.2)	0.375 (9.53)	0.551 (14.00)	R	0.500 (12.7)
8	(200)	13.50	(342.90)	11.75	(298.45)	8	0.875 (22.2)	0.375 (9.53)	0.630 (16.00)		0.625 (15.9)
10	(250)	16.00	(406.40)	14.25	(361.95)	12	1.000 (25.4)	0.375 (9.53)	0.630 (16.00)	T	0.750 (19.1)
12	(300)	19.00	(482.60)	17.00	(431.80)	12	1.000 (25.4)	0.375 (9.53)	0.748 (19.00)	O	0.750 (19.1)
14	(350)	21.00	(533.40)	18.75	(476.25)	12	1.125 (28.6)	0.375 (9.53)	0.866 (22.00)		0.750 (19.1)
16	(400)	23.50	(596.90)	21.25	(539.75)	16	1.125 (28.6)	0.375 (9.53)	0.866 (22.00)	D	1.000 (25.4)
18	(450)	25.00	(635.00)	22.75	(577.85)	16	1.250 (31.8)	0.375 (9.53)	0.866 (22.00)	E	1.000 (25.4)
20	(500)	27.50	(698.50)	25.00	(635.00)	20	1.250 (31.8)	0.375 (9.53)	0.984 (25.00)	T	1.000 (25.4)
22	(550)	29.50	(749.30)	27.25	(692.15)	20	1.375 (34.9)	0.375 (9.53)	0.984 (25.00)	E	1.000 (25.4)
24	(600)	32.00	(812.80)	29.50	(749.30)	20	1.375 (34.9)	0.375 (9.53)	0.984 (25.00)	R	1.000 (25.4)
26	(650)	34.25	(869.95)	31.75	(806.45)	24	1.375 (34.9)	0.375 (9.53)	0.984 (25.00)	M	1.000 (25.4)
28	(700)	36.50	(927.10)	34.00	(863.60)	28	1.375 (34.9)	0.375 (9.53)	0.984 (25.00)	I	1.250 (31.8)
30	(750)	38.75	(984.25)	36.00	(914.40)	28	1.375 (34.9)	0.375 (9.53)	0.984 (25.00)	N	1.500 (38.1)
32	(800)	41.75	(1060.45)	38.50	(977.90)	28	1.625 (41.3)	0.375 (9.53)	0.984 (25.00)	E	1.250 (31.8)
34	(850)	43.75	(1111.25)	40.50	(1028.70)	32	1.625 (41.3)	0.375 (9.53)	0.984 (25.00)		1.500 (38.1)
36	(900)	46.00	(1168.40)	42.75	(1085.85)	32	1.625 (41.3)	0.375 (9.53)	0.984 (25.00)	M	1.750 (44.5)
38	(950)	48.75	(1238.25)	45.25	(1149.35)	32	1.625 (41.3)	0.375 (9.53)	0.984 (25.00)	A	1.500 (38.1)
40	(1000)	50.75	(1289.05)	47.25	(1200.15)	36	1.625 (41.3)	0.375 (9.53)	0.984 (25.00)	T	1.500 (38.1)
42	(1050)	53.00	(1346.20)	49.50	(1257.30)	36	1.625 (41.3)	0.375 (9.53)	1.181 (29.99)	I	1.500 (38.1)
44	(1100)	55.25	(1403.35)	51.75	(1314.45)	40	1.625 (41.3)	0.375 (9.53)	1.181 (29.99)	N	1.500 (38.1)
46	(1150)	57.25	(1454.15)	53.75	(1365.25)	40	1.625 (41.3)	0.375 (9.53)	1.181 (29.99)	G	1.500 (38.1)
48	(1200)	59.50	(1511.30)	56.00	(1422.40)	44	1.625 (41.3)	0.375 (9.53)	1.181 (29.99)		1.750 (44.5)
50	(1250)	61.75	(1568.45)	58.25	(1479.55)	44	1.875 (47.6)	0.375 (9.53)	1.181 (29.99)	F	1.500 (38.1)
52	(1300)	64.00	(1625.60)	60.50	(1536.70)	44	1.875 (47.6)	0.375 (9.53)	1.181 (29.99)	L	1.750 (44.5)
54	(1350)	66.25	(1682.75)	62.75	(1593.85)	44	2.000 (50.8)	0.375 (9.53)	1.181 (29.99)	A	2.000 (50.8)
56	(1400)	68.75	(1746.25)	65.00	(1651.00)	48	1.875 (47.6)	0.375 (9.53)	1.181 (29.99)	N	2.000 (50.8)
58	(1450)	71.00	(1803.40)	67.25	(1708.15)	48	1.875 (47.6)	0.375 (9.53)	1.181 (29.99)	G	2.000 (50.8)
60	(1500)	73.00	(1854.20)	69.25	(1758.95)	52	2.000 (50.8)	0.375 (9.53)	1.181 (29.99)	E	2.000 (50.8)
66	(1650)	80.00	(2032.00)	76.00	(1930.40)	52	2.000 (50.8)	0.375 (9.53)	1.181 (29.99)		2.000 (50.8)
68	(1700)	82.25	(2089.15)	78.25	(1987.55)	56	2.000 (50.8)	0.375 (9.53)	1.181 (29.99)	T	2.000 (50.8)
72	(1800)	86.50	(2197.10)	82.50	(2095.50)	60	2.000 (50.8)	0.375 (9.53)	1.181 (29.99)	H	2.000 (50.8)
78	(1950)	93.00	(2362.20)	89.00	(2260.60)	64	2.125 (53.0)	0.375 (9.53)	1.188 (30.18)	I	2.000 (50.8)
84	(2100)	99.75	(2533.65)	95.50	(2425.70)	64	2.250 (57.2)	0.375 (9.53)	1.188 (30.18)	C	2.250 (57.2)
90	(2250)	106.50	(2705.10)	102.00	(2590.80)	68	2.375 (60.3)	0.375 (9.53)	1.188 (30.18)	K	2.500 (63.5)
96	(2400)	113.25	(2876.55)	108.50	(2755.90)	68	2.500 (63.5)	0.375 (9.53)	1.188 (30.18)	N	2.750 (69.9)
102	(2550)	120.00	(3048.00)	114.50	(2908.30)	72	2.625 (66.7)	0.375 (9.53)	1.188 (30.18)	E	2.500 (63.5)
108	(2700)	126.75	(3219.45)	120.75	(3067.05)	72	2.625 (66.7)	0.375 (9.53)	1.188 (30.18)	S	2.500 (63.5)
120	(3000)	140.25	(3562.35)	132.75	(3371.85)	76	2.875 (73.0)	0.375 (9.53)	1.188 (30.18)	S	2.500 (63.5)
132	(3300)	153.75	(3905.25)	145.75	(3705.05)	80	3.125 (79.4)	0.375 (9.53)	1.188 (30.18)		2.500 (63.5)
144	(3600)	167.25	(4248.15)	158.25	(4019.55)	84	3.375 (85.7)	0.375 (9.53)	1.188 (30.18)		2.500 (63.5)

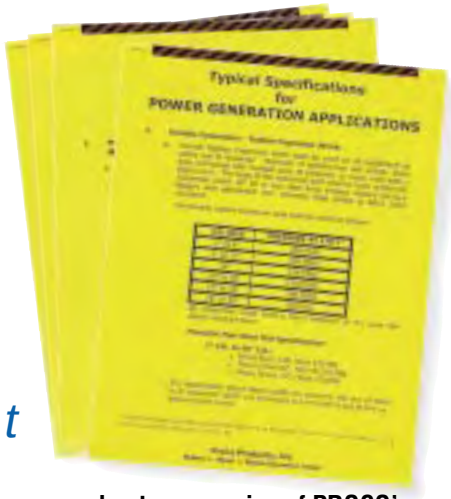
Metric Conversion Formula: Nominal I.D.: in. x 25 = mm; Dimensions: in. x 25.4 = mm; Pressure: PSIG x .069 = Bar

Notes: 1. Control rod length is determined by OAL of rubber expansion joint, rated extension, retaining ring thickness, mating flange thickness and number of nuts. Consult PROCO for rod lengths.
2. Flange dimensions shown are in accordance with 125/150 pound standards: ANSI B16.1 AWWA C-207 Tables 1 and 2 Class D; AWWA C-207 Table 3 see Class E. Hole size shown is l/8" larger than AWWA standard.
3. Plate thickness is based on a maximum width PROCO would use to design a control rod plate.

PROCO

YOUR EXPANSION JOINT SOURCE

PROCO PRODUCTS, INC. can offer our customers the largest expansion joint product selection available in today's market! Whether it be rubber, molded PFA, fabric or metal expansion joints, PROCO can offer a product to meet your needs. And remember … if PROCO doesn't have the products needed for your application, nobody does!



Phone us and get your copies of PROCO's Typical Specifications for your HVAC, Water/ Waste Water, Power Generation, and Plastic/FRP/Glass piping applications!

These PROCO products complement the Series 230/220

The PROCO Series RE (Eccentric Reducer) Rubber Expansion Joints are in stock in neoprene and butyl elastomers.

The PROCO Series RC (Concentric Reducer) Rubber Expansion Joints are in stock in a multitude of sizes.

The PROCO Series Series 300 Rubber Pipe can be used to elimi- nate piping vibration.

The PROCO Series 251/BT PTFE and FEP Lined Rubber Expansion Joints are are an excellent choice for highly corrosive fluid pipelines.

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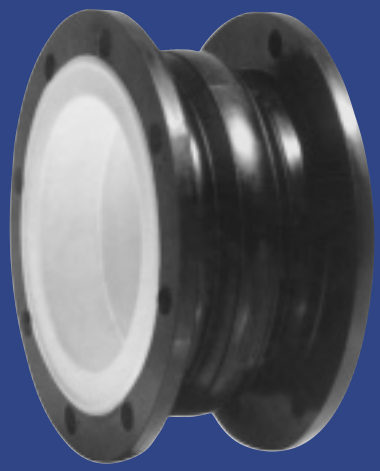
PROCO™

SERIES 231/BT

PTFE lined rubber expansion joints



The PROCO Series 231/BT PTFE lined expansion joints are designed for tough demanding corrosive chemical applications, as found in: Chemical & Petrochemical Process Facilities and Highly Corrosive Industrial Piping & Pollution Control Systems. The greatest usage of the Series 231/BT is found in the Pulp and Paper Industry where the ability to resist corrosive attack at elevated temperature and pressure is unmatched by metallic, plastic or other competitive expansion joints. PROCO's Series 231 PTFE lined expansion joints can easily handle such pulp/paper applications as: White-Green-Black liquor, bleach plant chlorination and caustic extraction stages. Chemically resistant against the entire pH range, PROCO Series 231 PTFE expansion joints are designed to handle practically every chemical plant application. Installed next to mechanical equipment or between anchor points of a piping system, specify the PROCO 231/BT to: (1) Absorb Pipe Movements/Stress, (2) Reduce System Noise, (3) Isolate Mechanical Vibrations, (4) Compensate Alignment/Offset, (5) Eliminate Electrolytic Action and Electrolysis, (6) Protect Against Start-Up/Surge Forces. Our history in the manufacture of expansion joints dates back to 1930. When you need an engineered rubber expansion joint solution to a piping problem, call PROCO.

Series 231/BT. The new and improved PROCO Series 231/BT will complement the existing PROCO Series 251/BT expansion joint. This new molded product has been completely re-engineered to provide improved strength, flexibility and movement capabilities. Manufactured utilizing tire cord industry technology, the Series 231/BT combines woven polyester fabric and polyester tire cord into a fabric matrix and bonded with a Chlorobutyl elastomer that is reinforced with wire and bonded to a PTFE liner to create a product with greater operating performance. **Note: The PTFE liner extends to the bolt circle of the bottom of bolt holes.**

Greater Movements with a Lower/Wider Arch Profile. The movements for the PROCO Series 231/BT exceed the specification of the Fluid Sealing Association's, Rubber Expansion Joint Division Technical Handbook (Sixth Edition), Table V. Due to a new and improved lower, wider profile arch, more axial compression and extension coupled with lateral and angular movements can be obtained without increasing the face-to-face requirements. For greater movements based on re-engineering and new product construction for highly corrosive piping installations, specify the PROCO Series 231/BT PTFE lined expansion joints.

Chemical Service Capability at Minimal Cost. Expensive, exotic metal expansion joint for low temperature service can be replaced with the PROCO Series 231/BT PTFE lined expansion joints. Engineered to operate up to 225 PSIG and 250°F, the PROCO Series 231/BT can be specified for a wide range of piping system requirements. Our standard stock is furnished with an exterior Chlorobutyl cover. Compared to metal, plastic or other rubber-backed competitive products, you will invest less and have access to in-stock availability with the high quality PROCO Series 231/BT.

Specifications Met. PROCO has assigned conservative pressure ratings to the Series 231/BT PTFE lined rubber expansion joints. The ratings, however, meet the requirements of the Fluid Sealing Association's, Rubber Expansion Joint Division Technical Handbook (Sixth Edition), Series C. The pressure ratings for the Series 231/BT PTFE lined rubber expansion joints have been fully tested and are based on a minimum four-to-one safety factor. For pressure protection with confidence, specify the PROCO Series 231/BT.

Prevents Electrolysis and Electrolytic Action. In Chemical applications when metallic expansion joints are used, they are generally of a metal dissimilar from the pipeline. This may create an electrolytic galvanic action that could be destructive to the connector equipment or piping system. The use of the rubber-backed PROCO 231/BT PTFE lined expansion joints prevents this potential hazard. Additionally, our 231/BT expansion joints are nonconductive and eliminate the metal-to-metal contact at the flange face thus stopping electrolysis.

Absorbs Vibration • Noise • Shock. The PROCO Series 231/BT PTFE lined rubber expansion joints are a replacement for "sound transmitting" metallic expansion joints. Sound loses energy traveling axially through an expansion joint. Water hammer, pumping impulses, water-borne noises and other forms of strain-stress-shock are cushioned and absorbed by the PTFE lined/rubber elastomer expansion joint, not related to piping. Install the Series 231/BT in a system to reduce vibration transmission when the piping section beyond the expansion joint is anchored or sufficiently rigid. For quiet, stress-free systems specify the PROCO Series 231/BT.

Large Inventories Mean Same-Day Shipment. We maintain the largest inventory of expansion joints in the world. Rubber, PTFE Lined, Plastic or Metal Hose — PROCO can ship the products you need when you need them! In fact, when it comes to expansion joints, **if PROCO doesn't have them in stock … nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

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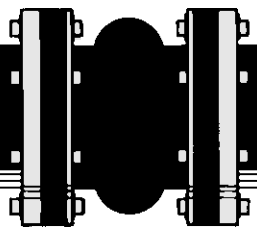
Fax ..... 209 / 943-0242
Email ..... sales@procoproducts.com
Website ..... www.procoproducts.com

Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

Rev. 00 5/03

Table 1: Available Styles • Design Descriptions • I.D. Sizes	
#231/BT — Standard Single-Arch, Spool-Type Joint (See Table 2)	1"–48"
#251/BT — Standard Single-Arch, Spool-Type Joint	1"–48"
#151/BT — Special Non-Standard Length Single-Arch, Spool-Type Joint	1"–48"
#310/BT — Standard "No-Arch" Flanged Rubber Pipe Connectors	1"–12"



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ISD Independent Sealing Distributors

NAHAD National Association of Hose and Accessories Distributors

PTFE lined rubber expansion joints

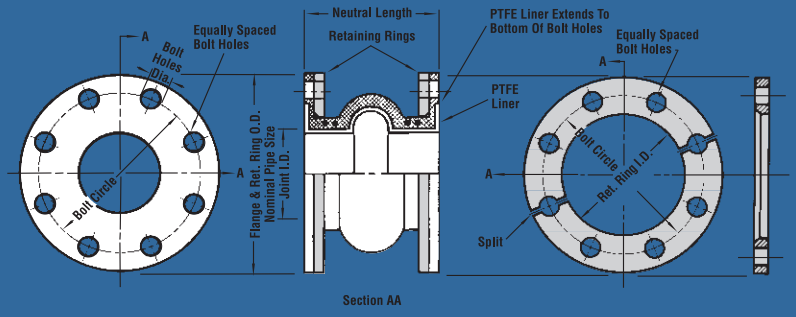

Figure 1: Detail Of Style 231/BT

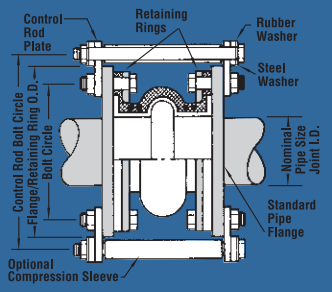

Table 2: Sizes • Movements • Pressures • Weights • Drilling

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm) [1]		NEUTRAL LENGTH Inch / (mm)		231/BT Movement Capability: From Neutral Position						Operating Conditions [5]		Weights in lbs / (kgs) [6]			Flange Dimensions and Drilling [8]			
				Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [2] Deflection Degrees	Torsional [3] Rotation Degrees	Thrust Factor [4] In2 / (cm2)	Positive PSIG / (Bar)	Vacuum Inches of Hg / (mm of Hg)	Joint Assembly	Retaining Ring Set	Control Unit [7] Assembly	O.D. of Exp. Joint / Ring Inch / (mm)	Bolt Circle Inch / (mm)	Number of Holes	Size of Holes Inch / (mm)
1.5	(40)	6	(150)	1.25 (32)	0.625 (16)	0.625 (16)	28.0°	1°	1.8 (11)	225 (15.5)	30 (762)	1.5 (0.7)	2.5 (1.1)	2.3 (1.0)	5.0 (127.0)	3.88 (98.6)	4	0.625 (15.88)
2	(50)				0.625 (16)	0.625 (16)	25.0°	1°	3.1 (20)	225 (15.5)	30 (762)	2.0 (0.9)	4.0 (1.8)	2.8 (1.3)	6.0 (152.4)	4.75 (120.65)	4	0.750 (19.05)
2.5	(65)				0.625 (16)	0.625 (16)	20.2°	1°	4.9 (32)	225 (15.5)	30 (762)	2.5 (1.2)	4.5 (2.0)	2.8 (1.3)	7.0 (177.8)	5.50 (139.7)	4	0.750 (19.05)
3	(80)				0.625 (16)	0.625 (16)	18.0°	1°	7.1 (46)	225 (15.5)	30 (762)	3.0 (1.4)	5.5 (2.5)	2.8 (1.3)	7.5 (190.5)	6.00 (152.4)	4	0.750 (19.05)
4	(100)				0.625 (16)	0.625 (16)	14.2°	1°	12.6 (81)	225 (15.5)	30 (762)	4.0 (1.8)	8.0 (3.6)	2.8 (1.3)	9.0 (228.6)	7.50 (190.5)	8	0.750 (19.05)
5	(125)				0.625 (16)	0.625 (16)	13.0°	1°	19.6 (127)	225 (15.5)	30 (762)	5.0 (2.3)	8.5 (3.9)	4.0 (1.8)	10.0 (254.0)	8.50 (215.9)	8	0.875 (22.23)
6	(150)				0.625 (16)	0.625 (16)	12.2°	1°	28.3 (182)	225 (15.5)	30 (762)	7.0 (3.2)	9.5 (4.3)	4.0 (1.8)	11.0 (279.4)	9.50 (241.3)	8	0.875 (22.23)
8	(200)				0.625 (16)	0.625 (16)	12.0°	1°	50.3 (324)	210 (14.5)	30 (762)	11.0 (5.0)	14.5 (6.6)	8.0 (3.6)	13.5 (342.9)	11.75 (298.4)	8	0.875 (22.23)
10	(250)	8	(200)	2.0 (50)	1.0 (25)	1.0 (25)	11.9°	1°	78.5 (507)	210 (14.5)	30 (762)	19.0 (8.6)	17.0 (7.7)	10.0 (4.5)	16.0 (406.4)	14.25 (362.0)	12	1.000 (25.40)
12	(300)				1.0 (25)	1.0 (25)	11.3°	1°	113.1 (730)	210 (14.5)	30 (762)	29.0 (13.2)	24.5 (11.0)	10.0 (4.5)	19.0 (482.6)	17.00 (431.8)	12	1.000 (25.40)
14	(350)				1.0 (25)	1.0 (25)	11.5°	1°	153.9 (993)	150 (10.0)	30 (762)	38.0 (17.2)	27.0 (12.3)	12.0 (5.4)	21.0 (533.4)	18.75 (476.3)	12	1.125 (28.58)
16	(400)				1.0 (25)	1.0 (25)	10.1°	1°	201.1 (1297)	150 (10.0)	30 (762)	44.0 (20.0)	33.5 (15.2)	15.0 (6.8)	23.5 (596.9)	21.25 (539.8)	16	1.125 (28.58)
18	(450)				1.0 (25)	1.0 (25)	8.9°	1°	254.5 (1642)	150 (10.0)	30 (762)	49.0 (22.2)	34.0 (15.5)	16.5 (7.2)	25.0 (635.0)	22.75 (577.9)	16	1.250 (31.75)
20	(500)				1.0 (25)	1.0 (25)	8.1°	1°	314.2 (2027)	150 (10.0)	30 (762)	54.0 (24.5)	38.0 (17.3)	16.5 (7.2)	27.5 (698.5)	25.00 (635.0)	20	1.250 (31.75)
24	(600)	10	(250)	3.0 (75)	1.5 (38)	1.5 (38)	9.0°	1°	452.4 (2919)	110 (7.5)	28 (711)	60.0 (27.2)	48.0 (21.8)	20.0 (9.0)	32.0 (812.8)	29.50 (749.3)	20	1.375 (34.93)
30	(750)				1.5 (38)	1.5 (38)	7.5°	1°	706.9 (4560)	100 (7.0)	28 (711)	88.0 (44.0)	63.0 (28.6)	29.5 (13.3)	38.8 (984.3)	36.00 (914.4)	28	1.375 (34.93)
36	(900)				1.5 (38)	1.5 (38)	6.7°	1°	1017.9 (6567)	100 (7.0)	28 (711)	112.0 (50.8)	76.0 (34.5)	43.0 (19.5)	46.0 (1168.4)	42.75 (1085.9)	32	1.625 (41.28)

Notes:

1. Teflon liner extends to bottom of bolt holes.
2. The degree of angular movement is based on the maximum rated extension.
3. Torsional movement is expressed when the expansion joint is a neutral length.
4. To determine "end thrust", multiply thrust factor by operating pressure of system.
5. Pressure rating is based on 194°F operating temperature. At higher temperature the pressure rating is slightly reduced.
6. Weights are approximate.
7. Control unit weight consists of one rod, four washers, three nuts and two control rod plates. Multiply number of control units needed for application (as specified in the Fluid Sealing Association Technical Handbook) to determine correct weights.
8. Dimensions shown are in accordance with 125/150# standards of ANSI B-16.1, B-16.24, B-16.5; AWWA C-207 Table 1 and 2 Class D.

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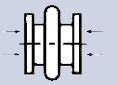
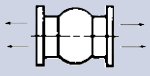
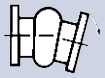


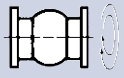
Axial Compression



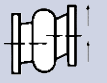
Axial Elongation



Angular Movement
Bending Of The Centerline



Torsional Movement
Rotation About The Centerline (Twist)



Lateral Movement
Shear Or Perpendicular To Centerline

Absorbing Vibration

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SERIES 240/242

molded expansion joints

PROCO Series 240 and Series 242 Non-Metallic Expansion Joints are designed for tough demanding industrial applications as found in: Air Conditioning-Heating and Ventilating Systems, Chemical-Petrochemical and Industrial Process Piping Systems, Power Generating Systems, Marine Services, Pulp & Paper Systems, Water-Waste-water-Sewage and Pollution Control Systems. Installed next to mechanical equipment or between the anchor points of a piping system, specify the PROCO Series 240 or 242 to: (1) Absorb Pipe/Movement/Stress, (2) Reduce System Noise, (3) Isolate Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-Up/Surge Forces. Our history in the manufacturing of expansion joint products dates back to 1930. When you need an engineered rubber solution to a piping system problem, call PROCO.

Spherical Shapes-Stronger-More Efficient. Featuring an engineered molded style single or twin sphere designed bellows, the PROCO Series 240 and Series 242 are inherently stronger than the conventional hand-built Spool Type arch. Internal pressure within a sphere is exerted in all directions, distributing forces evenly over a larger area The spherical design "flowing-arch" reduces turbulence, sediment buildup, thrust area and the effects of thrust on the piping system equipment when compared to the "high-arch" design of hand-built standard products.

Greater Movements Are Available with the PROCO Series 240 and Series 242 when compared to the movements of conventional hand-built products. Axial compression, elongation, deflection and angular movements in the system are more readily absorbed by spherical types. These products are more forgiving and can be compressed or extended to install in non-standard openings, caused by equipment shifting or settling (Pre-compressing/extending the expansion joints for installation, may result in reduced pressure, vacuum and movement capabilities of the expansion joints. See Tables 2 and 3.)

Easy Installation With Alignable Metallic Flanges. The floating metallic flanges freely rotate on the bellows, compensating for mating flange misalignment, thus speeding up installation time (see Figures 1, 2, 3 & 4). Gaskets are also not required with the Series 240 or Series 242, provided the expansion joints are mated against a flat face flange as required in the installation instructions.

Less System Strain With Thin Wall Design. Manufactured by high pressure molding of elastomer and high-tensile fabric reinforcement, the Series 240 and Series 242 have a thinner wall section and lighter weight when compared to conventional hand-built products. Lower spring forces are therefore required, reducing piping/flange/equipment stress-strain-damage. PROCO Styles 240-C and 240-A are acceptable for use with plastic piping systems where even lower deflection forces are required.

Specifications Met. The PROCO Series 240 and Series 242 are designed to meet or exceed the pressure, movement and dimensional rating of the Spool Type arch as shown in the Rubber Expansion Joint Division, Fluid Sealing Association "Technical Handbook - Sixth Edition" Tables IV & V.

Absorbs Vibration-Noise-Shock. The PROCO quiet operating Series 240 and Series 242 are a replacement for "sound transmitting" metallic expansion joints. Sound loses energy traveling axially through the elastomer bellows. Water hammer pumping impulses and water-borne noises are cushioned and absorbed by the molded lightweight thin-wall structure. Install the Series 240 or Series 242 in a system to enable isolated equipment to move freely on its vibration mountings; or to reduce vibration transmission when the piping section beyond the expansion joint is anchored or sufficiently rigid.

Flange Materials/Drilling. All PROCO Spherical 240 and 242 connectors are furnished complete with plated carbon steel flanges for corrosion protection. Series 240 and 242 Neoprene connectors — 12" and below — are tapped to ANSI 125/150# drilling. All other connectors come with standard drilled holes to the ANSI 125/150# standards (see Table 7 and Figures 3 & 4). Stainless steel flanges and other drilling standards such as: ANSI 250/300#, BS-10, DIN NP-10 and DIN NP-16 are also available from stock and are listed on Table 7. JIS-5K and JIS-10K are also available upon request.

Chemical Service Capability At Minimal Cost. Expensive, exotic metal expansion joints for chemical service can be replaced with the PROCO Series 240 or Series 242. Molded with low cost chemical resistant elastomers such as Neoprene, Nitrile, Hypalon®, EPDM and Chlorobutyl insures an expansion joint is compatible with the fluid being pumped or piped. (See Table 1 below). Use the PROCO "Chemical/Rubber Guide" to specify an elastomer recommendation compatible for your requirement.

Wide Service Range With Low Cost. Engineered to operate up to 300 PSIG and 265°F, the PROCO Series 240 and Series 242 can be specified for a wide range of piping requirements. Compared to conventional hand-built Spool Type arch, you will invest less money when specifying the mass-produced, consistent high quality, molded single or twin sphere expansion joints.

Large Inventories Mean Same-Day Shipment. PROCO maintains the largest inventory of spherical expansion joints in the Americas. Every size listed is in stock in several elastomers and comes with a choice of drilling patterns. Shipment is based on customer need. PROCO can ship same day as order placement. In fact, when it comes to rubber expansion joints, **if PROCO doesn't have your requirement…nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

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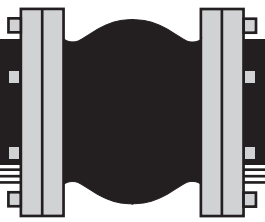
Weekday office hours are 5:30 a.m. to 5:15 p.m. (Pacific Time)

Table 1: Available Styles • Materials

For Specific Elastomer Recommendations, See: **PROCO™ "Chemical To Elastomer Guide"**

240-A	240-C	240-AV,D,E,M	242-A,B,C	PROCO™ Material Code [1]	Cover Elastomer [2]	Tube Elastomer	Maximum Operating Temp. °F	Identifying Color Band/Label
		X	X	/BB	Chlorobutyl	Chlorobutyl	250°	Black
	X	X	X	/EE	EPDM	EPDM	250°	Red
	X			/EE-9	EPDM	EPDM	265°	Red
	X			/ET-9 [3]	EPDM	Teflon®	265°	Red
	X			/HH	Hypalon®	Hypalon®	230°	Green
		X	X	/NH	Neoprene	Hypalon®	230°	Green
	X			/NJ	Neoprene	FDA-Nitrile	230°	White
		X	X	/NN	Neoprene	Neoprene	230°	Blue
X	X	X	X	/NP	Neoprene	Nitrile	230°	Yellow
X	X			/NT [3]	Neoprene	Teflon®	230°	



Protecting Piping And Equipment Systems From Stress/Motion

NOTES: Hypalon® is a registered trademark of DuPont Dow Elastomers. Teflon® is a registered trademark of the DuPont Company.
1. All elastomers include nylon reinforcing, except EE-9 which is steel cord.
   All materials meet or exceed the Rubber Expansion Joint Division, Fluid Sealing Association-REJ Division requirements for Standard Class I and II. EE-9 also meets Special Class II. For more information see The FSA Technical Handbook, Table 1.
   Materials NN, NP and NH meet all requirements of U.S.C.G.
   EPDM Materials good for up to 300°F for pressures 15 PSI or less.
2. Expansion joint "cover" (outside) can be Hypalon® painted on special order.
3. Products with Teflon® "tube" (inside) are not to be used for vacuum service.

Rev. 04 12/04

series 240 single sphere expansion joints

Table 2: Sizes • Movements • Pressures • Flange Standards • Weights

NOMINAL PIPE Size I.D.	Neutral Length	PROCO Style Number [1]	240 Movement Capability: From Neutral Position [2]					Pressure [4]		Standard Flange Bolting Dimensions					Weight in lbs [8]	
			Axial Compression Inches	Axial Extension Inches	Lateral Deflection Inches	Angular Deflection Degrees	Thrust [3] Factor	Positive [5] PSIG	Vacuum [6] Inches of Hg	Flange O.D. Inches	Bolt Circle Inches	Number of Holes	Size of Holes Inches	Bolt Hole [7] Thread	Exp. Joint & Flanges	Control Unit Set (2 Rod)
1	**6.00**	**240-AV**	0.500	0.375	0.500	37	4.43	225	26	4.25	3.13	4	0.625	1/2-13 UNC	3.8	3.3
1.25	3.74	240-D	0.312	0.188	0.312	17	6.34	235	26	4.63	3.5	4	0.625	—	4.6	3.3
	5.00	240-C	1.063	1.250	1.188	45		225	21				0.625	—	5.0	
	5.00	240-E	.500	0.375	0.500	31		225	26				0.625		5.0	
	6.00	**240-AV**	.500	0.375	0.500	31		225	26				0.625	1/2-13 UNC	5.0	
1.5	3.74	240-D	0.375	0.188	0.312	14	6.49	225	26	5.0	3.88	4	0.625	—	5.4	4.6
	4.00	240-M	0.375	0.188	0.312	14		225	26				0.625	—	5.5	
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.625	—	5.1	
	5.00	240-E	0.500	0.375	0.500	27		225	26				0.625		6.0	
	6.00	**240-AV**	0.500	0.375	0.500	27		225	26				0.625	1/2-13 UNC	6.1	
2	4.00	240-M	0.375	0.188	0.312	11	7.07	225	26	6.0	4.75	4	0.750	—	8.3	6.3
	4.13	240-D	0.375	0.188	0.312	11		225	26				0.750	—	8.5	6.3
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.750	—	7.1	6.3
	5.00	240-E	0.375	0.375	0.500	20		225	26				0.750	—	8.5	6.3
	6.00	240-A	1.188	1.188	1.188	45		235	18				0.750	—	7.1	6.3
	6.00	240-HW	0.500	0.375	0.500	20		300	26				0.750	—	11.0	7.6
	6.00	**240-AV**	0.500	0.375	0.500	20		225	26				0.750	5/8-11 UNC	12.3	7.6
2.5	4.00	240-M	0.375	1.188	0.375	8	11.05	225	26	7.0	5.5	4	0.750	—	12.0	7.6
	4.53	240-D	0.500	0.250	0.375	11		225	26				0.750	—	12.3	
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.750	—	10.6	
	5.00	240-E	0.500	0.375	0.500	17		225	26				0.750	—	12.0	
	6.00	240-A	1.188	1.188	1.188	43		235	18				0.750	—	12.0	
	6.00	**240-AV**	0.500	0.375	0.500	17		225	26				0.750	5/8-11 UNC	12.3	
3	5.00	240-C	1.063	1.250	1.188	40	13.36	235	15	7.5	6.0	4	0.750	—	13.3	8.3
	5.00	240-E	0.500	0.375	0.500	14		225	26				0.750	—	14.0	8.3
	5.14	240-D	0.500	0.375	0.500	14		225	26				0.750	—	14.0	8.3
	6.00	240-A	1.188	1.188	1.188	38		235	15				0.750	—	13.8	8.3
	6.00	240-HW	0.500	0.375	0.500	14		300	26				0.750	—	17.5	8.3
	6.00	**240-AV**	0.500	0.375	0.500	14		225	26				0.750	5/8-11 UNC	14.0	8.3
	8.00	**240-AV**	0.500	0.375	0.500	14		225	26				0.750	5/8-11 UNC	15.0	8.7
3.5	**6.00**	**240-AV**	0.500	0.375	0.500	12	18.67	225	26	8.5	7.0	8	0.750	5/8-11 UNC	17.6	7.4
4	5.00	240-C	1.063	1.250	1.188	32	22.69	235	15	9.0	7.5	8	0.750	—	16.5	7.4
	5.00	240-E	0.750	0.500	0.500	14		225	26				0.750	—	17.0	7.4
	5.32	240-D	0.750	0.500	0.500	14		225	26				0.750	—	17.1	7.4
	6.00	240-A	1.188	1.188	1.188	30		235	15				0.750	—	17.5	7.4
	6.00	240-HW	0.750	0.500	0.500	14		300	26				0.750	—	26.0	7.4
	6.00	**240-AV**	0.750	0.500	0.500	14		225	26				0.750	5/8-11 UNC	18.3	7.4
	8.00	**240-AV**	0.750	0.500	0.500	14		225	26				0.750	5/8-11 UNC	19.3	7.8
5	5.00	240-C	1.063	1.250	1.188	27	30.02	235	10	10.0	8.5	8	0.875	—	20.3	8.3
	5.00	240-E	0.750	0.500	0.500	11		225	26				0.875	—	22.0	8.3
	6.00	240-A	1.188	1.188	1.188	25		235	10				0.875	—	21.8	8.3
	6.00	**240-AV**	0.750	0.500	0.500	11		225	26				0.875	3/4-10 UNC	22.8	8.3
	6.69	240-D	0.750	0.500	0.500	11		225	10				0.875	—	23.6	8.5
	8.00	**240-AV**	0.750	0.500	0.500	11		225	26				0.875	3/4-10 UNC	25.0	10.8
6	5.00	240-C	1.063	1.250	1.188	23	41.28	225	8	11.0	9.5	8	0.875	—	22.6	10.4
	5.00	240-E	0.750	0.500	0.500	9		225	26				0.875	—	26.0	10.4
	6.00	240-A	1.188	1.188	1.188	21		235	10				0.875	—	24.0	10.4
	6.00	240-HW	0.750	0.500	0.500	9		300	26				0.875	—	39.0	10.4
	6.00	**240-AV**	0.750	0.500	0.500	9		225	26				0.875	3/4-10 UNC	26.8	10.4
	7.09	240-D	0.750	0.500	0.500	9		225	26				0.875	—	29.0	10.6
	8.00	**240-AV**	0.750	0.500	0.500	9		225	26				0.875	3/4-10 UNC	29.1	10.8
8	5.00	240-C	1.063	1.188	1.188	17	63.62	235	8	13.5	11.75	8	0.875	—	35.5	13.4
	5.00	240-E	0.750	0.500	0.500	7		225	26				0.875	—	40.0	13.4
	6.00	240-A	1.188	1.188	1.188	16		235	8				0.875	—	38.5	13.4
	6.00	240-HW	0.750	0.500	0.500	7		300	26				0.875	—	70.0	13.4
	6.00	**240-AV**	0.750	0.500	0.500	7		225	26				0.875	3/4-10 UNC	40.6	13.4
	8.07	240-D	1.000	0.563	0.875	8		225	26				0.875	—	41.3	14.0
10	5.00	240-C	1.063	1.188	1.188	14	103.87	235	6	16.0	14.25	12	1.000	—	49.3	21.0
	5.00	240-E	1.000	0.625	0.750	7		225	26				1.000	—	56.0	21.0
	8.00	240-A	1.188	1.188	1.188	13		235	6				1.000	—	53.6	21.3
	8.00	**240-AV**	1.000	0.625	0.750	7		225	26				1.000	7/8-9 UNC	56.6	21.3
	9.00	**240-AV**	1.000	0.625	0.750	7		225	26				1.000	7/8-9 UNC	57.0	22.0
	8.00	240-HW	1.000	0.625	0.750	7		275	26				1.000	—	56.0	22.0
	9.45	240-D	1.000	0.625	0.875	7		225	26				1.000	—	58.5	22.0
	10.00	**240-AV**	1.000	0.625	0.750	7		225	26				1.000	7/8-9 UNC	60.5	26.5
12	5.00	240-C	1.063	1.250	1.188	12	137.89	235	6	19.0	17.0	12	1.000	—	73.4	26.5
	5.00	240-E	1.000	0.625	0.750	6		225	26				1.000	—	74.0	26.5
	8.00	240-A	1.188	1.188	1.188	11		235	6				1.000	—	80.0	27.0
	8.00	240-HW	1.000	0.625	0.750	6		275	26				1.000	—	100.0	27.0
	8.00	**240-AV**	1.000	0.625	0.750	6		225	26				1.000	7/8-9 UNC	83.0	27.0
	9.00	**240-AV**	1.000	0.625	0.750	6		225	26				1.000	7/8-9 UNC	88.0	27.0
	10.24	240-D	1.000	0.625	0.875	6		225	26				1.000	—	89.0	28.0
14	8.00	240-HW	1.000	0.625	0.750	5	182.65	200	26	21.0	18.75	12	1.125	—	162.0	28.0
	8.00	**240-AV**	1.000	0.625	0.750			150	26				1.125	—	115.0	28.0
	9.00	240-M	1.000	0.625	0.750			150	26				1.125	—	117.0	29.0
	10.43	240-D	1.000	0.625	0.875			150	26				1.125	—	120.0	29.0
16	8.00	240-C	1.000	1.063	1.188	8	240.53	145	6	23.5	21.25	16	1.125	—	136.0	26.8
	8.00	240-HW	1.000	0.625	0.750	4		175	26				1.125	—	186.0	26.8
	8.00	**240-AV**	1.000	0.625	0.750	4		125	26				1.125	—	165.0	26.8
	9.00	240-M	1.000	0.625	0.750	4		125	26				1.125	—	168.0	27.0
	10.43	240-D	1.000	0.625	0.975	4		125	26				1.125	—	170.0	27.0
18	8.00	240-HW	1.000	0.625	0.750	4	298.65	175	26	25.0	22.75	16	1.250	—	209.0	31.4
	8.00	**240-AV**	1.000	0.625	0.750			125	26				1.250	—	168.0	31.4
	9.00	240-M	1.000	0.625	0.750			125	26				1.250	—	169.0	33.1
	10.43	240-D	1.000	0.625	0.875			125	26				1.250	—	170.0	33.1
20	8.00	240-C	1.000	1.063	1.188	6	363.05	145	6	27.5	25.00	20	1.250	—	154.0	32.4
	8.00	240-HW	1.000	0.625	0.750	3		175	26				1.250	—	234.0	32.4
	8.00	**240-AV**	1.000	0.625	0.750	3		125	26				1.250	—	170.0	32.4
	9.00	240-M	1.000	0.625	0.750	3		125	26				1.250	—	173.0	34.1
	10.43	240-D	1.000	0.625	0.875	3		125	26				1.250	—	175.0	34.1
22	**10.00**	**240-AV**	1.000	0.625	0.750	3	433.74	115	26	27.5	25.0	20	1.375	—	210.0	34.5
24	8.00	240-C	1.000	1.063	1.188	5	510.70	145	6	32.5	29.5	20	1.375	—	214.0	44.0
	10.00	**240-AV**	1.000	0.625	0.750	3		110	26				1.375	—	255.0	45.5
	10.00	240-HW	1.000	0.625	0.750	3		160	26				1.375	—	297.0	45.5
	10.47	240-D	1.000	0.625	0.875	3		110	26				1.375	—	265.0	46.0
26	**10.00**	**240-AV**	1.000	0.625	0.750	3	593.96	110	26	34.25	31.75	24	1.375	—	270.0	46.5
30	**10.00**	**240-AV**	1.000	0.625	0.750	2	779.31	110	26	38.75	36.0	28	1.375	—	295.0	57.0

Standard PROCO Style 240-AV Expansion Joints shown in Bold Type are considered Standards and inventoried in large quantities.

NOTES:
1. "HW" denotes Heavy Weight Construction.
2. Movements stated are non-concurrent.
3. To determine End Thrust: Multiply Thrust Factor by Operating Pressure of System. This is End Thrust in pounds.
4. Pressure rating is based on 170°F operating temperature. The pressure rating is reduced slightly at higher temperatures.
5. Pressures shown are maximum "operating pressure." Test pressure is 1.5 times "operating pressure." Burst pressure is approximately 4 times "operating pressure."
6. Vacuum rating is based on neutral installed length, without external load. Products should not be installed "extended" on vacuum applications.
7. Style 240-AV/NN (Neoprene elastomer only) expansion joints 1.0" I.D. – 12.0" I.D. come with tapped holes in lieu of drilled holes.
8. All expansion joints are furnished complete with flanges. Control units are required on applications where movements could exceed rated capabilities.

series 242 twin sphere expansion joints

Table 3: Sizes • Movements • Pressures • Flange Standards • Weights

NOMINAL PIPE Size I.D.	Neutral Length	PROCO Style Number [1]	242 Movement Capability: From Neutral Position [2]					Pressure [4]		Standard Flange Bolting Dimensions					Weight in lbs [8]	
			Axial Compression Inches	Axial Extension Inches	Lateral Deflection Inches	Angular Deflection Degrees	Thrust [3] Factor	Positive [5] PSIG	Vacuum [6] Inches of Hg	Flange O.D. Inches	Bolt Circle Inches	Number of Holes	Size of Holes Inches	Bolt Hole [7] Thread	Exp. Joint & Flanges	Control Unit Set (2 Rod)
1	10.00	242-C	2.000	1.188	1.750	45	4.43	225	26	4.25	3.13	4	0.625	—	5.2	3.6
1.25	**7.0** 7.0 10.00	**242-A** 242-HA 242-C	2.000	1.188	1.750	45	6.34	225 300 225	26	4.63	3.5	4	0.625 0.625 0.625	1/2-13 UNC — —	5.3 6.5 6.2	3.5 3.5 3.6
1.5	6.00 6.00 **7.00** 7.00 10.00	242-B 242-HB **242-A** 242-HA 242-C	2.000	1.188	1.750	45	6.49	225 300 225 300 225	26	5.0	3.88	4	0.625 0.625 0.625 0.625 0.625	— — 1/2-11 UNC — —	6.1 7.6 6.8 8.3 7.7	4.6 4.6 4.8 4.8 5.1
2	6.00 6.00 **7.00** 7.00 10.00	242-B 242-HB **242-A** 242-HA 242-C	2.000	1.188	1.750	45	7.07	225 300 225 300 235	26	6.0	4.75	4	0.750 0.750 0.750 0.750 0.750	— — 5/8-11 UNC — —	9.0 10.5 9.0 10.5 10.2	6.6 6.6 7.0 7.0 7.3
2.5	6.00 6.00 **7.00** 7.00 10.00	242-B 242-HB **242-A** 242-HA 242-C	2.000	1.188	1.750	43	11.05	225 300 225 300 225	26	7.0	5.5	4	0.750 0.750 0.750 0.750 0.750	— — 5/8-11 UNC — —	12.9 15.3 13.3 15.8 14.5	7.6 7.6 8.0 8.0 8.4
3	**7.00** 7.00 9.00 10.00 12.00	**242-A** 242-HA 242-B 242-C 242-C	2.000	1.188	1.750	38	13.36	225 300 225 225 300	26	7.5	6.0	4	0.750 0.750 0.750 0.750 0.750	5/8-11 UNC — — — —	14.3 18.2 15.2 15.8 16.0	8.6 8.6 9.0 9.1 9.9
3.5	10.00	242-C	2.000	1.188	1.750	34	18.67	225	26	8.5	7.0	8	0.750	—	20.6	8.1
4	**9.00** 9.00 10.00 12.00	**242-A** 242-HA 242-C 242-C	2.000	1.375	1.562	34	22.69	225 300 225 225	26	9.0	7.5	8	0.750 0.750 0.750 0.750	5/8-11 UNC — — 3/4-10 UNC	20.3 26.4 21.3 22.0	8.0 8.0 8.2 8.2
5	**9.00** 9.00 10.00 12.00	**242-A** 242-HA 242-C 242-C	2.000	1.375	1.562	29	30.02	225 300 225 225	26	10.0	8.5	8	0.875 0.875 0.875 0.875	— — — —	24.5 31.4 25.5 26.0	8.3 8.3 9.1 9.1
6	**9.00** 9.00 10.00 12.00 14.00	**242-A** 242-HA 242-C 242-C 242-C	2.000	1.375	1.562	25	41.28	225 300 225 225 225	26	11.0	9.5	8	0.875 0.875 0.875 0.875 0.875	3/4-10 UNC — — — —	29.5 38.6 30.5 31.0 32.0	11.7 11.7 11.9 12.0 12.0
8	9.00 9.00 10.00 12.00 **13.00** 13.00 14.00	242-B 242-HB 242-C 242-C **242-A** 242-HA 242-C	2.375	1.375	1.375	19	63.62	225 300 225 225 225 300 225	26	13.5	11.75	8	0.875 0.875 0.875 0.875 0.875 0.875 0.875	— — — — 3/4-10 UNC — —	42.3 55.4 43.4 44.0 43.8 57.5 46.0	14.5 14.5 15.0 15.2 15.4 15.4 16.0
10	12.00 12.00 **13.00** 13.00 14.00	242-B 242-HB **242-A** 242-HA 242-C	2.375	1.375	1.375	15	103.87	225 275 225 275 225	26	16.0	14.25	12	1.000 1.000 1.000 1.000 1.000	— — 7/8-9 UNC — —	64.1 86.5 65.5 88.4 66.7	23.5 23.5 24.5 24.5 24.5
12	12.00 12.00 **13.00** 13.00 14.00	242-B 242-HB **242-A** 242-HA 242-C	2.375	1.375	1.375	13	137.89	225 275 225 275 225	26	19.0	17.00	12	1.000 1.000 1.000 1.000 1.000	— — 7/8-9 UNC — —	94.0 110.0 95.0 110.0 99.1	30.0 30.0 31.0 31.0 31.0
14	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	9	182.65	150 150 200	26	19.0	18.75	12	1.125 1.125 1.125	— — —	110.0 112.0 144.0	30.5 32.0 32.0
16	12.00 12.00 **13.75** 13.75	242-C 242-HC **242-A** 242-HA	1.750	1.118	1.118	8	240.53	125 175 125 175	26	23.5	21.25	16	1.125 1.125 1.125 1.125	— — — —	124.0 160.0 132.0 170.2	28.8 28.8 30.8 30.8
18	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	7	298.65	125 125 175	26	25.0	22.75	16	1.250 1.250 1.250	— — —	138.0 146.0 181.2	35.1 36.1 36.1
20	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	7	363.05	125 125 175	26	27.5	25.0	20	1.250 1.250 1.250	— — —	172.0 182.0 182.0	35.0 35.5 35.5
22	12.00	242-C	1.750	1.118	1.118	6	433.74	115	26	29.5	27.25	20	1.375	—	181.0	35.5
24	12.00 **13.75** 13.75	242-C **242-A** 242-HA	1.750	1.118	1.118	5	510.70	110 110 160	26	32.5	29.5	20	1.375 — 1.375	— — —	190.0 220.0 266.2	47.0 48.0 48.0
26	12.00	242-C	1.750	1.118	1.118	5	593.96	110	26	34.25	31.75	24	1.375	—	243.0	52.0
30	12.00	242-C	1.750	1.118	1.118	4	779.31	110	26	38.75	36.0	28	1.375	—	270.0	62.0

Standard PROCO Style 242-A Expansion Joints shown in Bold Type are considered Standards and inventoried in large quantities.

NOTES:
1. "HA", "HB", and "HC" denote Heavy Weight Construction.
2. Movements stated are non-concurrent.
3. To determine End Thrust: Multiply Thrust Factor by Operating Pressure of System. This is End Thrust in pounds.
4. Pressure rating is based on 170°F operating temperature. The pressure rating is reduced slightly at higher temperatures.
5. Pressures shown are maximum "operating pressure." Test pressure is 1.5 times "operating pressure." Burst pressure is approximately 4 times "operating pressure."
6. Vacuum rating is based on neutral installed length, without external load. Products should not be installed "extended" on vacuum applications.
7. Style 240-AV/NN (Neoprene elastomer only) expansion joints 1.25" I.D. – 12.0" I.D. come with tapped holes in lieu of drilled holes.
8. All expansion joints are furnished complete with flanges. Control units are required on applications where movements could exceed rated capabilities.

Installation Note:
Install at the neutral length dimension as shown in Tables 2 & 3. Make sure the mating flanges are **FLAT-FACE TYPE.** When attaching beaded end flanged expansion joints to raised face flanges, the use of ring gaskets are required to prevent metal flange faces from cutting rubber bead during installation. ***Care must be taken when pushing the joint into the breech between the mating flanges so as not to roll the leading edge of the joint out of its flange groove.***

Precompression Note:
Joint must be precompressed approximately 1/8" to 3/16" in order to obtain a correct installed face-to-face dimension.

control units

PROCO PRODUCTS, INC.

Table 4: Control Units/Unanchored

Control Units must be installed when pressures (test • design • surge • operating) exceed rating below:

Pipe Size	Series 240 P.S.I.G.	Series 242 P.S.I.G.
1" thru 4"	180	135
5" thru 10"	135	135
12" thru 14"	90	90
16" thru 24"	45	45
26" thru 30"	35	35

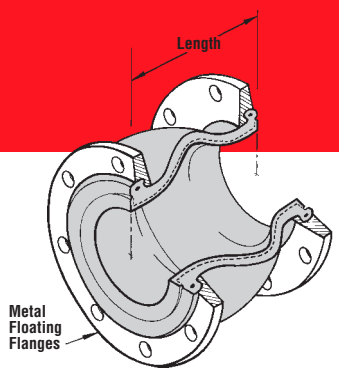


Figure 1.
Style 240
Single Sphere Connector

Table 5: Control Units

Control Rod Plate O.D. [1] (in)	Control Rod Plate Thickness (in)	Rod Diameter [2] (in)	Nominal Pipe Size (in)	Maximum Surge or Test Pressure of System/PSIG [3] Number of Rods Required: 2	3	4
8.375	0.375	0.625	1	949	—	—
8.750	0.375	0.625	1.25	830	—	—
9.125	0.375	0.625	1.5	510	—	—
10.125	0.375	0.625	2	661	—	—
11.125	0.375	1.000	2.5	529	—	—
11.625	0.375	1.000	3	441	—	—
12.625	0.375	1.000	3.5	365	547	729
13.125	0.375	1.000	4	311	467	622
14.125	0.500	1.000	5	235	353	470
15.125	0.500	1.000	6	186	278	371
19.125	0.500	1.000	8	163	244	326
21.625	0.750	1.000	10	163	244	325
24.625	0.750	1.000	12	160	240	320
26.625	0.750	1.000	14	112	167	223
30.125	0.750	1.250	16	113	170	227
31.625	0.750	1.250	18	94	141	187
34.125	0.750	1.250	20	79	118	158
36.125	1.000	1.250	22	85	128	171
38.625	1.000	1.250	24	74	110	147
40.825	1.000	1.250	26	62	93	124
44.125	1.250	1.500	28	65	98	130
46.375	1.250	1.500	30	70	105	141

NOTES:
1. Control Rod Plate O.D. installed dimension is based on a **maximum** O.D. PROCO would supply. (See Figures 3 & 4)
2. Control Rod diameter is based on a **maximum** diameter PROCO would use to design a Control Rod.
3. Rod pressure ratings are based on metal conforming to F.S.A. standards and dimensions.

Table 6: Special Construction Pressures

Pipe Size	Series 240 & 242 Heavyweight P.S.I.G.
1" thru 8"	300
10" thru 12"	275
14"	200
16" thru 20"	175
22" thru 30"	160

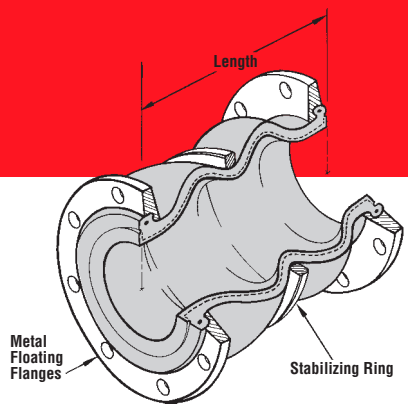
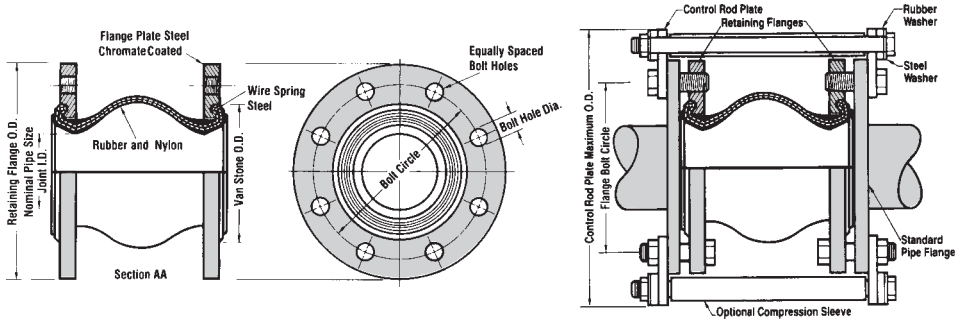


Figure 2.
Style 242
Twin Sphere Connector

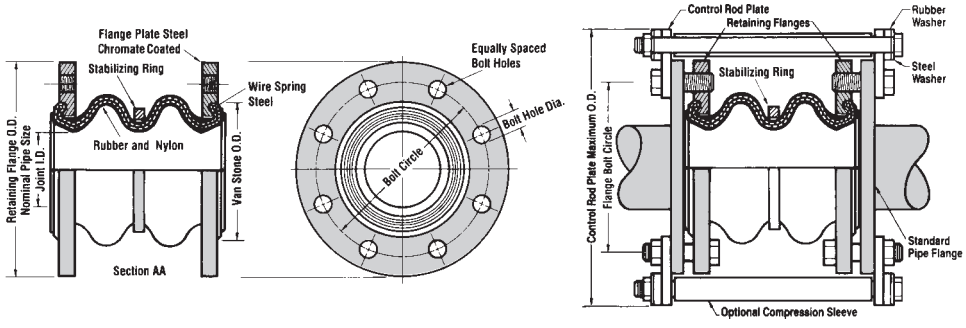
Style 240 Single Sphere Connector

Figure 3.



Style 242 Twin Sphere Connector

Figure 4.



Control Rod/Unit Applications. Control unit assemblies are designed to absorb static pressure thrust developed at the expansion joint. When used in this manner, control unit assemblies are an additional safety factor, minimizing possible failure of the expansion joint or damage to equipment. (See Tables 4 & 5).

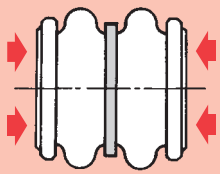
1. **Anchored Systems:** Control unit assemblies are not required in piping systems that are anchored on both sides of the expansion joint, provided piping movements are within the rated movements as shown in Tables 2 & 3.
2. **Unanchored Systems:** Control unit assemblies are always required in unanchored systems. Additionally, control unit assemblies must be used when maximum pressure exceeds the limits shown in Table 4 & 5, or the movement exceeds the rated movements as shown in Tables 2 & 3.
3. **Spring-Mounted Equipment:** Control unit assemblies are always recommended for spring-mounted equipment. Additionally, control unit assemblies must be used when maximum pressure exceeds the limits shown in Tables 4 & 5, or the movement exceeds the rated movements as shown in Tables 2 & 3.

Special Applications. Certain Style 240 (Single Sphere) and 242 (Twin Sphere) expansion joints are available in High-Pressure Designs. For specific pressures, see Table 6. Style designations are listed as 240-HW (sizes stocked in Table 2) and 242-HA, 242-HB & 242-HC (sizes stocked in Table 3.) The High-Pressure Design is recommended when the connector is to be installed into ANSI 250/300# piping systems.

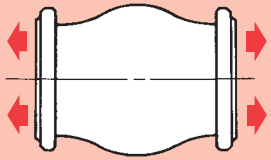
drilling for series 240 and series 242 expansion joints

Table 7: Flange Drilling

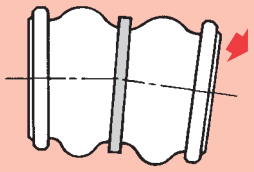
NOMINAL PIPE SIZE Inch/ mm	American 125/150# Conforms to ANSI B16.1 and B16.5						American 250/300# Conforms to ANSI B16.1 and B16.5					British Standard 10:1962 Conforms to BS 10 Table E					Metric Series Conforms to I.S.O. 2084-1974 Table NP10 Holes to I.S.O. /R-273					Metric Series Conforms to I.S.O. 2084-1974 Table NP16 Holes to I.S.O. /R-273				
	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Drilled Hole Size	Threaded Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size
1 25	0.55 14.0	4.25 108.0	3.13 79.4	4 4	0.62 15.9	1/2 - 13 UNC	0.63 16.0	4.88 124.0	3.5 88.9	4 4	0.75 19.1	0.59 15.0	4.5 114.0	3.25 82.6	4 4	0.62 15.9	0.63 16.0	4.53 115.0	3.35 85.0	4 4	0.55 14.0	0.63 16.0	4.53 115.0	3.35 85.0	4 4	0.55 14.0
1.25 32	0.55 14.0	4.63 118.0	3.5 88.9	4 4	0.62 15.9	1/2 - 13 UNC	0.63 16.0	5.25 133.0	3.88 98.4	4 4	0.75 19.1	0.59 15.0	4.75 121.0	3.44 87.3	4 4	0.62 15.9	0.63 16.0	5.51 140.0	3.94 85.0	4 4	0.71 18.0	0.63 16.0	5.51 140.0	3.94 100.0	4 4	0.71 18.0
1.5 40	0.55 14.0	5.0 127.0	3.88 98.4	4 4	0.62 15.9	1/2 - 13 UNC	0.63 16.0	6.12 156.0	4.50 114.3	4 4	0.88 22.2	0.59 15.0	5.25 133.0	3.88 98.4	4 4	0.62 15.9	0.63 16.0	5.91 150.0	4.33 110.0	4 4	0.71 18.0	0.63 16.0	5.91 150.0	4.33 110.0	4 4	0.71 18.0
2 50	0.63 16.0	6.0 152.0	4.75 120.7	4 4	0.75 19.1	5/8 - 11 UNC	0.71 18.0	6.50 165.0	5.00 127.0	8 8	0.75 19.1	0.63 16.0	6.0 152.01	4.5 114.3	4 4	0.75 19.1	0.71 18.0	6.50 165.0	4.92 125.0	4 4	0.71 18.0	0.71 18.0	6.50 165.0	4.92 125.0	4 4	0.71 18.0
2.5 65	0.71 18.0	7.0 178.0	5.5 139.7	4 4	0.75 19.1	5/8 - 11 UNC	0.71 18.0	7.5 191.0	5.88 149.2	8 8	0.88 22.2	0.71 18.0	6.5 165.0	5.0 127.0	4 4	0.75 19.1	0.71 18.0	7.25 185.0	5.71 145.0	4 4	0.71 18.0	0.71 18.0	7.28 185.0	5.71 145.0	4 4	0.71 18.0
3 80	0.71 18.0	7.5 191.0	6.0 152.4	4 4	0.75 19.1	5/8 - 11 UNC	0.79 20.0	8.25 210.0	6.62 168.2	8 8	0.88 22.2	0.71 18.0	7.25 184.0	5.75 146.1	4 4	0.75 19.1	0.79 20.0	7.87 200.0	6.3 160.0	8 8	0.71 18.0	0.79 20.0	7.87 200.0	6.30 160.0	8 8	0.71 18.0
3.5 90	0.71 18.0	8.5 216.0	7.0 177.8	8 8	0.75 19.1	5/8 - 11 UNC	0.79 20.0	9.0 229.0	7.25 184.2	8 8	0.88 22.2	0.71 18.0	8.0 203.0	6.5 165.1	8 8	0.75 19.1	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
4 100	0.71 18.0	9.0 229.0	7.5 190.5	8 8	0.75 19.1	5/8 - 11 UNC	0.79 20.0	10.0 254.0	7.88 200.0	8 8	0.88 22.2	0.71 18.0	8.5 216.0	7.0 177.8	8 8	0.75 19.1	0.79 20.0	8.66 220.0	7.09 180.0	8 8	0.71 18.0	0.79 20.0	8.66 220.0	7.09 180.0	8 8	0.71 18.0
5 125	0.79 20.0	10.0 254.0	8.5 215.9	8 8	0.88 22.2	3/4 - 10 UNC	0.87 22.0	11.0 279.0	9.25 235.0	8 8	0.88 22.2	0.79 20.0	10.0 254.0	8.25 209.6	8 8	0.75 19.1	0.87 22.0	9.84 250.0	8.27 210.0	8 8	0.71 18.0	0.87 22.0	9.84 250.0	8.27 210.0	8 8	0.71 18.0
6 150	0.87 22.0	11.0 279.0	9.5 241.3	8 8	0.88 22.2	3/4 - 10 UNC	0.87 22.2	12.5 318.0	10.62 269.9	12 12	0.88 22.2	0.87 22.2	11.0 279.0	9.25 235.0	8 8	0.88 22.2	0.87 22.0	11.22 285.0	9.45 240.0	8 8	0.87 22.0	0.87 22.0	11.22 285.0	9.45 240.0	8 8	0.87 22.0
8 200	0.87 22.0	13.5 343.0	11.75 298.5	8 8	0.88 22.2	3/4 - 10 UNC	0.95 24.0	15.0 381.0	13.0 330.2	12 12	1.00 25.4	0.87 22.2	13.25 337.0	11.5 292.1	8 8	0.88 22.2	0.87 22.0	13.39 340.0	11.61 295.0	8 8	0.87 22.0	0.87 22.0	13.39 340.0	11.61 295.0	12 12	0.87 22.0
10 250	0.95 24.0	16.0 406.0	14.25 362.0	12 12	1.00 25.4	7/8 - 9 UNC	1.02 26.0	17.5 445.0	15.25 387.4	16 16	1.13 28.6	0.95 24.0	116.0 406.0	14.0 355.6	12 12	0.88 22.2	1.02 26.0	15.55 395.0	13.78 350.0	12 12	0.87 22.0	1.02 26.0	15.94 405.0	13.98 355.0	12 12	1.02 26.0
12 300	0.95 24.0	19.0 483.0	17.0 431.8	12 12	1.00 25.4	7/8 - 9 UNC	1.02 26.0	20.5 521.0	17.75 450.9	16 16	1.25 31.8	0.95 24.0	18.0 457.0	16.0 406.4	12 12	1.00 25.4	1.02 26.0	17.52 445.0	15.75 400.0	12 12	0.87 22.0	1.02 26.0	18.11 460.0	16.14 410.0	12 12	1.02 26.0
14 350	1.02 26.0	21.0 533.0	18.75 476.3	12 12	1.13 28.6	1 - 8 UNC	1.10 28.0	23.0 584.0	20.25 514.4	20 20	1.25 31.8	1.02 26.0	20.75 527.0	18.5 469.9	12 12	1.00 25.4	1.10 28.0	19.88 505.0	18.11 460.0	16 16	0.87 22.0	1.10 28.0	20.47 520.0	18.50 470.0	16 16	1.02 26.0
16 400	1.10 28.0	23.5 597.0	21.25 539.8	16 16	1.13 28.6	1 - 8 UNC	1.18 30.0	25.5 648.0	22.5 571.5	20 20	1.38 34.9	1.10 28.0	22.75 578.0	20.5 520.7	12 12	1.00 25.4	1.18 30.0	22.24 565.0	20.28 515.0	16 16	1.02 26.0	1.18 30.0	22.83 580.0	20.67 525.0	16 16	1.18 30.0
18 450	1.18 30.0	25.0 635.0	22.75 577.9	16 16	1.25 31.8	1 1/8 - 7 UNC	1.18 30.0	28.0 711.0	24.75 628.7	24 24	1.38 34.9	1.18 30.0	25.25 641.0	23.0 584.2	16 16	1.00 25.4	1.18 30.0	24.21 615.0	22.24 565.0	20 20	1.02 26.0	1.18 30.0	25.20 640.0	23.03 585.0	20 20	1.18 30.0
20 500	1.18 30.0	27.5 699.0	25.0 635.0	20 20	1.25 31.8	1 1/8 - 7 UNC	1.18 30.0	30.5 775.0	27.0 685.8	24 24	1.38 34.9	1.18 30.0	27.75 705.0	25.25 641.4	16 16	1.00 25.4	1.18 30.0	26.38 670.0	24.41 620.0	20 20	1.02 26.0	1.18 30.0	28.15 715.0	25.59 650.0	20 20	1.30 33.0
22 550	1.18 30.0	29.5 749.0	27.25 692.2	20 20	1.38 34.9	1 1/4 - 7 UNC	1.18 30.0	33.0 838.0	29.5 743.0	24 24	1.38 34.9	1.18 30.0	30.0 762.0	27.5 698.5	16 16	1.13 28.6	1.18 30.0	28.74 730.0	26.57 675.0	20 20	1.18 30.0	1.18 30.0	30.51 775.0	27.95 710.0	20 20	1.30 33.0
24 600	1.18 30.00	32.06 813.0	29.5 749.3	20 20	1.38 34.9	1 1/4 - 7 UNC	1.18 30.0	36.0 914.0	32.0 812.8	24 24	1.62 41.3	1.18 30.0	32.5 826.0	29.75 755.7	16 16	1.25 31.8	1.18 30.0	30.71 780.0	28.54 725.0	20 20	1.18 30.0	1.18 30.0	33.07 840.0	30.31 770.0	20 20	1.42 36.0
26 650	1.26 32.0	34.25 870.0	31.75 806.5	24 24	1.38 34.9	1 1/4 - 7 UNC	1.26 32.0	38.25 972.0	34.5 876.0	28 28	1.75 44.5	— —	— —	— —	— —	— —	1.26 32.0	32.87 835.0	30.71 780.0	24 24	1.18 30.0	1.26 32.0	33.86 860.0	31.10 790.0	24 24	1.42 36.0
30 750	1.26 32.0	38.75 984.0	36.0 914.4	28 28	1.38 34.9	1 1/4 - 7 UNC	1.26 32.0	43.0 1092.0	39.25 997.0	28 28	2.00 50.8	1.26 32.0	39.25 997.0	36.5 927.1	20 20	1.38 34.9	1.26 32.0	37.99 965.0	35.43 900.0	24 24	1.30 33.0	1.26 32.0	38.19 970.0	35.43 900.0	24 24	1.42 36.0



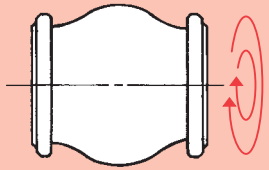
Axial Compression



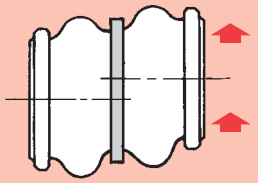
Axial Elongation



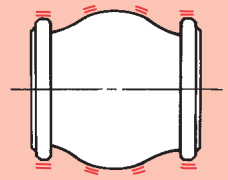
Angular Movement
Bending About the Centerline



Torsional Movement
Rotation About the Centerline (twist)



Lateral Movement
Shear or Perpendicular to Centerline



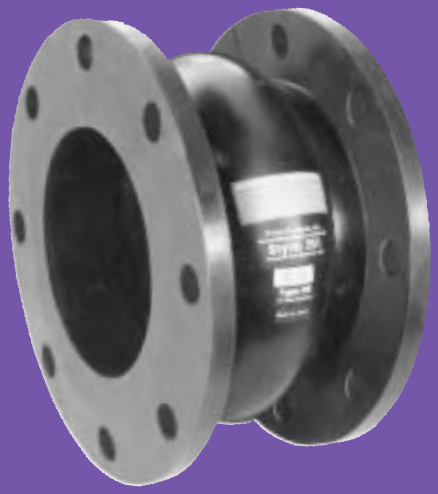
Absorbing Vibration

PROCO™ Series 240 and 242 are Designed to Absorb Different Movements Concurrently

PROCO™

SERIES 251

wide-arch expansion joints



The PROCO Series 251 Wide-Arch Expansion Joint is interchangeable with and replaces handmade spool-type and spherical expansion joints. Installed between the anchor points of a piping system or next to mechanical equipment such as: Pumps, Chillers, Cooling Towers, Compressors, Blowers, Fans, Absorption Machines, etc.; specify the PROCO Series 251 to: (1) Absorb Pipe Movement/Stress, (2) Reduce System Noise, (3) Isolate Mechanical Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-Up/Surge Forces. The PROCO Series 251 is engineered for tough, demanding, industrial and commercial applications, as found in: Air Conditioning-Heating and Ventilating Systems, Chemical-Petrochemical and Industrial Process Piping Systems, Power Generating Plants, Steel Mills, Marine Services, Pulp/Paper Systems, Water-Wastewater-Sewage and Pollution Control Systems, where metallic joints/hose or old design rubber expansion joints may have been previously used or specified. Our history in the manufacture of expansion joint products dates back to 1930. PROCO Products is a member of the Rubber Expansion Joint Division, Fluid Sealing Association. When you need an engineered rubber solution to a piping system problem, call PROCO.

In the early 1930's, the U.S. Rubber Company invented the spool-type rubber expansion joint. In 1968, the spherical-type rubber expansion joint was introduced by The Metraflex Company. Today, most makers of expansion joints use similar designs for their standard products. Both designs, spherical and spool-type, had certain strengths and weaknesses. Combining the best design features of the sphere/spool-type with sophisticated manufacturing technology; PROCO has developed the Series 251 Wide-Arch Rubber Expansion Joint. Here are some of the many advantages of our Series 251:

- **Greater Movements:** The Series 251 utilizes the spherical long flowing arch for maximum movements, when compared to the narrow high arch of the spool-type design. Self-flushing, this arch is great for slurries and reduces turbulence; eliminating the need for a "filled arch".
- **Easier Sealing:** The Series 251 design utilizes the full-faced rubber/fabric flange of the spool-type joint for a quick and sure seal at the flange when compared to the small lip seal of the spherical design.
- **Less Weight:** The metal flanges of the spherical design are very heavy when compared to the Series 251 with full-faced rubber flanges and retaining rings. Less weight means less freight and ease of installation.
- **Looks Familiar:** From the outside, the Series 251 looks very much like the spool-type joint your maintenance people have used for years. They are more comfortable with the proven appearance of the spool-type when compared to the spherical-type.

High Pressure With Full Safety Factors. The PROCO Series 251 pressure ratings meet or exceed the requirements of the Rubber Expansion Joint Division, Fluid Sealing Association, for Series A and B. More importantly, our conservative ratings are fully tested and based on a minimum of four-to-one safety factor. With competitive products the safety factor is often calculated, unknown and in one case a published three-to-one. For pressure protection, specify PROCO.

Less Turbulence Or Material Entrapment. The molded integral flange of the Series 251 joins the body at a true 90 degree angle. Our product will install snug against the mating pipe flange without voids. Because this flange/body angle is difficult to form, many competitors severely radius the edge angle. The resulting void can create flow disturbance, allow for material entrapment or bacteria growth. You can avoid these problems by specifying PROCO.

Absorbs Pipe-Wall And Fluid-Borne Noise. The quiet-operating PROCO Series 251 is a replacement for "sound transmitting" metallic expansion joints and hose. Pipe-Wall sound loses energy and is absorbed as the noise carried by the piping both enters and leaves the rubber section. Fluid-Borne noise is absorbed by the volumetric expansion (breathing) of the connector. This action cushions water hammer, and smooths out pumping impulses.

Isolates Vibrations And Motion. Vibration originating from mechanical equipment is absorbed by the PROCO Series 251. Rubber connectors should be installed right after and ahead of the equipment generating the vibration, thus isolating the equipment. As most machinery vibrates in a radial direction from the main shaft, for optimum performance the PROCO connector should be installed horizontally and parallel to this shaft. Vertical and perpendicular installations are acceptable as the PROCO Wide-Arch will accept both axial and lateral movements and vibrations. Installation of the Series 251 in a system enables isolated equipment to move freely on its vibration mountings. **Note: For maximum vibration transmission reduction the piping section beyond the rubber connector must be anchored or sufficiently rigid.**

Chemical Or Abrasive Service Capability At Minimal Cost. Expensive, exotic metal expansion joints for chemical service can be replaced with the PROCO Series 251. High pressure molded with low-cost chemical resistant elastomers such as: Chlorobutyl, EPDM, Hypalon®, Neoprene and Nitrile; assures a rubber expansion joint compatible with the fluid being pumped or piped. (See Table 1) Our Neoprene products should be specified when handling abrasive slurries. Use the PROCO "Chemical to Elastomer Guide" to specify an elastomer for your requirement.

Reduces System Stress And Strain/Compensate For Misalignment. Rigid attachment of piping to critical or mechanical equipment can produce excessive loading. Thermal or mechanically created strain-stress-shock are cushioned and absorbed with the installation of a flexible low "force-to-deflect" PROCO Rubber Series 251. The PROCO Wide-Arch Joint adds a flexible component that is automatically self-correcting for misalignment created by structural movements caused by settling, expansion or ground shifts.

Wide Service Range With Low Cost. Engineered to operate up to 200 PSIG and 250°F, the PROCO Series 251 can be specified for a wide range of piping system requirements. Compared to competitive products, you will invest less money when specifying the engineered design, industrial quality PROCO Wide-Arch Expansion Joint.

Large Inventories Mean Same-Day Shipment. We maintain the largest inventory of elastomer expansion joints in the Americas. Every size cataloged item is in stock in several elastomers. We can ship your requirement when you need it. In fact, when it comes to rubber expansion joints, **if PROCO doesn't have your requirement … nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

Toll-Free Phone ..... 800 / 344-3246 USA/CANADA
International Calls ..... 209 / 943-6088
Fax ..... 209 / 943-0242
Email ..... sales@procoproducts.com
Website ..... www.procoproducts.com

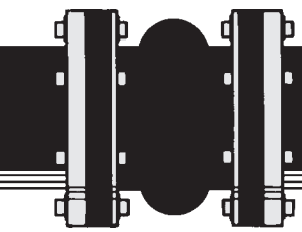
Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

Table 1: Available Styles • Materials • Temperatures

For Specific Elastomer Recommendations, See: PROCO™ "Chemical To Elastomer Guide"

PROCO™ Style Number	Type of Elastomer		Maximum Operating Temp. °F	Branding Label Color	F.S.A. Material Class
	Cover/ Outside	Tube/ Inside			
251/BB	Butyl	Butyl	250°	Black	STD. III
251/EE	EPDM	EPDM[3]	250°	Red	STD. III
251/NH	Neoprene	Hypalon®	230°	Green	STD. II
251/NN	Neoprene	Neoprene[2]	230°	Blue	STD. II
251/NP	Neoprene	Nitrile	230°	Yellow	STD. II

Notes: 1. Hypalon® is a trademark of DuPont Dow Elastomers, L.L.C.
2. Material NN meets all requirements of U.S.C.G.
3. In applications where pressure is less than 15 PSIG, temperature can be increased.
4. All products are reinforced with synthetic fabric and wire.



Protecting Piping And Equipment Systems From Stress/Motion

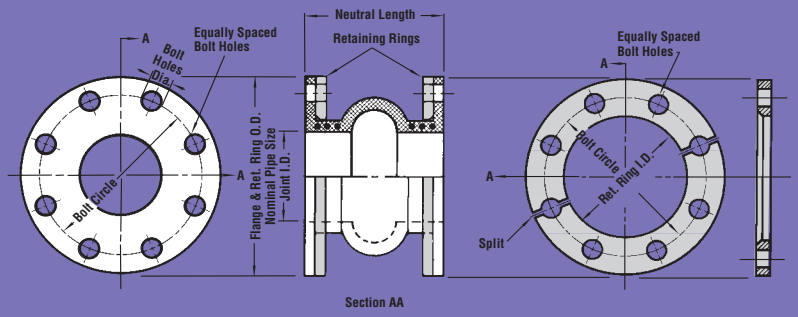
Water Environment Federation®
Preserving & Enhancing the Global Water Environment
MEMBER

ISD Independent Sealing Distributors
NAHAD National Association of Hose and Accessories Distributors
Fluid Sealing Association FSA

Rev. 03 6/99

wide-arch expansion joints

Figure 1: Detail Of Style 251



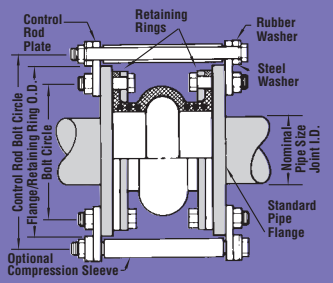
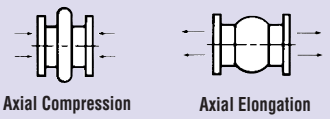


Table 2: Sizes • Movements • Pressures • Weights • Drilling

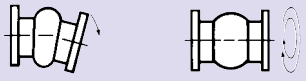
EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		251 Movement Capability: From Neutral Position						Operating Conditions [4]		Weights in lbs / (kgs) [5]			Flange Dimensions and Drilling [7]			
				Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Deflection Degrees	Thrust Factor [3] In2 / (cm2)	Positive PSIG / (Bar)	Vacuum Inches of Hg / (mm of Hg)	Joint Assembly	Retaining Ring Set	Control Unit [6] Assembly	O.D. of Exp. Joint / Ring Inch / (mm)	Bolt Circle Inch / (mm)	Number of Holes	Size of Holes Inch / (mm)
1	(25)			USE SERIES 231 PRODUCT AT THIS TIME														
1.25	(32)																	
1.5	(40)																	
2	(50)			1.06 (27)	.47 (12)	.59 (15)	25.2°	3°	3.1 (20)	200 (14.0)	26 (660)	2.9 (1.3)	4.0 (1.8)	2.8 (1.3)	6.0 (152.4)	4.75 (120.65)	4	0.750 (19.05)
2.5	(65)				.47 (12)	.59 (15)	20.6°	3°	4.9 (32)	200 (14.0)	26 (660)	3.5 (1.6)	4.5 (2.0)	2.8 (1.3)	7.0 (177.8)	5.50 (139.70)	4	0.750 (19.05)
3	(80)	6	(150)		.47 (12)	.59 (15)	17.4°	3°	7.1 (46)	200 (14.0)	26 (660)	4.3 (2.0)	5.5 (2.5)	2.8 (1.3)	7.5 (190.5)	6.00 (152.40)	4	0.750 (19.05)
4	(100)				.47 (12)	.59 (15)	13.2°	3°	12.6 (81)	200 (14.0)	26 (660)	5.7 (2.6)	8.0 (3.6)	2.8 (1.3)	9.0 (228.6)	7.50 (190.50)	8	0.750 (19.05)
5	(125)				.53 (14)	.66 (17)	12.0°	3°	19.6 (127)	200 (14.0)	26 (660)	7.0 (3.2)	8.5 (3.9)	4.0 (1.8)	10.0 (254.0)	8.50 (215.90)	8	0.875 (22.23)
6	(150)				.59 (15)	.74 (19)	11.1°	3°	28.3 (182)	200 (14.0)	26 (660)	8.2 (3.7)	9.5 (4.3)	4.0 (1.8)	11.0 (279.4)	9.50 (241.30)	8	0.875 (22.23)
8	(200)				.59 (15)	.74 (19)	8.4°	3°	50.3 (324)	180 (13.0)	26 (660)	11.7 (5.3)	14.5 (6.6)	8.0 (3.6)	13.5 (342.9)	11.75 (298.45)	8	0.875 (22.23)
10	(250)			1.65 (42)	.71 (18)	.89 (23)	8.1°	3°	78.5 (507)	150 (10.0)	26 (660)	20.1 (9.1)	17.0 (7.7)	10.0 (4.5)	16.0 (406.4)	14.25 (361.95)	12	1.000 (25.40)
12	(300)				.77 (19)	.96 (24)	7.3°	3°	113.1 (730)	150 (10.0)	26 (660)	27.8 (12.6)	24.5 (11.0)	10.0 (4.5)	19.0 (482.6)	17.00 (431.80)	12	1.000 (25.40)
14	(350)				.75 (19)	.96 (24)	6.3°	2°	153.9 (993)	130 (9.0)	26 (660)	40.0 (18.1)	27.0 (12.3)	12.0 (5.4)	21.0 (533.4)	18.75 (476.25)	12	1.125 (28.58)
16	(400)	8	(200)		.75 (19)	.96 (24)	5.9°	2°	201.1 (1297)	110 (8.0)	26 (660)	47.0 (21.3)	33.5 (15.2)	15.0 (6.8)	23.5 (596.9)	21.25 (539.75)	16	1.125 (28.58)
18	(450)				.75 (19)	1.0 (25)	5.3°	1°	254.5 (1642)	110 (8.0)	26 (660)	56.0 (25.4)	34.0 (15.5)	16.5 (7.2)	25.0 (635.0)	22.75 (577.85)	16	1.250 (31.75)
20	(500)				.75 (19)	1.0 (25)	4.8°	1°	314.2 (2027)	110 (8.0)	26 (660)	67.0 (30.4)	38.0 (17.3)	16.5 (7.2)	27.5 (698.5)	25.00 (635.00)	20	1.250 (31.75)
24	(600)	10	(250)	1.75 (42)	.83 (21)	1.0 (25)	3.9°	1°	452.4 (2919)	100 (7.0)	26 (660)	79.0 (35.9)	48.0 (21.8)	19.0 (8.6)	32.0 (812.8)	29.50 (749.30)	20	1.375 (34.93)
30	(750)				1.0 (25)	1.0 (25)	3.8°	1°	706.9 (4560)	90 (6.0)	26 (660)	117.0 (53.1)	63.0 (28.6)	29.5 (13.3)	38.8 (984.3)	36.00 (914.40)	28	1.375 (34.93)

Notes:
1. The degree of angular movement is based on the maximum rated extension.
2. Torsional movement is expressed when the expansion joint is a neutral length.
3. To determine "end thrust", multiply thrust factor by operating pressure of system.
4. Pressure rating is based on 170°F operating temperature. At higher temperature the pressure rating is slightly reduced.
5. Weights are approximate.
6. Control unit weight consists of one rod, four washers, three nuts and two control rod plates. Multiply number of control units needed for application (as specified in the Fluid Sealing Association Technical Handbook) to determine correct weights.
7. Dimensions shown are in accordance with 125/150# standards of ANSI B-16.1, B-16.24, B-16.5; AWWA C-207 Table 1 and 2 Class D.

PROCO™ Series 251 Products Are Designed To Absorb Different Movements Concurrently.



Axial Compression — Axial Elongation



Torsional Movement — Rotation About The Centerline (Twist)
Angular Movement — Bending Of The Centerline

Lateral Movement — Shear Or Perpendicular To Centerline
Absorbing Vibration

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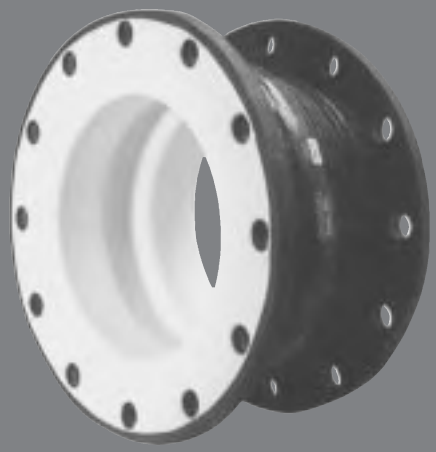

SERIES 251/BT

PTFE and FEP lined rubber expansion joints

The PROCO Series 251/BT PTFE and FEP lined expansion joints are designed for tough demanding corrosive chemical applications, as found in: Chemical & Petrochemical Process Facilities and Highly Corrosive Industiral Piping & Pollution Control Systems. The greatest usage of the the Series 251/BT is found in the Pulp and Paper Industry where the ability to resist corrosive attack at elevated temperature and pressure is unmatched by metallic, plastic or other competitive expansion joints. PROCO's Series 251 PTFE or FEP lined expansion joints can easily handle such pulp/paper applications as: White-Green-Black liquor, bleach plant chlorination and caustic extraction stages. Chemically resistant against the entire pH range, PROCO Series 251 PTFE and FEP expansion joints are designed to handle practically every chemical plant application. Installed next to mechanical equipment or between anchor points of a piping system, specify the PROCO 251/BT to: (1) Absorb Pipe Movements/Stress, (2) Reduce System Noise, (3) Isolate Mechanical Vibrations, (4) Compensate Alignment/ Offset, (5) Eliminate Electrolytic Action and Electrolysis, (6) Protect Against Start-Up/Surge Forces. Our history in the manufacture of expansion joints dates back to 1930. When you need an engineered rubber expansion joint solution to a piping problem, call PROCO.

Series 251/BT replaces Series FEP. The new and improved PROCO Series 251/BT will replace the PROCO Series FEP lined rubber expansion joint. (Series FEP products will be available in certain sizes. Contact Proco for information.) This new hand-built product has been completely re-engineered to provide improved strength, flexibility and movement capabilities. Manufactured utilizing tire cord industry technology, the Series 251/BT combines woven polyester fabric and polyester tire cord into a fabric matrix and bonded with a Chlorobutyl elastomer that is reinforced with wire and bonded to a PTFE or FEP liner to create a product with greater operating performance.

Greater Movements with a Lower/Wider Arch Profile. The movements for the PROCO Series 251/BT exceed the specification of the Fluid Sealing Association's, Rubber Expansion Joint Division Technical Handbook (Sixth Edition), Table V. Due to a new and improved lower, wider profile arch, more axial compression and extension coupled with lateral and angular movements can be obtained without increasing the face-to-face requirements. For greater movements based on re-engineering and new product construction for highly corrosive piping installations, specify the PROCO Series 251/BT PTFE and FEP lined expansion joints.

Chemical Service Capability at Minimal Cost. Expensive, exotic metal expansion joint for low temperature service can be replaced with the PROCO Series 251/BT PTFE and FEP lined expansion joints. Engineered to operate up to 225 PSIG and 250°F, the PROCO Series 251/BT can be specified for a wide range of piping system requirements. Our standard stock is furnished with an exterior Chlorobutyl cover. Other elastomer covers are available on special order. Compared to metal, plastic or other rubber-backed competitive products, you will invest less and have access to in-stock availability with the high quality PROCO Series 251/BT.

Specifications Met. PROCO has assigned conservative pressure ratings to the Series 251/BT and FEP lined rubber expansion joints. The ratings, however, meet the requirements of the Fluid Sealing Association's, Rubber Expansion Joint Division Technical Handbook (Sixth Edition), Series C. The pressure ratings for the Series 251/BT PTFE and FEP lined rubber expansion joints have been fully tested and are based on a minimum four-to-one safety factor. For pressure protection with confidence, specify the PROCO Series 251/BT.

Prevents Electrolysis and Electrolytic Action. In Chemical applications when metallic expansion joints are used, they are generally of a metal dissimilar from the pipeline. This may create an electrolytic galvanic action that could be destructive to the connector equipment or piping system. The use of the rubber-backed PROCO 251/BT PTFE and FEP lined expansion joints prevents this potential hazard. Additionally, our 251/BT expansion joints are non-conductive and eliminate the metal-to-metal contact at the flange face thus stopping electrolysis.

Absorbs Vibration • Noise • Shock. The PROCO Series 251/BT PTFE and FEP lined rubber expansion joints are a replacement for "sound transmitting" metallic expansion joints. Sound loses energy traveling axially through an expansion joint. Water hammer, pumping impulses, water-borne noises and other forms of strain-stress-shock are cushioned and absorbed by the PTFE or FEP lined/rubber elastomer expansion joint, not related to piping. Install the Series 251/BT in a system to reduce vibration transmission when the piping section beyond the expansion joint is anchored or sufficiently rigid. For quiet, stress-free systems specify the PROCO Series 251/BT.

Large Inventories Mean Same-Day Shipment. We maintain the largest inventory of expansion joints in the world. Rubber, PTFE or FEP Lined, Plastic or Metal Hose — PROCO can ship the products you need when you need them! In fact, when it comes to expansion joints, **if PROCO doesn't have them in stock … nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

Toll-Free Phone ..... 800 / 344-3246 USA/CANADA
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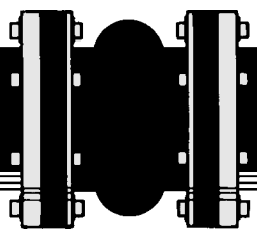
Email ..... sales@procoproducts.com
Website ..... www.procoproducts.com

Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

Table 1: Available Styles • Design Descriptions • I.D. Sizes	
#251/BT — Standard Single-Arch, Spool-Type Joint (See Table 2)	1"-48"
#151 — Special Non-Standard Length Single-Arch, Spool-Type Joint	1"-48"
#152 — Special Non-Standard Double-Arch, Spool-Type Joint	1"-48"
#153 — Special Non-Standard Triple-Arch, Spool-Type Joint	1"-48"
#310 — Standard "No-Arch" Flanged Rubber Pipe Connectors	1"-12"



Rev. 01 11/00

Protecting Piping And Equipment Systems From Stress/Motion

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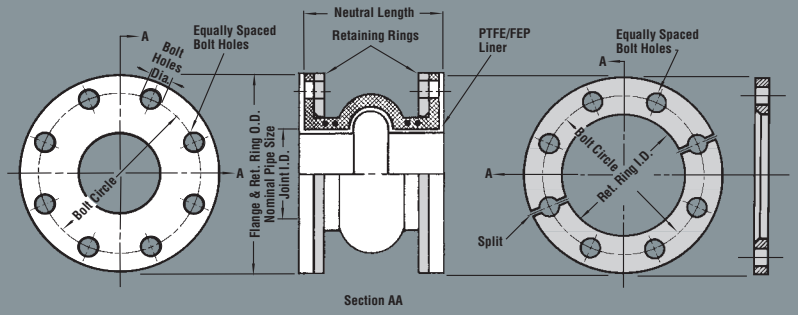
PTFE & FEP lined rubber expansion joints

Figure 1: Detail Of Style 251/BT



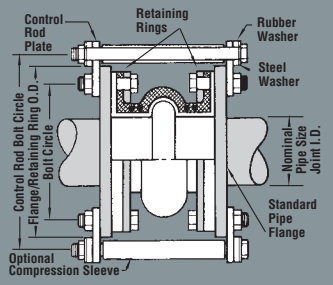


Table 2: Sizes • Movements • Pressures • Weights • Drilling

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		251/BT Movement Capability: From Neutral Position						Operating Conditions [4]		Weights in lbs / (kgs) [5]			Flange Dimensions and Drilling [7]			
				Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular [1] Deflection Degrees	Torsional [2] Rotation Degrees	Thrust Factor [3] In2 / (cm2)	Positive PSIG / (Bar)	Vacuum Inches of Hg / (mm of Hg)	Joint Assembly	Retaining Ring Set	Control Unit [6] Assembly	O.D. of Exp. Joint / Ring Inch / (mm)	Bolt Circle Inch / (mm)	Number of Holes	Size of Holes Inch / (mm)
1 [9, 10]	(25)	6	(150)	1.0 (25)	0.5 (13)	0.7 (17)	35.8°	1°	0.8 (5)	225 (15.5)	26 (660)	3.0 (1.4)	2.0 (0.8)	2.3 (1.0)	4.3 (108.0)	3.13 (79.5)	4	0.625 (15.88)
1.5 [9]	(40)				0.5 (13)	0.7 (17)	29.9°	1°	1.8 (11)	225 (15.5)	26 (660)	6.0 (2.7)	2.5 (1.1)	2.3 (1.0)	5.0 (127.0)	3.88 (98.6)	4	0.625 (15.88)
2 [9]	(50)				0.5 (13)	0.7 (17)	25.2°	1°	3.1 (20)	225 (15.5)	26 (660)	7.0 (3.2)	4.0 (1.8)	2.8 (1.3)	6.0 (152.4)	4.75 (120.65)	4	0.750 (19.05)
2.5 [9]	(65)				0.5 (13)	0.7 (17)	20.6°	1°	4.9 (32)	225 (15.5)	26 (660)	7.5 (3.4)	4.5 (2.0)	2.8 (1.3)	7.0 (177.8)	5.50 (139.7)	4	0.750 (19.05)
3	(80)				0.5 (13)	0.7 (17)	17.4°	1°	7.1 (46)	225 (15.5)	26 (660)	9.5 (4.3)	5.5 (2.5)	2.8 (1.3)	7.5 (190.5)	6.00 (152.4)	4	0.750 (19.05)
4	(100)				0.5 (13)	0.7 (17)	13.2°	1°	12.6 (81)	225 (15.5)	26 (660)	13.0 (5.9)	8.0 (3.6)	2.8 (1.3)	9.0 (228.6)	7.50 (190.5)	8	0.750 (19.05)
5	(125)				0.5 (13)	0.7 (17)	12.0°	1°	19.6 (127)	225 (15.5)	26 (660)	14.0 (6.4)	8.5 (3.9)	4.0 (1.8)	10.0 (254.0)	8.50 (215.9)	8	0.875 (22.23)
6	(150)				0.5 (13)	0.7 (17)	11.1°	1°	28.3 (182)	225 (15.5)	26 (660)	16.0 (7.3)	9.5 (4.3)	4.0 (1.8)	11.0 (279.4)	9.50 (241.3)	8	0.875 (22.23)
8	(200)			1.5 (38)	0.7 (17)	1.0 (25)	8.4°	1°	50.3 (324)	225 (15.5)	26 (660)	20.0 (9.1)	14.5 (6.6)	8.0 (3.6)	13.5 (342.9)	11.75 (298.4)	8	0.875 (22.23)
10	(250)	8	(200)		0.7 (17)	1.0 (25)	8.1°	1°	78.5 (507)	225 (15.5)	26 (660)	28.0 (12.7)	17.0 (7.7)	10.0 (4.5)	16.0 (406.4)	14.25 (362.0)	12	1.000 (25.40)
12	(300)				0.7 (17)	1.0 (25)	7.3°	1°	113.1 (730)	225 (15.5)	26 (660)	44.0 (20.0)	24.5 (11.0)	10.0 (4.5)	19.0 (482.6)	17.00 (431.8)	12	1.000 (25.40)
14	(350)				0.7 (17)	1.0 (25)	6.3°	1°	153.9 (993)	150 (10.0)	26 (660)	50.0 (22.7)	27.0 (12.3)	12.0 (5.4)	21.0 (533.4)	18.75 (476.3)	12	1.125 (28.58)
16	(400)				0.7 (17)	1.0 (25)	5.9°	1°	201.1 (1297)	150 (10.0)	26 (660)	59.0 (26.8)	33.5 (15.2)	15.0 (6.8)	23.5 (596.9)	21.25 (539.8)	16	1.125 (28.58)
18	(450)				0.7 (17)	1.0 (25)	5.3°	1°	254.5 (1642)	150 (10.0)	26 (660)	68.0 (30.8)	34.0 (15.5)	16.5 (7.2)	25.0 (635.0)	22.75 (577.9)	16	1.250 (31.75)
20	(500)			1.7 (44)	0.7 (17)	1.0 (25)	4.8°	1°	314.2 (2027)	150 (10.0)	26 (660)	79.0 (35.8)	38.0 (17.3)	16.5 (7.2)	27.5 (698.5)	25.00 (635.0)	20	1.250 (31.75)
24	(600)	10	(250)		0.7 (17)	1.0 (25)	3.9°	1°	452.4 (2919)	150 (10.0)	26 (660)	91.0 (41.3)	48.0 (21.8)	20.0 (9.0)	32.0 (812.8)	29.50 (749.3)	20	1.375 (34.93)
30	(750)				0.7 (17)	1.0 (25)	3.8°	1°	706.9 (4560)	125 (8.8)	26 (660)	129.0 (58.5)	63.0 (28.6)	29.5 (13.3)	38.8 (984.3)	36.00 (914.4)	28	1.375 (34.93)
36	(900)				0.7 (17)	1.0 (25)	3.1°	1°	1017.9 (6567)	125 (8.8)	26 (660)	160.0 (72.6)	76.0 (34.5)	43.0 (19.5)	46.0 (1168.4)	42.75 (1085.9)	32	1.625 (41.28)
48	(1200)	12	(300)		0.7 (17)	1.0 (25)	2.7°	1°	1809.6 (11675)	100 (7.0)	26 (660)	244.0 (110.7)	132.0 (59.9)	44.0 (20.0)	59.5 (1511.3)	56.00 (1142.4)	44	1.625 (41.28)

Notes:

1. The degree of angular movement is based on the maximum rated extension.
2. Torsional movement is expressed when the expansion joint is a neutral length.
3. To determine "end thrust", multiply thrust factor by operating pressure of system.
4. Pressure rating is based on 170°F operating temperature. At higher temperature the pressure rating is slightly reduced.
5. Weights are approximate.
6. Control unit weight consists of one rod, four washers, three nuts and two control rod plates. Multiply number of control units needed for application (as specified in the Fluid Sealing Association Technical Handbook) to determine correct weights.
7. Dimensions shown are in accordance with 125/150# standards of ANSI B-16.1, B-16.24, B-16.5; AWWA C-207 Table 1 and 2 Class D.
8. 1" I.D. through 12" I.D. have white PTFE liners.
   12" I.D. through 48" I.D. have clear FEP liners.
9. Teflon liner extends to bolt holes' center line only.
10. Available in filled arch configuration only.

PROCO PRODUCTS, INC.

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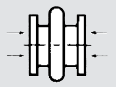
PROCO™ Series 251 Products Are Designed To Absorb Different Movements Concurrently.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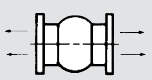
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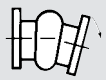
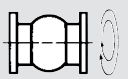
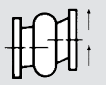

Angular Movement
Bending Of The Centerline


Torsional Movement
Rotation About The Centerline (Twist)


Lateral Movement
Shear Or Perpendicular To Centerline


Absorbing Vibration

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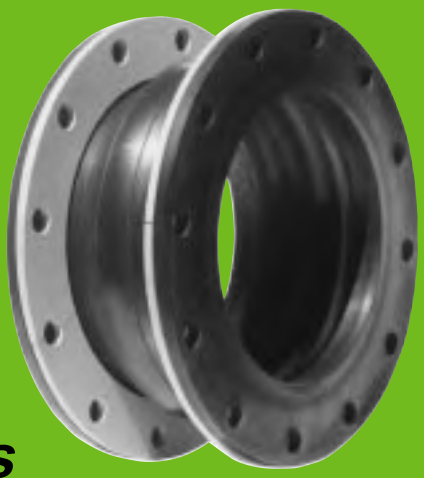
PROCO™

SERIES 261R

molded wide arch expansion joints



The PROCO Series 261R Wide Arch Expansion Joint expansion joint is specifically designed for use with Plastic or FRP Piping Systems. A replacement for standard spool-type expansion joints, the PROCO 261R has the lowest spring rate offered in the world today. With its low forces to compress, extend or laterally offset, the PROCO Series 261R can be used on plastic or FRP pipes, pumps, valves or tanks without fear of the expansion joint being stronger than the pipe, pump, valve or tank flanges. In addition the PROCO Series 261R is designed for tough demanding corrosive chemical applications, as found in: Chemical & Petrochemical Process Facilities and Highly Corrosive Industrial Piping & Pollution Control Systems. The PROCO Series 261R may be used where metallic hoses/expansion joints or old design rubber expansion joints may have been specified previously. Used on Pumps, Chillers, Cooling Towers, Compressors, Blowers, Fans, Absorption Machines, etc. to: (1) Absorb Pipe Movements/Stress, (2)Reduce System Noise, (3) Isolate Mechanical Vibrations, (4) Compensate Alignment/Offset, (5) Eliminate Electrolytic Action and Electrolysis, (6) Protect Against Start-Up/Surge Forces. Our history in the manufacture of expansion joints dates back to 1930. When you need an engineered rubber expansion joint solution to a piping problem, call PROCO.

PROCO Series 261R Wide Arch Rubber Expansion Joints offer some of the following advantages:

- **Low Spring Rates:** The Series 261R has the lowest spring rates and forces to deflect of any expansion joint made today.
- **Greater Movements:** The Series 261R has a wider arch than the conventional narrow arch of the spool-type expansion joint. This arch is twice the standard width of the spool-type arch, thus, eliminating the need for double and triple arch expansion joints.
- **Less Weight:** The steel flanges of spherical design (Series 240/242) can be very heavy, especially for plastic or fiberglass piping applications. The Series 261R Expansion Joint, including retaining rings, is considerably lighter than the spherical expansion joint design, which lowers shipping and installation costs.
- **Easier Sealing:** The Series 261R design utilizes the full-faced rubber and fabric flange of the spool-type design making sealing quick and sure when compared with the spherical design.
- **Self-Cleaning Wide Arch:** The Arch of the Series 261R is wide enough to allow the normal flow of the media to keep the arch clean of particulates. The accumulation of particles in the arch associated with the narrow arch spool-type design is not a consideration with the Wide Arch configuration.
- **Looks Familiar:** It looks like the familiar design of the spool-type expansion joint. This long proven design adds to the comfort of the Series 261R.

Flange Drilling/Retaining Rings. All PROCO Series 261R Wide Arch Expansion Joints are drilled in accordance with ANSI 125/150# Standards. They must be installed against a Full-Face Flange with the unique Backing/Retaining Rings that are supplied with the joint. Rings are fabricated from plate steel; plated to prevent corrosion. Rings from materials such as 304 or 316 Stainless Steel are available upon request. Gaskets or packing are not required with the PROCO Series 261R. **Visit our Web site for specific mating flange guidelines.**

High Pressure with Full Safety Factors. The PROCO Series 261R pressure ratings meet or exceed the requirements of the Fluid Sealing Association, Non-Metallic Expansion Joint Division for Series A or C. Sizes 1.5" through 12" include a three-to-one safety factor; sizes 14" through 20" include a four-to-one safety factor.

Absorbs Pipe-Wall and Fluid-Borne Noise. The noise transmission problems of metallic expansion joints are eliminated with the Series 261R Expansion Joints. Pipe-Wall sound loses energy and is absorbed as the noise carried by the piping both enters and leaves the rubber section. Fluid-Borne noise is absorbed by the volumetric expansion (breathing) of the expansion joint. This action cushions water hammer and smooths pumping impulses.

Isolates Vibration and Motion. Vibration originating from mechanical equipment is absorbed by the PROCO Series 261R. To isolate the equipment, rubber connectors should be installed just before and after the equipment generating the vibration. As most machinery vibrates in a radial direction from the main shaft, for optimum performance the PROCO connector should be installed horizontally and parallel to the shaft. Vertical and perpendicular installation of the Series 261R Wide Arch Expansion Joint is permissible as it will accept axial, lateral and rotational movements simultaneously. Installation of the Series 261R in a system allows isolated equipment to move freely on its vibration mountings. **Note: For maximum vibration transmission reduction, the piping section beyond the rubber connector must be anchored or rigid.**

Large Inventories Mean Same-Day Shipment. We maintain the largest inventory of expansion joints in the world. Rubber, PTFE Lined, Plastic or Metal Hose — PROCO can ship the products you need when you need them! In fact, when it comes to expansion joints, **if PROCO doesn't have them in stock … nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

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Email ..... sales@procoproducts.com
Website ..... www.procoproducts.com

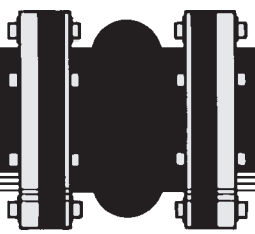
Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

Table 1: Available Styles • Materials • Temperatures

For Specific Elastomer Recommendations, See: **PROCO™ "Chemical To Elastomer Guide"**

PROCO Style Numbers Single Arch	Cover[1,2] Elastomer	Tube Elastomer	Maximum Operating Temp. °F (°C)	Branding Label Color	F.S.A. Material Class
261R/BB	Chlorobutyl	Chlorobutyl	250° (121°)	Black	STD. III
261R/EE[3]	EPDM	EPDM	250° (121°)	Red	STD. III
261R/NH	Neoprene	Hypalon®	212° (100°)	Green	STD. II
261R/NN	Neoprene	Neoprene	225° (107°)	Blue	STD. II
261R/NP[3]	Neoprene	Nitrile	225° (107°)	Yellow	STD. II
261R/NR	Neoprene	Natural	180° (68°)	White	STD. I

Notes: Hypalon® is a registered trademark of DuPont Dow Elastomers.
All products are reinforced with tire cord and metal materials.
1. Expansion joint "cover" can be coated with Hypalon® on special order.
2. Styles with Neoprene covers meet all requirements of U.S.C.G.
3. EPDM and Nitrile materials are available from Stock.
All other elastomers are available upon request.



Protecting Piping And Equipment Systems From Stress/Motion

Water Environment Federation® Preserving & Enhancing the Global Water Environment MEMBER

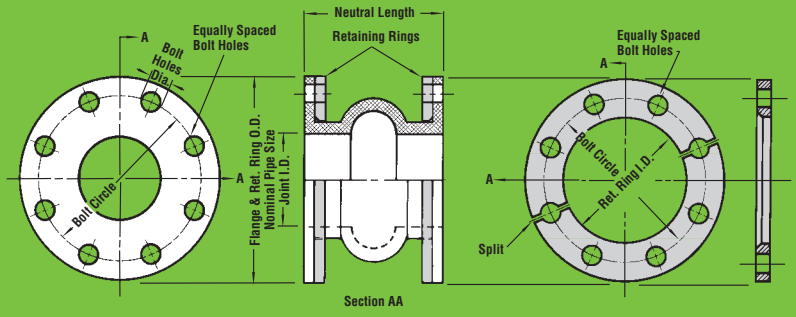
ISD Independent Sealing Distributors

Fluid Sealing Association FSA

NAHAD The Association for Hose and Accessories Distribution

molded wide arch expansion joints

Figure 1: Detail Of Style 261R



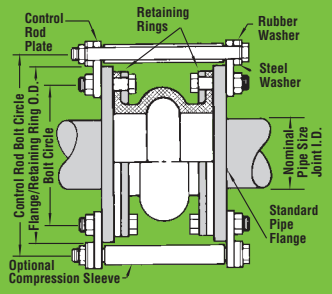


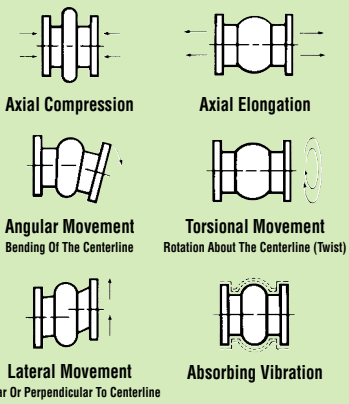
Table 2: Sizes • Movements • Spring Rates • Pressures • Weights • Drilling

EXPANSION JOINT SIZE Nom. I.D. x Inch / (mm)		NEUTRAL LENGTH Inch / (mm)		261R Movement Capability: From Neutral Position [1]						Spring Rates			Operating [4] Conditions		Weights in lbs / (kgs) [5]			Flange Dimensions and Drilling [7]			
				Axial Compression Inch / (mm)	Axial Extension Inch / (mm)	Lateral Deflection Inch / (mm)	Angular Deflection Degrees	Torsional Rotation [2] Degrees	Thrust Factor [3] In2 / (cm2)	Force Pounds for 1" Axial Compression lb/in / (N/mm)	Force Pounds for 1" Axial Extension lb/in / (N/mm)	Force Pounds for 1" Lateral Deflection lb/in / (N/mm)	Positive PSIG / (Bar)	Vacuum Inches of Hg / (mm of Hg)	Expansion Joint	Retaining Ring Set	Control Unit [6] Assembly	O.D. of Expansion Joint / Ring Inch / (mm)	Bolt Circle Inch / (mm)	Number of Holes	Size of Holes Inch / (mm)
1.5	(40)	6	(150)	1.5 (38)	0.625 (16)	0.750 (19)	28°	5°	11.04 (71)	126 (22)	182 (32)	149 (26)	225 (15.5)	24 (610)	1.3 (0.59)	2.5 (1.1)	2.3 (1.0)	5.00 (127.0)	3.88 (98.55)	4	0.625 (15.88)
2	(50)				0.625 (16)	0.750 (19)	25°	5°	14.18 (92)	132 (23)	158 (28)	130 (23)	225 (15.5)	24 (610)	1.7 (0.77)	4.0 (1.8)	2.8 (1.3)	6.00 (152.4)	4.75 (120.65)	4	0.750 (19.05)
2.5	(65)				0.625 (16)	0.750 (19)	20°	5°	17.71 (114)	128 (22)	141 (25)	111 (19)	225 (15.5)	24 (610)	2.1 (0.95)	4.5 (2.0)	2.8 (1.3)	7.00 (177.8)	5.50 (139.70)	4	0.750 (19.05)
3	(80)				0.625 (16)	0.750 (19)	18°	5°	21.64 (140)	139 (24)	208 (36)	133 (23)	225 (15.5)	24 (610)	2.4 (1.0)	5.5 (2.5)	2.8 (1.3)	7.50 (190.5)	6.00 (152.40)	4	0.750 (19.05)
4	(100)				0.625 (16)	0.750 (19)	14°	4°	30.66 (198)	110 (19)	180 (32)	105 (18)	225 (15.5)	24 (610)	3.2 (1.4)	6.0 (2.7)	2.8 (1.3)	9.00 (228.6)	7.50 (190.50)	8	0.750 (19.05)
5	(125)				0.625 (16)	0.750 (19)	13°	4°	41.26 (266)	143 (25)	190 (33)	136 (24)	225 (15.5)	24 (610)	3.6 (1.6)	8.5 (3.9)	4.0 (1.8)	10.00 (254.0)	8.50 (215.90)	8	0.875 (22.23)
6	(150)				0.625 (16)	0.750 (19)	12°	4°	53.43 (345)	136 (24)	166 (29)	147 (26)	225 (15.5)	24 (610)	4.9 (2.2)	9.5 (4.3)	4.0 (1.8)	11.00 (279.4)	9.50 (241.30)	8	0.875 (22.23)
8	(200)				0.625 (16)	0.750 (19)	12°	4°	82.47 (532)	226 (40)	230 (40)	210 (37)	210 (14.8)	24 (610)	7.7 (3.5)	14.5 (6.6)	8.0 (3.6)	13.50 (342.9)	11.75 (298.45)	8	0.875 (22.23)
10	(250)	8	(200)	2.25 (57)	0.750 (19)	1.0 (25)	12°	4°	135.13 (872)	248 (43)	381 (67)	281 (49)	210 (14.8)	24 (610)	13.9 (6.3)	17.0 (7.7)	10.0 (4.5)	16.00 (406.4)	14.25 (361.95)	12	1.000 (25.40)
12	(300)				0.750 (19)	1.0 (25)	11°	4°	179.46 (1158)	378 (66)	493 (86)	409 (72)	210 (14.8)	24 (610)	19.5 (8.8)	24.5 (11.0)	10.0 (4.5)	19.00 (482.6)	17.00 (431.80)	12	1.000 (25.40)
14	(350)				0.750 (19)	1.0 (25)	11°	3°	230.08 (1484)	423 (74)	592 (104)	497 (87)	150 (10.3)	24 (610)	22.7 (10.3)	27.0 (12.3)	12.0 (5.4)	21.00 (533.4)	18.75 (476.25)	12	1.125 (28.58)
16	(400)				0.750 (19)	1.0 (25)	10°	3°	286.98 (1852)	432 (76)	606 (106)	509 (89)	150 (10.3)	24 (610)	26.8 (12.2)	33.5 (15.3)	15.0 (6.8)	23.50 (596.9)	21.25 (539.75)	16	1.125 (28.58)
18	(450)				0.750 (19)	1.0 (25)	8°	3°	350.15 (2259)	543 (95)	761 (133)	690 (121)	150 (10.3)	24 (610)	29.5 (13.4)	34.0 (15.5)	16.0 (7.2)	25.00 (635.0)	22.75 (577.85)	16	1.250 (31.75)
20	(500)				0.750 (19)	1.0 (25)	8°	3°	419.61 (2707)	628 (110)	829 (145)	776 (136)	150 (10.3)	24 (610)	31.8 (17.3)	38.0 (17.3)	16.0 (7.2)	27.50 (698.50)	25.00 (635.00)	20	1.250 (31.75)

Notes:

1. Movements shown are non-concurrent.
2. Torsional movement is expressed when the expansion joint is at neutral length.
3. To determine "end thrust," multiply thrust factor by operating pressure of system.
4. Pressure rating is based on 194°F operating temperature. At higher temperature the pressure rating is slightly reduced.Vacuum rating is expressed when expansion joint is at neutral length.
5. Weights are approximate.
6. Control unit weight consists of one rod, four washers, three nuts and two control rod plates. Multiply number of control units needed for application (as specified in the Fluid Sealing Association Technical Handbook) to determine correct weights.
7. Dimensions shown are in accordance with 125/150# standards of ANSI B-16.1, B-16.24, B-16.5; AWWA C-207 Table 1 and 2 Class D.

PROCO™ Series 261R Products Are Designed To Absorb Different Movements Concurrently.



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PROCO™

SERIES 300

flanged rubber pipe connectors

PROCO Series 300 Rubber Pipe is designed for tough demanding industrial and commercial applications as found in: Chemical-Petrochemical and Industrial Process Piping Systems, Power Generating Plants, Steel Mills, Marine Services, Pulp/Paper Systems, Water-Waste/Water-Sewage and Pollution Control Systems. Specific equipment applications could include: Pumps, Cooling Towers, Compressors, Blowers, Fans, Absorption Machines, etc. Installed next to mechanical equipment or between the anchor points of a piping system, specify the PROCO Series 300 to: (1) Isolate Mechanical Vibration, (2) Reduce System Noise, (3) Absorb Pipe Movement/Stress, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-Up/Surge Forces. When you need an engineered rubber solution to a piping system problem, call PROCO.

Engineered For Your Application. Each PROCO Series 300 Rubber Pipe is constructed with a smooth interior tube specially compounded from an elastomer that satisfies the Chemical-Abrasion-Sound requirements of your application (See Table 2). Multiple plies of tough fabric and helical spring steel wire are embedded into the pipe wall during the manufacturing process to provide a product designed for your pressure and vacuum requirements. Available styles include:

Style 310-R: Precision molded to specific lengths as listed in Table 3. The built-in rubber flanges are drilled to ANSI - 125/150#.
Style 310: Manufactured by conventional methods which allow for fabrication to a specific length requirement, in addition to lengths as shown in Table 3. Standard with 125/150# drilling, the Style 310 can also be fabricated to meet other drilling patterns.
Style 320: Designed for high pressure applications (See Table 4); this connector manufactured similar to Style 310. Flanges are usually drilled to ANSI 250/300# with other drilling patterns furnished on request.
Style BE-310: This beaded-end design features a rotating floating metallic flange for fast perfect bolt hole alignment without torsion in new and old installations. **Only available in optimum length sizes as shown in Table 3.**

Table 1: Comparison of Material Acoustical Impedances

Material	Sound Velocity In. / Sec.	Density Lbs./In.^{3}	Acoustical Impedance Lbs. / In.^{2} Sec.	Relative Impedance
Steel	206,500	.283	58,440	551.3
Copper	140,400	.320	44,930	423.9
Cast Iron	148,800	.260	38,690	365.0
Lead	49,800	.411	20,470	193.1
Glass	216,000	.094	20,300	191.5
Concrete	198,000	.072	14,260	134.5
Water	56,400	.036	2,030	19.2
Pine	132,000	.0145	1,910	18.0
Cork	19,200	.0086	165	1.6
Rubber	2,400	.0442	106	1.0

NOTES: Acoustical impedance is defined as the product of material density times velocity of sound in that material. In acoustical systems low impedance corresponds to low sound transmission. Relative impedance is based on Rubber = 1.0

Table 2: Available Styles and Materials

For Specific Elastomer Recommendations, See: PROCO™ **"Chemical To Elastomer Guide"**

310	310-R	BE-310	320	PROCO Material Code	Cover Elastomer	Tube Elastomer	Maximum Operating Temp °F	F.S.A. Material Class
*	*	*	*	BB	Chlorobutyl	Chlorobutyl	250°	Special II
*			*	BT	Chlorobutyl	Teflon®	250°	Special II
*		*	*	EE	EPDM	EPDM	250°	Special II
*			*	NG	Neoprene	Gum	180°	Std. I
*	*	*	*	NH	Neoprene	Hypalon®	212°	Std. II
*	*	*	*	NN	Neoprene	Neoprene	225°	Std. II
*	*	*	*	NP	Neoprene	Nitrile	212°	Std. II

Product "cover" can be Hypalon® coated on special order.
Style 310/NN meets MIL-E-15330-D, Class A. Type III and conforms to all USCG requirements.

NOTES: 1. Hypalon is registered trademark of DuDont Dow Elastomers.
2. Teflon is a registered trademark of the DuDont Company.
3. Products with Teflon® "tubes" are not recommended with vacuum service.

Absorbs Pipe-Wall and Fluid-Borne Noise. The PROCO quiet-operating Series 300 is a replacement for "sound transmitting" metallic connectors. Compare the Acoustical Impedance ratings of rubber and other materials, as shown in Table 1. Pipe-Wall sound is absorbed as the noise carried by the piping both enters and leaves the rubber section. Connector length further influences absorption as sound loses energy traveling axially through the rubber. For optimum lengths, see Table 3. Fluid-borne noise is absorbed by the volumetric expansion (breathing) of the connector. This action cushions water hammer, and smoothes out pumping impulses.

Isolate Vibrations and Motion. Vibration originating from mechanical equipment is absorbed by the PROCO Series 300. Rubber pipe connectors should be installed right after and ahead of the equipment generating the vibration, thus isolating the equipment. As most machinery vibrates in a radial direction from the main shaft, for optimum performance the pipe connector should be installed horizontally and parallel to this shaft. While PROCO Series 300 Rubber Pipe will accept some axial motion, it is principally designed to accept transverse motion. When installed at right angles to the direction of the pipe motion (movement), PROCO rubber pipe connectors can absorb large amounts of expansion. For major two-plane vibration/motion it is best to use two flexible rubber pipe connectors installed at right angles, one to absorb the horizontal vibration and one to absorb the vertical vibration. A tension anchor is usually advisable to stabilize the elbow between the connectors. **Note: For maximum vibration transmission reduction, the piping section beyond the rubber connector must be anchored or sufficiently rigid.**

Prevents Electrolysis and Electrolytic Action. In chemical applications when metallic connectors are used, they are generally of a metal dissimilar from the pipe-line. This could create an electrolytic galvanic action that could be destructive to the connector, equipment or piping system. The use of the PROCO Series 300 eliminates this potential hazard. Additionally, because the all-rubber connector eliminates metal-to-metal contact at the flange face, electrolysis is stopped.

Systems Misalignment Compensation. In a rigid piping system, the installation of the PROCO Series 300 Rubber Pipe adds a flexible component that is automatically self-correcting for misalignment created by structural movements caused by settling, expansion or ground shifts (See Table 3).

Chemical Or Abrasive Service Capability At Minimal Cost: Expensive, exotic metal connectors for chemical service can be replaced with the PROCO Series 300. Fabricated with low cost chemical resistant elastomer such as: Chlorobutyl, EPDM, Gum, Hypalon®, Neoprene and Nitrile; insures a rubber connector compatible with the fluid being pumped or piped (See Table 1). Our Gum or Neoprene products should be specified when handling abrasive slurries. Use PROCO "Chemical to Elastomer Guide" to specify an elastomer for your requirements.

Protecting Piping And Equipment Systems From Stress/Motion

Water Environment Federation® Preserving & Enhancing the Global Water Environment MEMBER

Fluid Sealing Association FSA ISD Independent Sealing Distributors NAHAD National Association of Hose and Accessories Distributors

PROCO flanged rubber pipe connectors

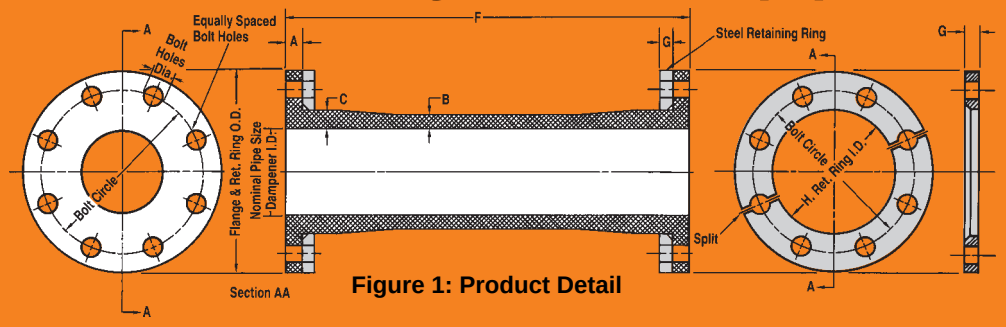
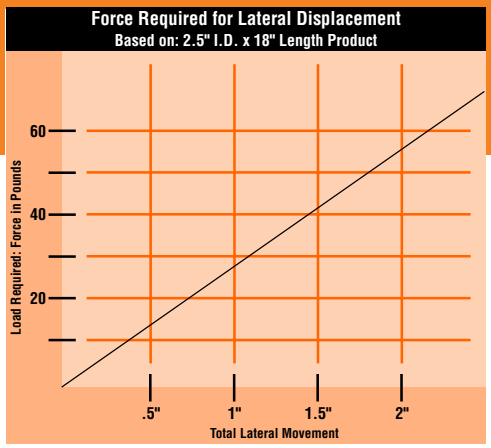
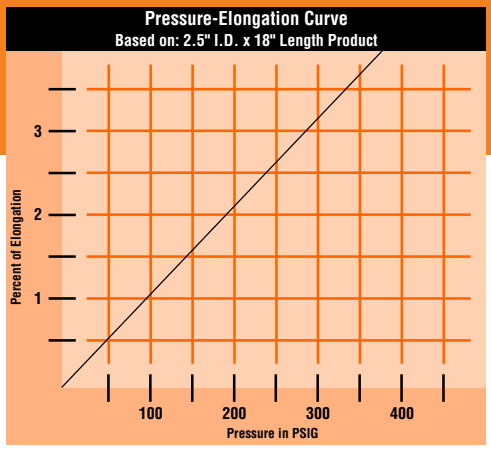


Figure 1: Product Detail





Reduce System Stress And Strain. Rigid attachment of piping to critical or mechanical equipment can produce excessive loading. Thermal or mechanically created strain-stress-shock are cushioned and absorbed with the installation of a flexible PROCO Series 300 Rubber Pipe.

Full Flow With Less Turbulence Or Material Entrapment. The smooth bore of the PROCO Series 300 Rubber Pipe Connector allows full flow without turbulence. Metallic connectors depend upon bellows or convolutions to absorb motion. These bellows/convolutions could create flow turbulence and also create an area for material entrapment or bacteria growth.

Leak Free Without Gaskets Or Packing. The full-face rubber flange of the PROCO Series 300 Rubber Pipe Connector is self-gasketing. Additionally, the Style 310-R features a molded in place "O-Ring" on each flange-face for faster sealing with less torque at installation and less long-term maintenance. Unlike interlocked metallic connectors, the Series 300 features a one-piece seamless tube that does not require packing. Our rubber connector is suitable for all air, gas, and fluids, including "searching" thin fluids.

Control Rod Assembly Usage. PROCO Style 491 Control Units are designed to protect the Series 300 Pipe Connector from excessive elongation. Control rods must be used: (1) when the piping containing the rubber pipe connector is not anchored and, (2) when the rubber pipe connector is attached to resiliently supported pipe or equipment.

Table 4: Standard Drilling • Connector Dimensions • Pressures • Weights

Nominal Pipe Size: Pipe I.D.	125/150# Flange Dimensions[1] Pipe • Rings • Rods				250/300# Flange Dimensions[2] Pipe • Rings • Rods				Pipe Dimensions See Figure 1		Operating Pressures[3] Positive In P.S.I.G.			Retaining Ring Weight Per Set	
	Flange O.D.	Bolt Circle	# of Holes	Size of Holes	Flange O.D.	Bolt Circle	# of Holes	Size of Holes	"A" Flange Thickness	"B" Body Thickness	Style 310-R	Style 310	Style 320	Style #481 150 Pound	Style #484 300 Pound
.75	3.88	2.75	4	.625	4.62	3.25	4	.750	.591	.472	300	150	300	1.5	2.0
1	4.25	3.12	4	.625	4.88	3.50	4	.750	.591	.551	300	150	300	1.9	2.9
1.25	4.62	3.50	4	.625	5.25	3.88	4	.750	.591	.551	300	150	300	2.4	3.0
1.50	5.00	3.88	4	.625	6.12	4.50	4	.875	.591	.551	300	150	300	2.6	4.4
2	6.00	4.75	4	.750	6.50	5.00	8	.750	.591	.551	250	150	250	3.6	4.3
2.50	7.00	5.50	4	.750	7.50	5.88	8	.875	.591	.591	200	150	250	5.3	5.5
3	7.50	6.00	4	.750	8.25	6.63	8	.875	.591	.591	175	150	250	5.6	6.0
3.5	8.50	7.00	8	.750	9.00	7.25	8	.875	.591	.669	175	150	250	6.5	7.0
4	9.00	7.50	8	.750	10.00	7.88	8	.875	.591	.669	175	150	250	7.3	10.0
5	10.00	8.50	8	.875	11.00	9.25	8	.875	.591	.669	175	150	250	7.9	11.6
6	11.00	9.50	8	.875	12.50	10.63	12	.875	.591	.709	150	150	250	9.1	14.5
8	13.50	11.75	8	.875	15.00	13.00	12	1.000	.591	.787	150	150	250	14.0	19.6
10	16.00	14.25	12	1.000	17.50	15.25	16	1.125	.787	.866	150	150	250	17.0	23.0
12	19.00	17.00	12	1.000	20.50	17.75	16	1.250	.787	.984	150	150	250	24.1	31.3
14	21.00	18.75	12	1.125	23.00	20.25	20	1.250	.787	.984	125*	125	200	26.8	37.0
16	23.50	21.25	16	1.125	25.50	22.50	20	1.375	.787	.984	100*	100	150	32.1	45.0
18	25.00	22.75	16	1.250	28.00	24.75	24	1.375	.875	1.000	100*	100	150	30.6	58.0
20	27.50	25.00	20	1.250	30.50	27.00	24	1.375	1.000	1.000	100*	100	150	35.9	67.0

NOTES: 1. Dimensions shown meet 125/150# standards of: ANSI B-16.1, B-16.24, B-16.5; AWWA C-207 Table 1 and 2, Class D; MSS SP-44 and NBS/PS 15-69.
2. Dimensions shown meet 250/300# standards of: ANSI B-16.1, B-16.24, B-16.5 and MSS SP-44 Class 300.
3. Vacuum rating is 26" hg. in all cases except where * appears. Pressure rating is based on 170°F. operating temperature.

Table 3: Sizes • Movements • Weights

Nominal Pipe Size: Pipe I.D.	Neutral Length	Movement Capability From Neutral				Approximate Weight / Lbs. Style 310-R
		In. of Axial Compression	In. of Axial Extension	± In. of Lateral Deflection	± In. of Angular Deflection	
.75	12*	.158	.158	1.97	21.8°	2.4
	18	.236	.236	2.96	31.0°	3.2
1	12*	.158	.158	1.77	17.7°	3.3
	18	.236	.236	2.66	25.6°	4.2
1.25	12*	.158	.158	1.58	14.0°	4.0
	18	.236	.236	2.36	20.6°	5.0
	24	.315	.315	3.15	26.6°	6.0
1.5	12*	.158	.158	1.39	11.3°	4.3
	18	.236	.236	2.09	16.7°	5.4
	24	.315	.315	2.78	21.8°	6.5
2	12*	.158	.158	1.18	9.1°	5.6
	18	.236	.236	1.77	13.5°	6.8
	24	.315	.315	2.36	17.7°	8.0
	30	.354	.354	2.96	19.8°	9.2
2.5	12*	.158	.158	.98	7.0°	6.9
	18	.236	.236	1.48	10.5°	8.2
	24	.315	.315	1.97	13.8°	9.5
	30	.354	.354	2.46	15.5°	10.0
3	12*	.158	.158	.79	5.7°	8.6
	18	.236	.236	1.18	8.5°	10.6
	24	.315	.315	1.58	11.3°	11.7
	30	.354	.354	1.97	12.7°	14.6
	36	.433	.433	2.36	15.4°	16.6
3.5	12	.158	.158	.59	5.1°	9.7
	18*	.236	.236	.89	7.6°	12.2
	24	.315	.315	1.18	10.1°	14.7
	30	.354	.354	1.48	11.3°	17.2
	36	.433	.433	1.77	13.7°	19.7
4	12	.158	.158	.59	4.6°	10.9
	18*	.236	.236	.89	6.8°	14.5
	24	.315	.315	1.18	9.1°	17.4
	30	.354	.354	1.48	10.2°	19.7
	36	.433	.433	1.77	12.4°	21.9
	48	.472	.472	1.98	14.8°	27.2
5	12	.158	.158	.45	3.7°	13.5
	18*	.236	.236	.67	5.5°	16.6
	24	.315	.315	.89	7.3°	20.1
	30	.354	.354	1.12	8.2°	23.1
	36	.433	.433	1.34	10.0°	26.1
6	12	.158	.158	.45	3.1°	18.9
	18	.236	.236	.67	4.6°	19.9
	24*	.315	.315	.89	6.1°	24.1
	30	.354	.354	1.12	6.8°	27.2
	36	.433	.433	1.34	8.3°	31.5
	48	.472	.472	1.55	9.9°	39.0
8	12	.118	.118	.35	1.7°	23.4
	18	.158	.158	.53	2.3°	29.4
	24*	.236	.236	.71	3.4°	35.7
	30	.276	.276	.89	4.0°	40.2
	36	.354	.354	1.06	5.1°	47.4
	48	.472	.472	1.42	6.8°	59.4
10	12	.118	.118	.32	1.4°	26.0
	18	.158	.158	.47	1.8°	37.0
	24*	.236	.236	.63	2.7°	48.7
	30	.276	.276	.79	3.2°	59.0
	36	.354	.354	.95	4.1°	70.0
	48	.472	.472	1.26	5.5°	92.0
12	12	.118	.118	.24	1.1°	36.0
	18	.158	.158	.36	1.5°	51.0
	24*	.236	.236	.47	2.3°	66.5
	30	.276	.276	.59	2.7°	81.0
	36	.354	.354	.71	3.4°	96.0
	48	.472	.472	.95	4.2°	126.0
14	12	.118	.118	.24	1.0°	58.0
	18	.158	.158	.36	1.3°	83.0
	24*	.236	.236	.47	2.0°	108.0
	30	.276	.276	.59	2.3°	133.0
	36	.354	.354	.71	2.9°	157.0
	48	.472	.472	.95	3.9°	208.0
16	12	.118	.118	.24	0.7°	83.0
	18	.158	.158	.36	1.3°	118.0
	24*	.236	.236	.47	1.7°	153.0
	36	.354	.354	.71	2.6°	233.0
	48	.472	.472	.95	3.4°	294.0
18	12	.112	.112	.18	0.9°	110.0
	18	.118	.118	.24	1.2°	157.5
	24*	.236	.236	.24	1.5°	205.0
	36	.354	.354	.36	2.3°	300.0
	48	.472	.472	.48	3.1°	394.0
20	24*	.236	.236	.24	1.4°	270.0
	36	.354	.354	.36	2.1°	394.0
	48	.472	.472	.48	2.7°	519.0

NOTES: * 1. For optimum noise and vibration absorption, use this or longer length.
2. The degree of angular movement is based on the maximum rated extension.
3. Larger I.D. or length sizes available. Contact PROCO.

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PROCO

PROCO PRODUCTS, INC.

Series 440

Molded PTFE Expansion Joints

PROCO™

SERIES

440

molded PTFE expansion joints

The PROCO Series 440 PTFE Molded Expansion Joints are used for corrosive applications found in: Chemical-Petrochemical, Industrial Process Piping Systems, Power Generation Plants, Pulp/Paper Plants, Water-Wastewater Sewage and Pollution Control Systems where metallic joints/lap joints or PTFE & FEP-lined rubber expansion joints may have been previously used or specified. Specify PROCO Series 440 expansion joints for installation between anchor points or next to mechanical equipment such as: Absorption Machines, Blowers, Chillers, Fans, Graphite Heat Exchangers, Glass Lined Vessels, Pumps, and Exotic Alloy/Plastic/Glass Lined Piping Systems. The Series 440 expansion joints are designed to: (1) Absorb Pipe Movements/Stress, (2) Reduce System Noise, (3) Reduce Mechanical Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect against Start-up/Surge Forces. Our history in the manufacture of expansion joint products dates back to 1930. When an engineered solution is needed to solve a piping problem, call PROCO.

Engineered For Your Application. The PROCO Series 440 PTFE expansion joints are available in 2, 3, and 5 convolutions. Each convolution profile offers different overall lengths (face-to-face dimensions), movements and pressure/temperature rating to fit the required specification. Available styles include:

- **Style 442-BD:** Features two convolutions for minimal movements, higher pressure/temperature ratings and short face-to-face opening requirements. Style 442-BD sizes range from 1" to 24" diameter. (See Table 1)
- **Style 442-E:** Features two convolutions, and is engineered with T-band compression limiters, limit cables (meets MIL-W-8342), and face-to-face lengths to be an exact equal to other more expensive, competitor models. Style 442-E sizes range from 1" to 12" diameter. (See Table 2)
- **Style 443-BD:** Features three convolutions and is designed for moderate movement and ease of system installation. Style 443-BD sizes range from 1" to 24" diameter. (See Table 3)
- **Style 443-E:** Features three convolutions, and is engineered with T-band compression limiters, limit cables (meets MIL-W-8342), and face-to-face lengths to be an exact equal to other more expensive, competitor models. Style 443-E sizes range from 1" to 8" diameter. (See Table 4)
- **Style 445-BD:** Features five convolutions, and is designed for maximum movements, low pressure/temperature ranges, vibration reduction and greater face-to-face lengths. Style 445-BD sizes range from 1" to 20" diameter. (See Table 5)
- **Style 445-E:** Features five convolutions, and is engineered with T-band compression limiters, limit cables (meets MIL-W-8342), and face-to-face lengths to be an exact equal to other more expensive, competitor models. Style 445-E sizes range from 1" to 6" diameter. (See Table 6)
- **Style 440-BE:** Features Styles' 440-E Neutral Lengths with Styles' 440-BD Limit Bolts. (See Table 7)

Absorbs Pipe-Wall and Fluid-Borne Noise. The quiet operating PROCO Series 440 PTFE expansion joints are a replacement for "sound transmitting" metallic/lap joints. Pipe Wall sound loses energy and is absorbed as the noise carried by the piping enters and exits the PTFE section. Fluid-borne noise is absorbed by the volumetric expansion (breathing of the connector). This action cushions water hammer and smoothes out pumping impulses.

Isolates Vibration and Motion. PROCO Series 440 PTFE expansion joints should be installed immediately after and ahead of equipment generating vibration in order to isolate the rotating/vibrating equipment from the rest of the piping system. For optimum performance, the PROCO Series 440 PTFE expansion joints should be installed horizontally to the shaft. Vertical and perpendicular installations are also acceptable as these expansion joints will accept axial, lateral and angular movements as well as vibration. Note: For maximum vibration transmission reduction, the pipe section beyond the PTFE expansion joints must be anchored or sufficiently rigid.

Reduces System Stress and Strain. Rigid attachment of piping to critical or mechanical equipment can produce excessive loading. Thermal or mechanically created strain-stress-shock are cushioned and absorbed with the installation of a flexible, low spring rate, PROCO Series 440 PTFE expansion joint. The PROCO Series 440 PTFE expansion joint adds a flexible component to the system that automatically self-corrects for misalignment created by structural movements caused by settling, pipe expansion or ground shifts.

Tested Force Pound and Spring Rate Tables. At PROCO we have machine tested nearly every size of the Series 440 PTFE expansion joints for Axial and Lateral Spring Rates and have provided Thrust/Force factors so designers can properly design system restraints. It should be noted that the PROCO Series 440 PTFE expansion joints are in accordance with the performance characteristics of the Fluid Sealing Association's Non-Metallic Expansion Joint Division.

Superior "Flex Life" and Strength. The PROCO Series 440 PTFE expansion joints are contour molded from extruded tubing providing superior "Flex Life" and Strength. Utilizing TEFLON® T-62 resins from DuPont, the PROCO Series 440 PTFE expansion joints provide dramatically more cycle life than that of PFA or FEP.

Flange and Limit Bolts/Cables. All PROCO Series 440 PTFE expansion joint flange configurations are coated with a rust inhibitive primer to prevent corrosion and are dimensionally tapped to ANSI 125/150# Standards. Hole drilling on center line, other drilling standards, or other flange materials, such as 316 stainless, 304 stainless, or Epoxy Coated flanges are available on special order. In addition, all PROCO Series 440 PTFE expansion joints are supplied with factory set limit bolts or cables to prevent over-extension during operation.

Chemical Service Capability at Minimal Cost. Expensive, exotic metal, PTFE or FEP lined rubber expansion joints for severe chemical service can be replaced with the low cost PROCO Series 440 PTFE expansion joints. The PTFE bellows are van stoned to the flanges which allows all wetted surfaces to come in contact with only the PTFE material. Specify the PROCO Series 440 PTFE expansion joints where high temperatures coupled with lower pressures or lower temperatures coupled with higher pressures are proposed. The PROCO Series 440 PTFE offers the lowest cost expansion joint that is impervious to chemical attack. Use the PROCO "Chemical to Elastomer Guide" for reference on chemical compatibility.

Services and Locations. PROCO Series 440 PTFE Expansion Joints have been supplied and successfully used by a range of customers worldwide in the process industries for use in both organic and inorganic chemical processing and production, including such demanding applications as agrochemical and pharmaceutical chemical production, acid processing and food manufacture.

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays…the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

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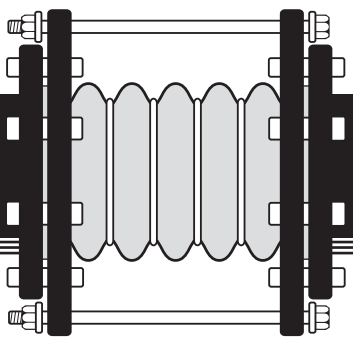
Website ..... www.procoproducts.com

Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.



Protecting Piping And Equipment Systems From Stress/Motion

Rev. 1 4/05

PROCO™

STYLE

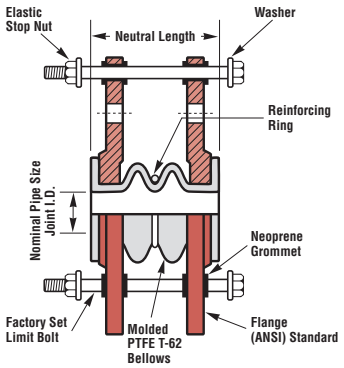
442-BD

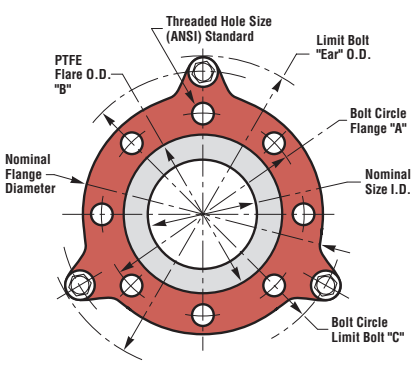
molded PTFE expansion joints

Table 1: Sizes • Movements • Spring Rates • Flange Standards • Temperatures • Vacuum • Weights

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON TWO CONVOLUTION DESIGN [1]			SPRING RATE CAPABILITY [2]				EXPANSION JOINT FLANGE DRILLING									PRESSURE AT TEMPERATURE (PSIG) @ °F								VACUUM RATING [3]	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	COMPRESSION SPRING RATE	EXTENSION SPRING RATE	LATERAL SPRING RATE	THRUST FACTOR	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	PTFE FLARE O.D. "B"	FLANGE THICKNESS	NOMINAL FLANGE O.D.	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "C"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB_f/IN	LB_f/IN	LB_f/IN																				
1.00	1.375	0.250	.125	7	104	80	104	2.76	4	1/2- 13	3.125	2.000	.313	4.250	.250	5.125	6.000	185	170	148	130	115	100	84	68	29.9" @ 425°F	2
1.25	1.375	0.250	.125	7	61	137	400	2.25	4	1/2- 13	3.500	2.520	.394	4.630	.250	5.196	6.850	185	170	148	130	115	100	84	68	CF	5
1.50	1.375	0.250	.125	7	320	180	224	4.60	4	1/2- 13	3.875	2.875	.344	5.000	.250	5.875	6.750	185	170	148	130	115	100	84	68	29.9" @ 425°F	3
2.00	1.563	0.250	.125	7	512	300	240	7.07	4	5/8- 11	4.750	3.625	.438	6.000	.375	6.875	8.125	185	170	148	130	115	100	84	68	29.9" @ 425°F	7
2.50	2.250	0.313	.125	7	457	278	328	9.62	4	5/8- 11	5.500	4.125	.500	7.000	.375	8.125	9.375	185	170	148	130	115	100	84	68	29.9" @ 425°F	10
3.00	2.250	0.375	.188	7	648	320	319	15.90	4	5/8- 11	6.000	5.000	.500	7.500	.375	8.750	10.000	185	170	148	130	115	100	84	68	29.9" @ 425°F	10
4.00	2.625	0.500	.250	7	480	280	400	23.75	8	5/8- 11	7.500	6.188	.625	9.000	.375	9.875	11.125	185	170	148	130	115	100	84	68	29.9" @ 400°F	18
5.00	3.250	0.500	.250	7	440	440	320	33.17	8	3/4- 10	8.500	7.313	.750	10.000	.500	11.500	13.000	185	170	148	130	115	100	84	68	29.9" @ 400°F	24
6.00	2.750	0.500	.250	7	440	386	440	50.24	8	3/4- 10	9.500	8.500	.750	11.000	.500	12.500	14.000	185	170	148	130	115	100	84	68	29.9" @ 400°F	29
8.00	4.000	0.500	.250	7	450	390	480	83.49	8	3/4- 10	11.750	10.625	.938	13.500	.500	14.750	16.250	164	150	129	112	100	87	73	60	29.9" @ 250°F	47
10.00	5.250	0.500	.250	7	760	600	580	108.38	12	7/8- 9	14.250	12.750	1.000	16.000	.500	17.500	19.000	164	150	129	112	100	87	73	60	29.9" @ 250°F	64
12.00	6.000	0.500	.250	7	1300	420	700	176.63	12	7/8- 9	17.000	15.000	1.000	19.000	.625	20.500	22.000	70	59	48	40	35	30	26	22	29.9" @ 75°F	115
14.00	6.313	0.750	.375	7	320	1056	1256	233.59	12	1- 8	18.750	16.250	1.188	21.000	1.420	24.172	27.313	70	59	48	40	35	30	26	22	10.0" @ 212°F	126
16.00	7.000	1.000	.375	7	297	1096	1256	259.68	16	1- 8	21.250	18.500	1.188	23.500	1.420	27.563	31.500	70	59	48	40	35	30	26	22	10.0" @ 212°F	159
18.00	7.938	1.000	.375	7	440	1941	1370	321.90	16	1 1/8- 8	22.750	21.000	1.188	25.000	1.420	29.000	32.906	70	59	48	40	35	30	26	22	9.0" @ 212°F	174
20.00	9.000	1.000	.375	7	—	—	—	374.57	20	1 1/8- 8	25.000	23.000	1.188	27.500	1.420	31.500	35.438	70	59	48	40	35	30	26	22	6.0" @ 212°F	183
24.00	6.313	0.625	.375	7	—	—	—	538.36	20	1 1/4- 7	29.500	27.250	1.344	32.000	1.420	35.906	39.844	70	59	48	40	35	30	26	22	4.0" @ 212°F	238

NOTES: 1. Movements are non-concurrent and based from Neutral Length with Limit Bolts installed.
2. Spring Rate Capability is based on 1" of movement at zero pressure conditions.
3. Vacuum Rating is based from fully extended position. CF = Contact Factory.





SERIES 442-BD MATERIALS OF CONSTRUCTION

DESCRIPTION	1" THROUGH 12"	14" THROUGH 24"
BELLOWS	PTFE T-62	PTFE T-62
FLANGES	DUCTILE IRON	ZINC PLATED CARBON STEEL
REINFORCING RINGS	STAINLESS STEEL	STAINLESS STEEL
LIMIT BOLTS	CARBON STEEL	CARBON STEEL
NUTS	CARBON STEEL	CARBON STEEL
GROMMETS	NEOPRENE	NEOPRENE
WASHERS	CARBON STEEL	CARBON STEEL

PROCO™

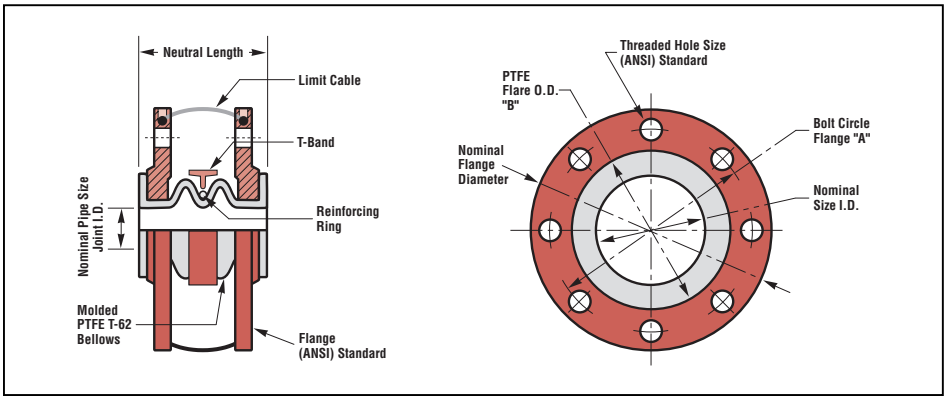
STYLE 442-E

molded PTFE expansion joints

Table 2: Sizes • Movements • Spring Rates • Flange Standards • Temperatures • Vacuum • Weights

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON TWO CONVOLUTION DESIGN [1]			SPRING RATE CAPABILITY [2]				EXPANSION JOINT FLANGE DRILLING						PRESSURE AT TEMPERATURE (PSIG) @ °F								VACUUM RATING [3]	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	COMPRESSION SPRING RATE	EXTENSION SPRING RATE	LATERAL SPRING RATE	THRUST FACTOR	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	PTFE FLARE O.D. "B"	FLANGE THICKNESS	NOMINAL FLANGE O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB_f/IN	LB_f/IN	LB_f/IN																	
1.00	1.750	0.344	.250	16	140	144	120	2.76	4	1/2- 13	3.125	2.000	.438	4.250	185	170	148	130	115	100	84	68	29.9" @ 425°F	3
1.50	1.813	0.344	.250	13	240	200	240	4.60	4	1/2- 13	3.875	2.875	.469	5.000	185	170	148	130	115	100	84	68	29.9" @ 425°F	4
2.00	1.875	0.344	.281	12	430	350	440	7.07	4	5/8- 11	4.750	3.625	.484	6.000	185	170	148	130	115	100	84	68	29.9" @ 425°F	7
3.00	2.188	0.406	.313	10	650	320	350	15.90	4	5/8- 11	6.000	5.000	.578	7.500	185	170	148	130	115	100	84	68	29.9" @ 425°F	10
4.00	2.281	0.438	.313	9	360	280	630	23.75	8	5/8- 11	7.500	6.188	.578	9.000	185	170	148	130	115	100	84	68	29.9" @ 400°F	17
6.00	2.531	0.469	.375	7	460	350	720	50.24	8	3/4- 10	9.500	8.500	.641	11.000	185	170	148	130	115	100	84	68	29.9" @ 400°F	27
8.00	2.750	0.531	.406	6	300	230	800	81.48	8	3/4- 10	11.750	10.625	.688	13.500	164	150	129	112	100	87	73	60	29.9" @ 250°F	35
10.00	2.969	0.563	.438	5	1280	870	1000	108.38	12	7/8- 9	14.250	12.750	.734	16.000	164	150	129	112	100	87	73	60	29.9" @ 250°F	52
12.00	3.094	0.594	.469	5	380	240	1000	176.63	12	7/8- 9	17.000	15.000	.813	19.000	70	59	48	40	35	30	26	22	29.9" @ 75°F	107

NOTES: 1. Movements are non-concurrent and based from Neutral Length with Limit Cables installed.
2. Spring Rate Capability is based on 1" of movement at zero pressure conditions.
3. Vacuum Rating is based from fully extended position.



SERIES 442-E MATERIALS OF CONSTRUCTION	
DESCRIPTION	**1" THROUGH 12"**
BELLOWS	PTFE T-62
FLANGES	DUCTILE IRON
REINFORCING RINGS	STAINLESS STEEL
T-BANDS	CARBON STEEL
LIMIT CABLES	MIL-W-8342

PROCO™

STYLE

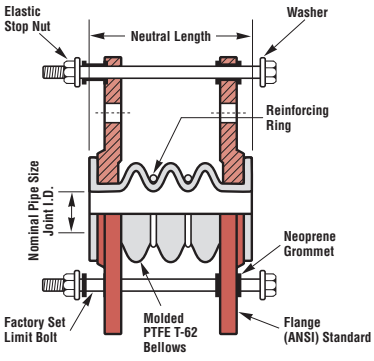
443-BD

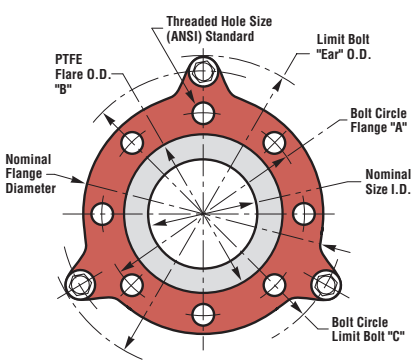
molded PTFE expansion joints

Table 3: Sizes • Movements • Spring Rates • Flange Standards • Temperatures • Vacuum • Weights

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON THREE CONVOLUTION DESIGN [1]			SPRING RATE CAPABILITY [2]				EXPANSION JOINT FLANGE DRILLING									PRESSURE AT TEMPERATURE (PSIG) @ °F								VACUUM RATING [3]	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	COMPRESSION SPRING RATE	EXTENSION SPRING RATE	LATERAL SPRING RATE	THRUST FACTOR	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	PTFE FLARE O.D. "B"	FLANGE THICKNESS	NOMINAL FLANGE O.D.	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "C"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB_f/IN	LB_f/IN	LB_f/IN																				
1.00	1.750	0.500	.250	14	190	82	96	2.81	4	1/2- 13	3.125	2.000	.313	4.250	.250	5.125	6.000	138	126	107	90	115	64	53	45	29.9" @ 400°F	2
1.25	1.810	0.500	.250	14	40	120	314	2.25	4	1/2- 13	3.500	2.520	.394	4.630	.250	5.196	6.850	128	120	96	85	72	56	42	36	CF	5
1.50	2.000	0.500	.250	14	84	66	108	5.09	4	1/2- 13	3.875	2.875	.344	5.000	.250	5.875	6.750	138	126	107	90	115	64	53	45	29.9" @ 400°F	4
2.00	2.750	0.750	.375	14	69	76	109	9.11	4	5/8- 11	4.750	3.625	.438	6.000	.375	6.875	8.125	138	126	107	90	115	64	53	45	29.9" @ 400°F	8
2.50	3.188	0.750	.375	14	91	97	160	11.41	4	5/8- 11	5.500	4.125	.500	7.000	.375	8.125	9.375	138	126	107	90	115	64	53	45	29.9" @ 400°F	11
3.00	3.625	1.000	.500	14	124	125	194	16.91	4	5/8- 11	6.000	5.000	.500	7.500	.375	8.750	10.000	138	126	107	90	115	64	53	45	29.9" @ 400°F	13
4.00	3.625	1.000	.500	14	220	155	264	25.40	8	5/8- 11	7.500	6.188	.625	9.000	.375	9.875	11.125	138	126	107	90	115	64	53	45	29.9" @ 400°F	19
5.00	4.000	1.000	.500	14	320	210	324	34.45	8	3/4- 10	8.500	7.313	.750	10.000	.500	11.500	13.000	138	126	107	90	115	64	53	45	29.9" @ 300°F	25
6.00	4.000	1.125	.563	14	289	187	266	50.24	8	3/4- 10	9.500	8.500	.750	11.000	.500	12.500	14.000	138	126	107	90	115	64	53	45	29.9" @ 300°F	30
8.00	6.000	1.125	.563	14	178	218	423	83.49	8	3/4- 10	11.750	10.625	.938	13.500	.500	14.750	16.250	120	110	94	80	100	57	47	38	29.9" @ 125°F	48
10.00	7.000	1.188	.500	14	420	531	857	128.55	12	7/8- 9	14.250	12.750	1.000	16.000	.500	17.500	19.000	82	70	64	52	46	39	34	30	19.0" @ 212°F	60
12.00	7.875	1.188	.625	14	743	542	857	144.72	12	7/8- 9	17.000	15.000	1.000	19.000	.625	20.500	22.000	82	70	64	52	46	40	34	30	10.0" @ 212°F	77
14.00	8.500	1.250	.688	14	239	628	970	233.59	12	1- 8	18.750	16.250	1.188	21.000	1.420	24.172	27.313	82	70	64	52	46	40	34	30	10.0" @ 212°F	132
16.00	9.188	1.375	.750	14	245	571	970	259.68	16	1- 8	21.250	18.500	1.188	23.500	1.420	27.563	31.500	82	70	64	52	46	40	34	30	10.0" @ 212°F	165
18.00	11.063	1.188	.750	14	—	—	1085	321.90	16	1 1/8- 8	22.750	21.000	1.188	25.000	1.420	29.000	32.906	60	58	48	42	36	30	28	26	9.0" @ 212°F	201
20.00	12.875	1.188	1.000	14	—	—	1142	374.57	20	1 1/8- 8	25.000	23.000	1.188	27.500	1.420	31.500	35.438	60	58	48	42	36	30	28	26	6.0" @ 212°F	243
24.00	11.875	1.000	.750	14	—	—	—	538.36	20	1 1/4- 7	29.500	27.250	1.344	32.000	1.420	35.906	39.844	60	58	48	42	36	30	28	26	4.0" @ 212°F	309

NOTES: 1. Movements are non-concurrent and based from Neutral Length with Limit Bolts installed.
2. Spring Rate Capability is based on 1" of movement at zero pressure conditions.
3. Vacuum Rating is based from fully extended position. CF = Contact Factory.





SERIES 443-BD MATERIALS OF CONSTRUCTION		
DESCRIPTION	1" THROUGH 12"	14" THROUGH 24"
BELLOWS	PTFE T-62	PTFE T-62
FLANGES	DUCTILE IRON	ZINC PLATED CARBON STEEL
REINFORCING RINGS	STAINLESS STEEL	STAINLESS STEEL
LIMIT BOLTS	CARBON STEEL	CARBON STEEL
NUTS	CARBON STEEL	CARBON STEEL
GROMMETS	NEOPRENE	NEOPRENE
WASHERS	CARBON STEEL	CARBON STEEL

PROCO™

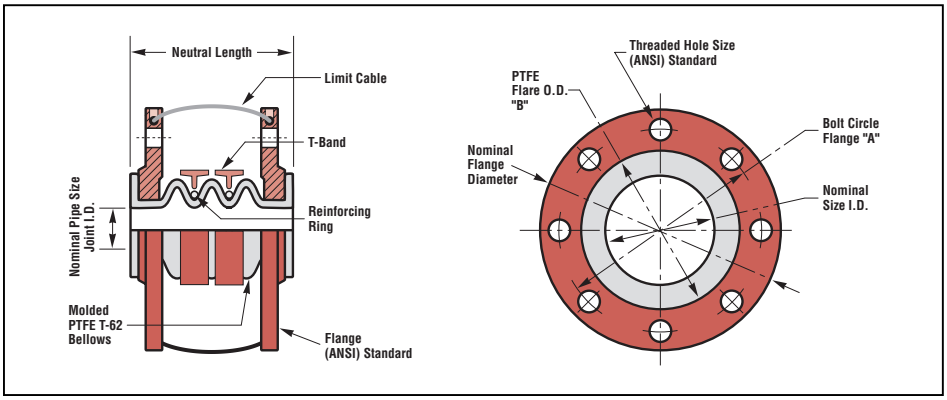
STYLE 443-E

molded PTFE expansion joints

Table 4: Sizes • Movements • Spring Rates • Flange Standards • Temperatures • Vacuum • Weights

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON THREE CONVOLUTION DESIGN [1]			SPRING RATE CAPABILITY [2]				EXPANSION JOINT FLANGE DRILLING						PRESSURE AT TEMPERATURE (PSIG) @ °F								VACUUM RATING [3]	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	COMPRESSION SPRING RATE	EXTENSION SPRING RATE	LATERAL SPRING RATE	THRUST FACTOR	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	PTFE FLARE O.D. "B"	FLANGE THICKNESS	NOMINAL FLANGE O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB_f/IN	LB_f/IN	LB_f/IN																	
1.00	2.313	0.500	.375	24	130	130	260	2.81	4	1/2- 13	3.125	2.000	.438	4.250	138	126	107	90	76	64	53	45	29.9" @ 400°F	3
1.50	2.406	0.531	.375	20	80	70	110	5.09	4	1/2- 13	3.875	2.875	.469	5.000	138	126	107	90	76	64	53	45	29.9" @ 400°F	5
2.00	2.500	0.531	.406	17	70	80	160	9.11	4	5/8- 11	4.750	3.625	.484	6.000	138	126	107	90	76	64	53	45	29.9" @ 400°F	8
3.00	2.906	0.625	.469	15	140	160	190	16.91	4	5/8- 11	6.000	5.000	.578	7.500	138	126	107	90	76	64	53	45	29.9" @ 400°F	14
4.00	3.063	0.656	.500	13	220	160	190	25.40	8	5/8- 11	7.500	6.188	.578	9.000	138	126	107	90	76	64	53	45	29.9" @ 400°F	19
6.00	3.375	0.719	.531	10	350	190	540	50.24	8	3/4- 10	9.500	8.500	.641	11.000	138	126	107	90	76	64	53	45	29.9" @ 300°F	30
8.00	3.656	0.781	.594	9	450	170	750	81.48	8	3/4- 10	11.750	10.625	.688	13.500	120	110	94	80	67	57	47	38	29.9" @ 125°F	39

NOTES: 1. Movements are non-concurrent and based from Neutral Length with Limit Cables installed.
2. Spring Rate Capability is based on 1" of movement at zero pressure conditions.
3. Vacuum Rating is based from fully extended position.

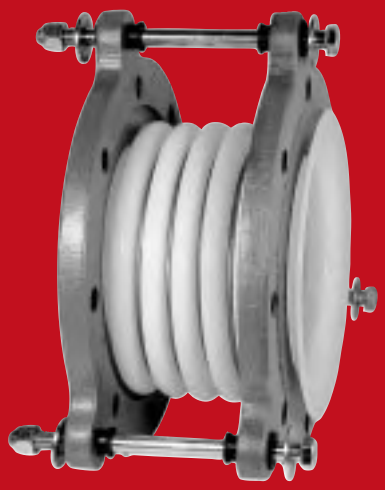


SERIES 443-E MATERIALS OF CONSTRUCTION	
DESCRIPTION	**1" THROUGH 8"**
BELLOWS	PTFE T-62
FLANGES	DUCTILE IRON
REINFORCING RINGS	STAINLESS STEEL
T-BANDS	CARBON STEEL
LIMIT CABLES	MIL-W-8342

PROCO™

STYLE

445-BD

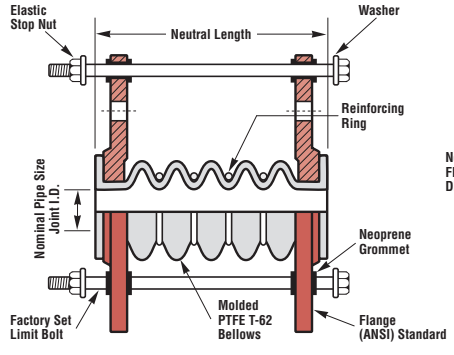


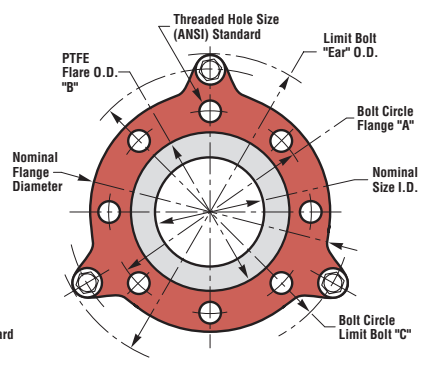
molded PTFE expansion joints

Table 5: Sizes • Movements • Spring Rates • Flange Standards • Temperatures • Vacuum • Weights

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON FIVE CONVOLUTION DESIGN [1]			SPRING RATE CAPABILITY [2]				EXPANSION JOINT FLANGE DRILLING									PRESSURE AT TEMPERATURE (PSIG) @ °F								VACUUM RATING [3]	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	COMPRESSION SPRING RATE	EXTENSION SPRING RATE	LATERAL SPRING RATE	THRUST FACTOR	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	PTFE FLARE O.D. "B"	FLANGE THICKNESS	NOMINAL FLANGE O.D.	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "C"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB_f/IN	LB_f/IN	LB_f/IN																				
1.00	3.000	0.500	.500	20	30	44	22	2.81	4	1/2- 13	3.125	2.000	.313	4.250	.250	5.125	6.000	72	61	46	40	34	29	27	24		2
1.25	2.670	0.394	.470	20	36	114	171	2.25	4	1/2- 13	3.500	2.520	.394	4.630	.250	5.196	6.850	62	56	42	36	30	26	22	22		5
1.50	3.500	0.750	.500	20	75	83	46	5.09	4	1/2- 13	3.875	2.875	.344	5.000	.250	5.875	6.750	72	61	46	40	34	29	27	24	NOT	5
2.00	4.000	1.000	.500	20	60	47	50	9.11	4	5/8- 11	4.750	3.625	.438	6.000	.375	6.875	8.125	72	61	46	40	34	29	27	24		9
2.50	4.600	0.980	.510	20	116	319	285	10.08	4	5/8- 11	5.500	4.125	.500	7.000	.375	8.125	9.375	62	56	42	36	30	26	22	22	DESIGNED	11
3.00	5.000	1.000	.500	20	55	60	170	16.91	4	5/8- 11	6.000	5.000	.500	7.500	.375	8.750	10.000	72	61	46	40	34	29	27	24		14
4.00	5.250	1.250	.625	20	72	60	80	25.40	8	5/8- 11	7.500	6.188	.625	9.000	.375	9.875	11.125	72	61	46	40	34	29	27	24		20
5.00	6.000	1.250	.625	20	140	388	400	32.33	8	3/4- 10	8.500	7.313	.750	10.000	.500	11.500	13.000	62	56	42	36	30	26	22	22	FOR	26
6.00	6.000	1.250	.625	20	190	130	195	50.24	8	3/4- 10	9.500	8.500	.750	11.000	.500	12.500	14.000	72	61	46	40	34	29	27	24		31
8.00	8.000	1.250	.625	20	304	388	457	76.07	8	3/4- 10	11.750	10.625	.938	13.500	.500	14.750	16.250	48	42	34	30	26	22	22	22		49
10.00	8.750	1.250	.625	20	458	388	457	128.55	12	7/8- 9	14.250	12.750	1.000	16.000	.500	17.500	19.000	48	42	34	30	26	22	22	22	VACUUM	64
12.00	9.000	1.375	.688	20	529	445	457	144.72	12	7/8- 9	17.000	15.000	1.000	19.000	.625	20.500	22.000	48	42	34	30	26	22	22	22		88
14.00	12.790	1.375	.688	20	203	371	514	233.59	12	1- 8	18.750	16.250	1.188	21.000	1.420	24.172	27.313	48	42	34	30	26	22	22	22		143
16.00	13.500	1.625	1.000	20	180	383	514	259.68	16	1- 8	21.250	18.500	1.188	23.500	1.420	27.563	31.500	48	42	34	30	26	22	22	22	SERVICE	179
20.00	20.470	1.625	1.000	20	185	371	571	374.57	20	1 1/8- 8	25.000	23.000	1.188	27.500	1.420	31.500	35.438	48	42	34	30	26	22	22	22		243

NOTES: 1. Movements are non-concurrent and based from Neutral Length with Limit Bolts installed.
2. Spring Rate Capability is based on 1" of movement at zero pressure conditions.
3. Style 445-BD is not designed for Vacuum Service.

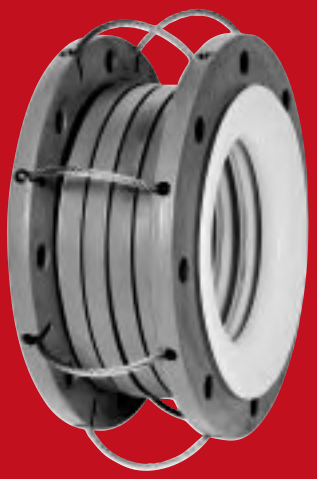




SERIES 445-BD MATERIALS OF CONSTRUCTION		
DESCRIPTION	1" THROUGH 12"	14" THROUGH 20"
BELLOWS	PTFE T-62	PTFE T-62
FLANGES	DUCTILE IRON	ZINC PLATED CARBON STEEL
REINFORCING RINGS	STAINLESS STEEL	STAINLESS STEEL
LIMIT BOLTS	CARBON STEEL	CARBON STEEL
NUTS	CARBON STEEL	CARBON STEEL
GROMMETS	NEOPRENE	NEOPRENE
WASHERS	CARBON STEEL	CARBON STEEL

PROCO™

STYLE 445-E

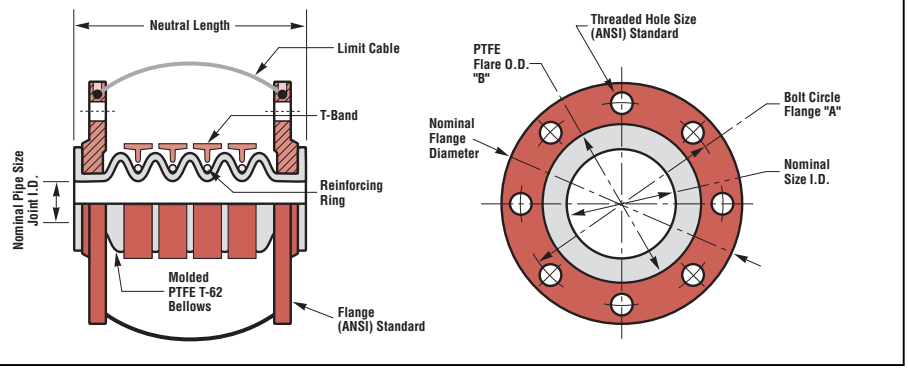


molded PTFE expansion joints

Table 6: Sizes • Movements • Spring Rates • Flange Standards • Temperatures • Vacuum • Weights

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON FIVE CONVOLUTION DESIGN [1]			SPRING RATE CAPABILITY [2]				EXPANSION JOINT FLANGE DRILLING						PRESSURE AT TEMPERATURE (PSIG) @ °F								VACUUM RATING [3]	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	COMPRESSION SPRING RATE	EXTENSION SPRING RATE	LATERAL SPRING RATE	THRUST FACTOR	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	PTFE FLARE O.D. "B"	FLANGE THICKNESS	NOMINAL FLANGE O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB_f/IN	LB_f/IN	LB_f/IN																	
1.00	3.500	0.844	.625	39	50	110	50	2.81	4	1/2- 13	3.125	2.000	.438	4.250	72	61	46	40	34	29	27	24	NOT	3
1.50	3.625	0.875	.656	32	75	80	50	5.09	4	1/2- 13	3.875	2.875	.469	5.000	72	61	46	40	34	29	27	24	DESIGNED	7
2.00	3.750	0.875	.656	29	60	50	50	9.11	4	5/8- 11	4.750	3.625	.484	6.000	72	61	46	40	34	29	27	24	FOR	10
3.00	4.375	1.031	.781	25	55	60	170	16.91	4	5/8- 11	6.000	5.000	.578	7.500	72	61	46	40	34	29	27	24	VACUUM	16
4.00	4.563	1.094	.813	21	70	60	80	25.40	8	5/8- 11	7.500	6.188	.578	9.000	72	61	46	40	34	29	27	24	SERVICE	23
6.00	5.031	1.188	.906	17	190	130	195	50.24	8	3/4- 10	9.500	8.500	.641	11.000	72	61	46	40	34	29	27	24		34

NOTES: 1. Movements are non-concurrent and based from Neutral Length with Limit Cables installed.
2. Spring Rate Capability is based on 1" of movement at zero pressure conditions.
3. Style 445-E is not designed for Vacuum Service.



SERIES 445-E MATERIALS OF CONSTRUCTION	
DESCRIPTION	**1" THROUGH 6"**
BELLOWS	PTFE T-62
FLANGES	DUCTILE IRON
REINFORCING RINGS	STAINLESS STEEL
T-BANDS	CARBON STEEL
LIMIT CABLES	MIL-W-8342

PROCO™

STYLE 440-BE

molded PTFE expansion joints

(440-E Neutral Lengths with 440-BD Limit Bolts)

Table 7: Sizes • Movements • Spring Rates • Flange Standards • Temperatures • Vacuum • Weights

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES [1]			SPRING RATE CAPABILITY [2]				EXPANSION JOINT FLANGE DRILLING									PRESSURE AT TEMPERATURE (PSIG) @ °F								VACUUM RATING [3]	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	COMPRESSION SPRING RATE	EXTENSION SPRING RATE	LATERAL SPRING RATE	THRUST FACTOR	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	PTFE FLARE O.D. "B"	FLANGE THICKNESS	NOMINAL FLANGE O.D.	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "C"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB_f/IN	LB_f/IN	LB_f/IN																				
Style 442-BE — *442-E Neutral Lengths with 442-BD Limit Bolts*																											
1.00	1.750	0.344	.125	7	140	144	120	2.76	4	1/2- 13	3.125	2.000	.438	4.250	.250	5.125	6.000	185	170	148	130	115	100	84	68	29.9" @ 425°F	2
1.50	1.813	0.344	.125	7	240	200	240	4.60	4	1/2- 13	3.875	2.875	.469	5.000	.250	5.875	6.750	185	170	148	130	115	100	84	68	29.9" @ 425°F	2
2.00	1.875	0.344	.125	7	430	350	440	7.07	4	5/8- 11	4.750	3.625	.484	6.000	.375	6.875	8.125	185	170	148	130	115	100	84	68	29.9" @ 425°F	7
3.00	2.188	0.406	.188	7	650	320	350	15.90	4	5/8- 11	6.000	5.000	.578	7.500	.375	8.750	10.000	185	170	148	130	115	100	84	68	29.9" @ 425°F	10
4.00	2.281	0.438	.250	7	360	280	630	23.75	8	5/8- 11	7.500	6.188	.578	9.000	.375	9.875	11.125	185	170	148	130	115	100	84	68	29.9" @ 400°F	18
6.00	2.531	0.469	.250	7	460	350	720	50.24	8	3/4- 10	9.500	8.500	.641	11.000	.500	12.500	14.000	185	170	148	130	115	100	84	68	29.9" @ 400°F	29
8.00	2.750	0.531	.250	7	300	230	800	81.48	8	3/4- 10	11.750	10.625	.688	13.500	.500	14.750	16.250	164	150	129	112	100	87	73	60	29.9" @ 250°F	47
10.00	2.969	0.563	.250	6	1280	870	1000	108.38	12	7/8- 9	14.250	12.750	0.734	16.000	.500	17.500	19.000	164	150	129	112	100	87	73	60	29.9" @ 250°F	64
12.00	3.094	0.594	.250	5	380	240	1000	176.63	12	7/8- 9	17.000	15.000	0.813	19.000	.625	20.500	22.000	70	59	48	40	35	30	26	22	29.9" @ 75°F	115
Style 443-BE — *443-E Neutral Lengths with 443-BD Limit Bolts*																											
1.00	2.313	0.500	.250	14	130	130	260	2.81	4	1/2- 13	3.125	2.000	.438	4.250	.250	5.125	6.000	138	126	107	90	76	64	53	45	29.9" @ 400°F	2
1.50	2.406	0.531	.250	12	80	70	110	5.09	4	1/2- 13	3.875	2.875	.469	5.000	.250	5.875	6.750	138	126	107	90	76	64	53	45	29.9" @ 400°F	4
2.00	2.500	0.531	.375	12	70	80	160	9.11	4	5/8- 11	4.750	3.625	.484	6.000	.375	6.875	8.125	138	126	107	90	76	64	53	45	29.9" @ 400°F	8
3.00	2.906	0.625	.500	10	140	160	190	16.91	4	5/8- 11	6.000	5.000	.578	7.500	.375	8.750	10.000	138	126	107	90	76	64	53	45	29.9" @ 400°F	13
4.00	3.063	0.656	.500	10	220	160	190	25.40	8	5/8- 11	7.500	6.188	.578	9.000	.375	9.875	11.125	138	126	107	90	76	64	53	45	29.9" @ 400°F	19
6.00	3.375	0.719	.563	9	350	190	540	50.24	8	3/4- 10	9.500	8.500	.641	11.000	.500	12.500	14.000	138	126	107	90	76	64	53	45	29.9" @ 300°F	30
8.00	3.656	0.781	.563	9	450	170	750	81.48	8	3/4- 10	11.750	10.625	.688	13.500	.500	14.750	16.250	120	110	94	80	67	57	47	38	29.9" @ 125°F	48
Style 445-BE — *445-E Neutral Lengths with 445-BD Limit Bolts*																											
1.00	3.500	0.844	.500	20	50	110	50	2.81	4	1/2- 13	3.125	2.000	.438	4.250	.250	5.125	6.000	72	61	46	40	34	29	27	24	*NOT DESIGNED FOR VACUUM SERVICE*	2
1.50	3.625	0.785	.500	20	75	80	50	5.09	4	1/2- 13	3.875	2.875	.469	5.000	.250	5.875	6.750	72	61	46	40	34	29	27	24		5
2.00	3.750	0.875	.500	15	60	50	50	9.11	4	5/8- 11	4.750	3.625	.484	6.000	.375	6.875	8.125	72	61	46	40	34	29	27	24		9
3.00	4.375	1.031	.500	17	55	60	170	16.91	4	5/8- 11	6.000	5.000	.578	7.500	.375	8.750	10.000	72	61	46	40	34	29	27	24		14
4.00	4.563	1.094	.625	15	70	60	80	25.40	8	5/8- 11	7.500	6.188	.578	9.000	.375	9.875	11.125	72	61	46	40	34	29	27	24		20
6.00	5.031	1.188	.625	15	190	130	195	50.24	8	3/4- 10	9.500	8.500	.641	11.000	.500	12.500	14.000	72	61	46	40	34	29	27	24		31

NOTES: 1. Movements are non-concurrent and based from Neutral Length with Limit Bolts installed.
2. Spring Rate Capability is based on 1" of movement at zero pressure conditions.
3. Vacuum Rating is based from fully extended position. Style 445-BE is not designed for Vacuum Service.

PROCO STYLE NUMBER:	STYLE 440-BE MATERIALS OF CONSTRUCTION						
	BELLOWS	FLANGES	REINFORCING RINGS	LIMIT BOLTS	NUTS	GROMMETS	WASHERS
442-BE — 1" THROUGH 12" 443-BE — 1" THROUGH 8" 445-BE — 1" THROUGH 6"	PTFE T-62	DUCTILE IRON	STAINLESS STEEL	CARBON STEEL	CARBON STEEL	NEOPRENE	CARBON STEEL

Installation Instructions for Series 440 PTFE Expansion Joints

TORQUE TABLE LISTING

SIZE I.D. (IN)	1.0	1.25	1.5	2.0	2.5	3.0	4.0	5.0	6.0	8.0	10.0	12.0
TORQUE (FT/LBS)	10	16	25	52	47	82	54	80	100	135	125	155
TOLERANCE (+/-)(FT/LBS)	2	3	6	13	11	20	13	20	24	32	31	38

Notes: 1. Bolt Torque requirements may vary depending on mating flange material and installation.
2. "Over-Torque" may cause the PTFE material to creep.

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: PROCO Series 440 PTFE 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 Bolt/Cable: Limit bolts and cables 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 bolt/cable settings.

4. Anchoring: Solid anchoring is required whenever the pipeline changes direction. PROCO Series 440 PTFE 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 bolts/cables 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 spray shields be used for all hazardous service to protect against serious personal injury in the event of expansion joint failure. (Contact PROCO for spray shield information.)

7. Installation:

a. Store expansion joints with wood 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.

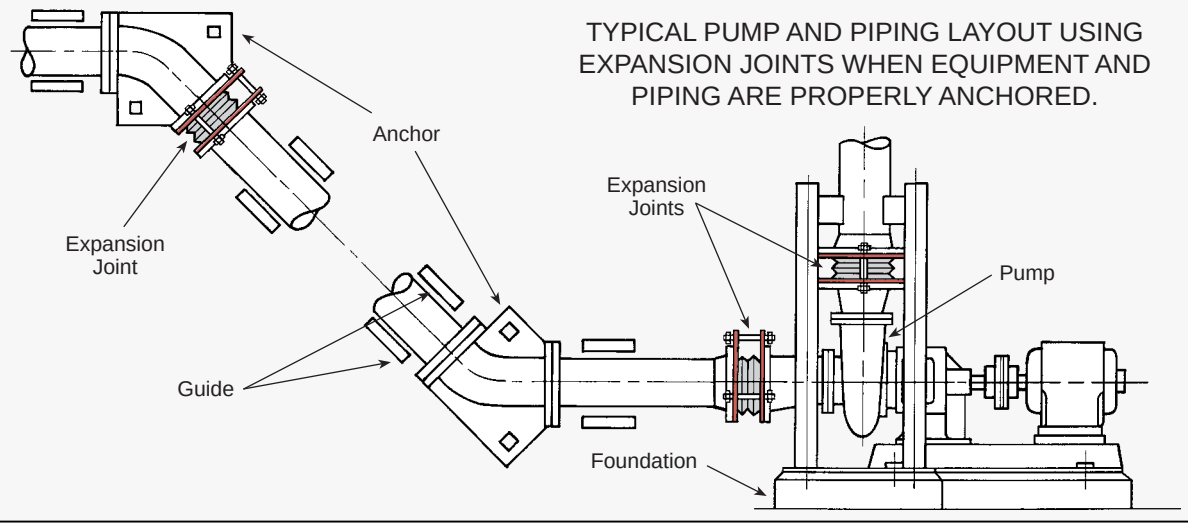
c. Install the PROCO Series 440 PTFE expansion joints to the prescribed neutral lengths. If expansion joints are used in high temperature processes, it is recommended that units be installed at/near the extended values. For cold process installations, expansion joints should be installed in a nearly compressed length. These settings will enable the expansion joint to realize full travel capabilities. (See appropriate Tables for Neutral Lengths.)

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_f), **P** is the system operating pressure (Psig) and T_1 is the thrust factor (or bellows effective area [in^2]). The pressure thrust, T_p, will act in the axial direction and must be added to the axial spring force **(Fx•Δx)** to give the total axial reaction force, **Rx**.

$$Rx = T_p + (Fx \cdot \Delta x)$$

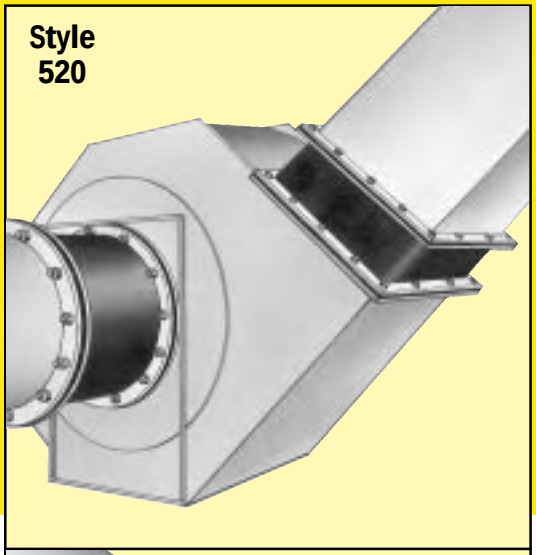
Rx is the pipe support reaction force (lb_f), T_p is the pressure thrust (lb_f), **Fx** is the axial spring force of the unit and **Δx** is the expected or designed axial movement of the unit (See Tables 1-6).

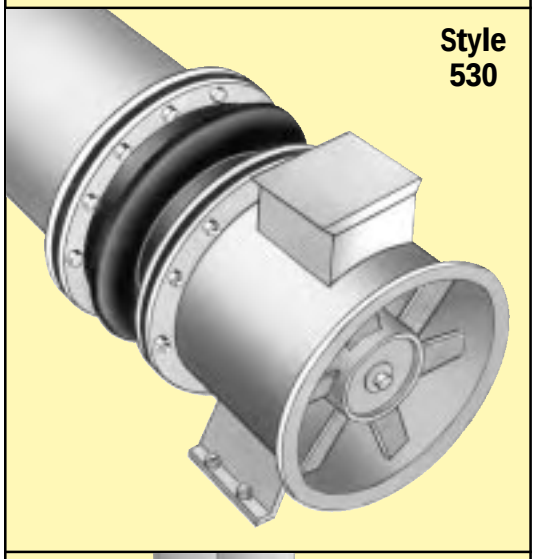
2. It should be noted that axial spring rate values found in Tables 1 through 6 are based on an ambient temperature (70°F) and will decrease as the system temperature rises. In addition, spring rates decrease over time due to thermoplastic creep if units are operated under pressure.

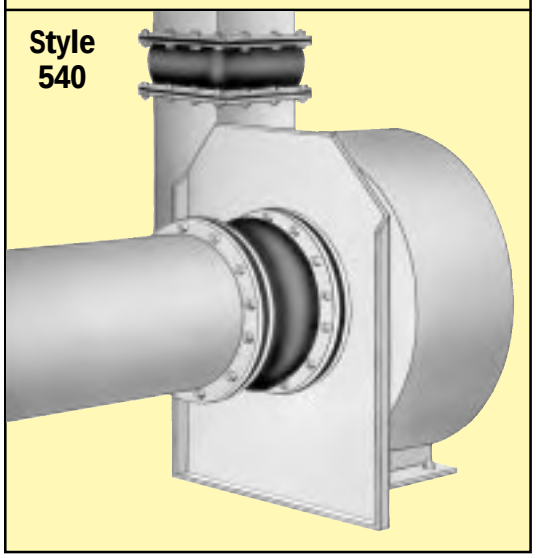
PROCO™

SERIES 500

non-metallic flexible fan connectors







The PROCO Series 520, Series 530, and Series 540 non-metallic connectors are designed to match inlet and outlet flanges of most industrial fan manufacturers and are found in: Ventilating Systems, Industrial Process Ducting Systems, Chemical-Petrochemical Plants, Power Generating Plants, Pulp/Paper Plants, Water-Waste Water Sewage and Odor Control Ducting Systems. Specify the PROCO Series 520, Series 530 and Series 540 non-metallic connectors for installation between anchor points or next to mechanical equipment such as: Fans, Blowers, Compressors and Hot Air Ducts. The PROCO Series 500 non-metallic flexible connectors are designed to: (1) Absorb Ducting Movements, (2) Reduce System Noise, (3) Isolate Vibration, (4) Compensate Alignment/ Offset. Our history in the manufacture of expansion joint products dates back to 1930. When an engineered solution is needed to solve a ducting problem, call PROCO.

Engineered For Your Application: The PROCO Series 500 non-metallic connectors are available in U-Designs, Arch-Designs and W-Designs. Each style offers different movement and pressure ratings to fit required specification. Available styles include:

- **Style 520:** Known as a U-Type, this integrally flanged non-metallic connector is found in applications where large movements are required and where vibration and sound absorption are needed. This non-metallic fan connector can be manufactured in both round and rectangular shapes.
- **Style 530:** Known as an Arch-Type, this integrally flanged non-metallic connector is found in applications where large movements and short overall lengths are required. Primarily used for Clean Hot Air/Gas Service, the Style 530 is designed with a high profile molded arch, giving it exceptional movement capabilities. This non-metallic connector can be manufactured in both round and rectangular shapes.
- **Style 540:** Known as a W-Type, this integrally flanged non-metallic connector is found in applications where large movements are required for Standard Hot Air/Gas Service. The Style 540 is designed with a molded radius allowing for greater movement capability and should be used when the U-Type (520) does not meet movement specifications. This non-metallic connector can be manufactured in both round and rectangular shapes.
- **Other Styles Available From PROCO Include:** Style 501 (Flat Belt Type), Style 502 (Flat Belt Arch-Type) and 190-K Navy Fan Connector (U-Type or Arch-Type). These styles are included in this brochure.

Retaining Rings/Backing Bars. Retaining rings (round) or backing bars (rectangular) are required for Series 500 non-metallic connectors and can be furnished by PROCO upon request. Standard construction calls for 2" wide by 3/8" thick carbon steel bars drilled to customer specifications. Other materials of construction can be provided upon request. In addition, PROCO can also supply T-Bolt Latch Clamps for round applications under 20" ID.

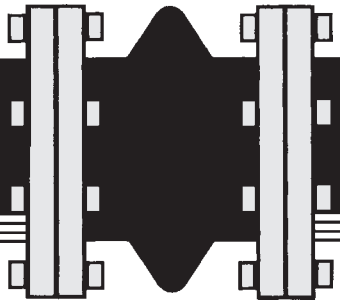
Available Fabric Materials. PROCO can manufacture the Series 500 non-metallic connectors in a wide selection of materials which include Chlorobutyl, Neoprene, Hypalon®, EPDM and Viton®. Material selection is dependent upon application. Consult the PROCO "Chemical to Elastomer Guide" (available upon request) for appropriate selection of materials.

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

Toll-Free Phone . . . . . 800 / 344-3246 USA/CANADA
International Calls . . . . . 209 / 943-6088
Fax . . . . . 209 / 943-0242
E-mail . . . . . sales@procoproducts.com
Web Site . . . . . www.procoproducts.com

Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

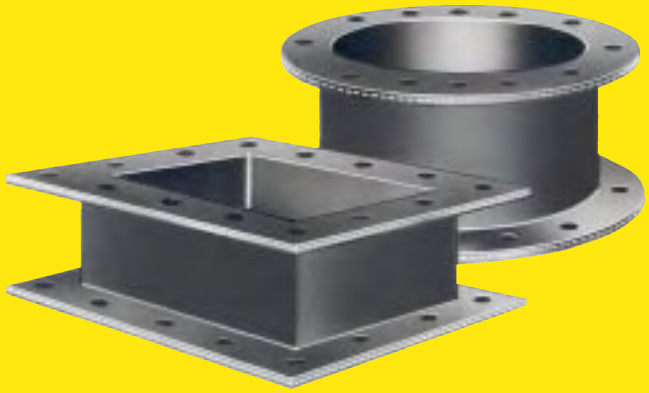
The Expansion Joint People



Protecting Ducting And Equipment Systems From Stress/Motion

PROCO™

STYLE 520

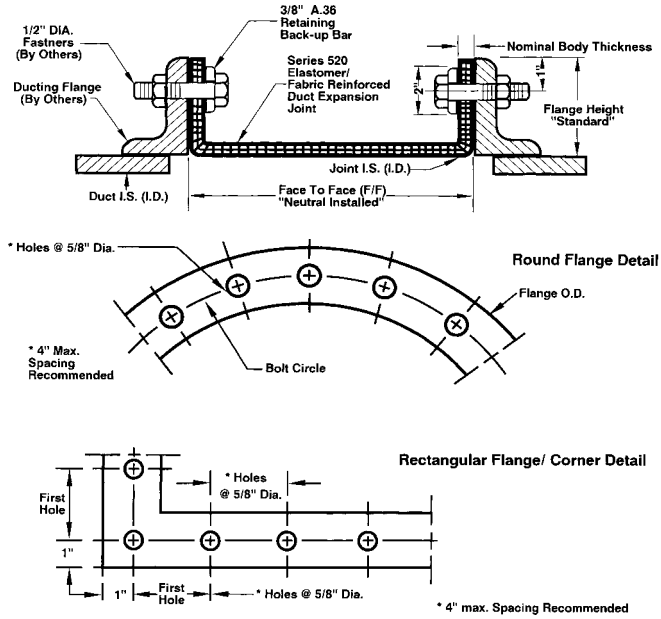


U-DESIGN for standard movements

PROCO Style 520 U-Type Fan/Duct Connectors: The most economical of the integrally flanged designs, the Style 520 is predominately used for fan vibration applications. The fan/duct connector is manufactured in a U-Design configuration with a minimum of one (1) to two (2) plies of reinforced fabric vulcanized into a homogeneous product that is 3/16", 1/4" or 3/8" thick. The Style 520 is manufactured with continuous corners. No splices will be made in the corner areas. Listed below is information regarding the Style 520 non-metallic fan/duct connectors:

System Design Considerations: In designing the Series 500, Style 520 non-metallic fans/duct connector, several considerations must be taken into account to ensure long lasting service.

- **System Media:** The designer and/or requesting party should define the system media to determine the correct elastomer for each application. Evaluation of the gas/air composition should be made during design of the non-metallic fan/duct connector. Abrasion characteristics and external environment conditions should also be taken into account when specifying the fabric element.
- **System Temperature:** The system operating temperature is of primary importance to the design of a non-metallic fan/duct connector, although the systemdesign is generally specified. It is important to distinguish between operating and design as "design" can include a significant safety factor which may result in an upgraded material or design selection.
- **System Pressure:** Normal operating pressures and maximum pressures (positive and negative) under upset conditions should be specified. Combinations of pressures and temperatures should be specifically identified.
- **Movements:** Movements consist of thermal growth resulting from both operating and upset conditions. Individual movements resulting from both conditions should be specified. Maximum installation misalignment should also be taken into account to determine if the non-metallic fan/duct connector design is capable of reacting to a combination of the total maximum movements.



Style 520 Available Materials

For Specific Elastomer Recommendations, See: PROCO™ "Chemical To Elastomer Guide"

Styles	PROCO Material Code	Elastomer	Nominal Body Thickness	No. of Reinforcement Plies	Maximum Operating Temp °F	Maximum Pressure Rating (PSI)
520	BB	Chlorobutyl	3/16"	1	300°	±2
	EE	EPDM			300°	
	HH	Hypalon®	1/4"	2	225°	±3
	NH	Neoprene/Hypalon®			225°	
	NN	Neoprene	3/8"	2	212°	±5
	NP	Neoprene/Buna-N			212°	
	VV	Viton®			400°	

NOTES:
1. Hypalon and Viton are registered trademarks of DuDont Dow Elastomers
2. Expansion Joint "Cover" (outside) can be Hypalon painted on special order.
3. Standard fabric reinforcement is polyester. Other high temperature materials are available upon request.
4. For vacuum applications, all fabric elements should retain sufficient setback from the duct to ensure that belting does not protrude into the flow stream.

Non-Metallic Fan/Duct Connector Weight
(pounds per square foot of periphery)

Nominal Body Thickness	Elastomers							Retaining Rings/Bars Linear/Foot
	Chloro-butyl	EPDM	Hypalon®	Neoprene/ Hypalon®	Neoprene	Neoprene/ Buna-N	Viton®	
1/4"	1.6	1.6	1.8	1.8	1.8	1.8	2.5	3.5
3/8"	2.5	2.5	2.6	2.6	2.6	2.6	4.8	

Maximum Movement Capabilities

6" Face To Face			9" Face To Face			12" Face To Face		
Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)	Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)	Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)
.75	.25	.50	1.25	.25	.75	2.0	.50	1.0

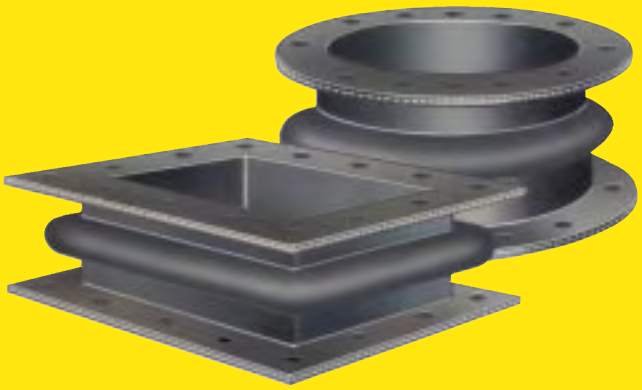
NOTES:
1. Lateral Offsets shown above are based on movements prior to axial compression. Greater lateral offset may be obtained if the fan/duct connector encounters simultaneous compression.
2. Axial extension may be increased by pre-compression of the fan/duct connector during installation. any pre-compression of the fan/duct connector will equally reduce the rated axial compression movement.

Design Data Sheet Fan/Duct Connector - Style 520

Item	Tag No.:	
	Quantity:	
Application	Equipment Adjacent The Connector:	
	Media: Gas or Air (circle one)	G A
	Location of Joint: (Inlet, Discharge, Bypass)	
Size	Duct I.S. or Diameter:	
	Face To Face:	IN.
Temperature	Operating:	°F
	Design:	°F
Pressure	Operating:	PSI
	Design:	PSI
Movements	Axial Compression:	IN.
	Axial Extension:	IN.
	Lateral Offset:	IN.

PROCO™

STYLE 530

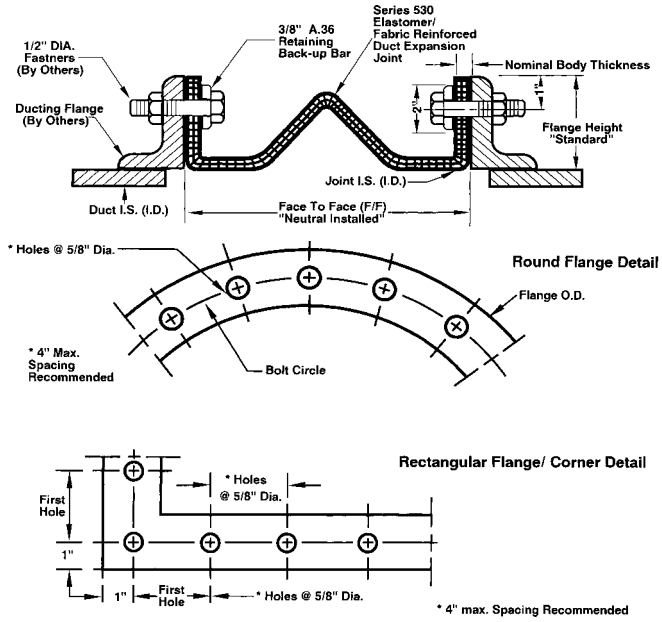


ARCH-DESIGN for ultra high movements

PROCO Style 530 Arch-Type Duct Connectors: The least economical of the integrally flanged designs, the Style 530 is predominately used for applications where movements are large and face-to-face space is a premium.The duct connector is manufactured in an Arch-Design configuration with a minimum of one (1) to two (2) plies of reinforced fabric vulcanized into a homogeneous product that is 3/1/6", 1/4" or 3/8" thick. The flanges shall be an integral part of the expansion joint. The Style 530 is manufactured with a premolded arch. The arch continues through the corner and straight sections and shall be fully developed when in the neutral installation position. Listed below is information regarding the Style 530 non-metallic duct connectors:

System Design Considerations: In designing the Series 500, Style 530 non-metallic duct connector, several considerations must be taken into account to ensure long lasting service.

- **System Media:** The designer and/or requesting party should define the system media to determine the correct elastomer for each application. Evaluation of the gas/air composition should be made during design of the non-metallic fan/duct connector. Abrasion characteristics and external environment conditions should also be taken into account when specifying the fabric element.
- **System Temperature:** The system operating temperature is of primary importance to the design of a non-metallic fan/duct connector, although the system design is generally specified. It is important to distinguish between operating and design as "design" can include a significant safety factor which may result in an upgraded material or design selection.
- **System Pressure:** Normal operating pressures and maximum pressures (positive and negative) under upset conditions should be specified. Combinations of pressures and temperatures should be specifically identified.
- **Movements:** Movements consist of thermal growth resulting from both operating and upset conditions. Individual movements resulting from both conditions should be specified. Maximum installation misalignment should also be taken into account to determine if the non-metallic fan/duct connector design is capable of reacting to a combination of the total maximum movements.



Style 530 Available Materials

For Specific Elastomer Recommendations, See: PROCO™ "Chemical To Elastomer Guide"

Styles	PROCO Material Code	Elastomer	Nominal Body Thickness	No. of Reinforcement Plies	Maximum Operating Temp °F	Maximum Pressure Rating (PSI)
530	BB	Chlorobutyl	3/16"	1	300°	±2
	EE	EPDM			300°	
	HH	Hypalon®			225°	
	NH	Neoprene/Hypalon®	1/4"	2	225°	±3
	NN	Neoprene			212°	
	NP	Neoprene/Buna-N	3/8"	2	212°	±5
	VV	Viton®			400°	

NOTES:
1. Hypalon and Viton are registered trademarks of DuDont Dow Elastomers
2. Expansion Joint "Cover" (outside) can be Hypalon painted on special order.
3. Standard fabric reinforcement is polyester. Other high temperature materials are available upon request.
4. For vacuum applications, all fabric elements should retain sufficient setback from the duct to ensure that belting does not protrude into the flow stream.

Non-Metallic Fan/Duct Connector Weight
(pounds per square foot of periphery)

Nominal Body Thickness	Elastomers							Retaining Rings/Bars Linear/Foot
	Chloro-butyl	EPDM	Hypalon®	Neoprene/ Hypalon®	Neoprene	Neoprene/ Buna-N	Viton®	
1/4"	1.6	1.6	1.8	1.8	1.8	1.8	2.5	3.5
3/8"	2.5	2.5	2.6	2.6	2.6	2.6	4.8	

Maximum Movement Capabilities

6" Face To Face			9" Face To Face			12" Face To Face		
Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)	Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)	Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)
2.25	1.25	1.25	2.75	1.5	1.5	3.5	2.0	2.0

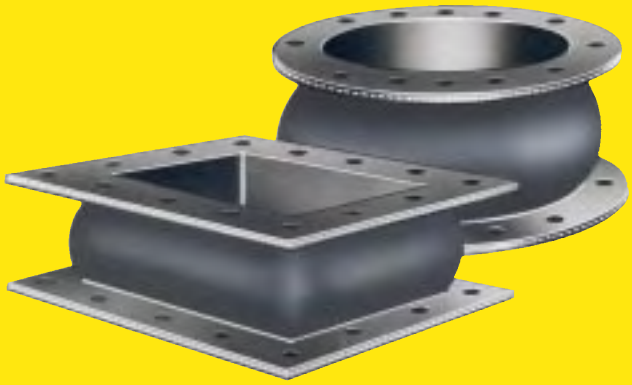
NOTES:
1. Lateral Offsets shown above are based on movements prior to axial compression. Greater lateral offset may be obtained if the fan/duct connector encounters simultaneous compression.
2. Axial extension may be increased by pre-compression of the fan/duct connector during installation. any pre-compression of the fan/duct connector will equally reduce the rated axial compression movement.

Design Data Sheet Fan/Duct Connector - Style 530

Item	Tag No.:	
	Quantity:	
Application	Equipment Adjacent The Connector:	
	Media: Gas or Air (circle one)	G A
	Location of Joint: (Inlet, Discharge, Bypass)	
Size	Duct I.S. or Diameter:	
	Face To Face:	IN.
Temperature	Operating:	°F
	Design:	°F
Pressure	Operating:	PSI
	Design:	PSI
Movements	Axial Compression:	IN.
	Axial Extension:	IN.
	Lateral Offset:	IN.

PROCO™

STYLE 540

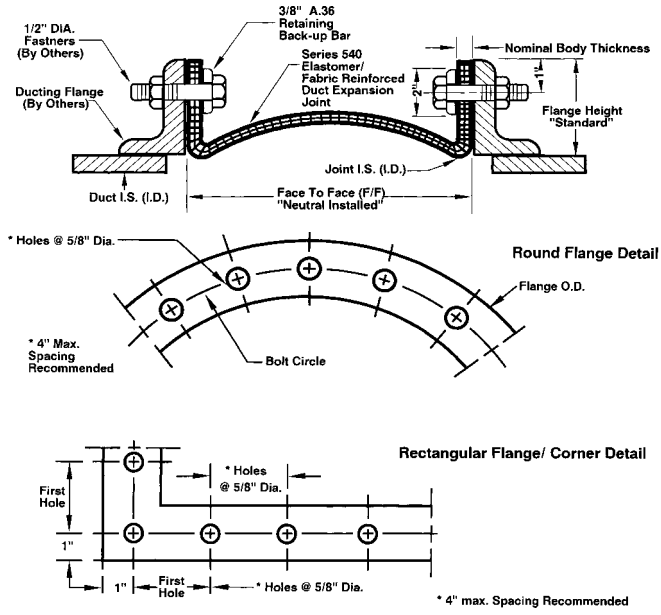


W-DESIGN for maximum movements

PROCO Style 540 W-Type Duct Connectors: An economical integrally flanged design, the Style 540 is predominately used for applications where there are large movements. The duct connector is manufactured in a W-Design configuration with a minimum of one (1) to two (2) plies of reinforced fabric vulcanized into a homogeneous product that is 3/16", 1/4" or 3/8" thick. The flanges shall be an integral part of the expansion joint. The Style 540 is manufactured with a premolded arch. The arch continues through the corner and shall be fully developed when in the neutral position. Listed below are considerations regarding the design of the Style 540 non-metallic duct connectors:

System Design Considerations: In designing the Series 500, Style 540 non-metallic duct connector, several considerations must be taken into account to ensure long lasting service.

- **System Media:** The designer and/or requesting party should define the system media to determine the correct elastomer for each application. Evaluation of the gas/air composition should be made during design of the non-metallic fan/duct connector. Abrasion characteristics and external environment conditions should also be taken into account when specifying the fabric element.
- **System Temperature:** The system operating temperature is of primary importance to the design of a non-metallic fan/duct connector, although the system design is generally specified. It is important to distinguish between operating and design as "design" can include a significant safety factor which may result in an upgraded material or design selection.
- **System Pressure:** Normal operating pressures and maximum pressures (positive and negative) under upset conditions should be specified. Combinations of pressures and temperatures should be specifically identified.
- **Movements:** Movements consist of thermal growth resulting from both operating and upset conditions. Individual movements resulting from both conditions should be specified. Maximum installation misalignment should also be taken into account to determine if the non-metallic fan/duct connector design is capable of reacting to a combination of the total maximum movements.



Style 540 Available Materials

For Specific Elastomer Recommendations, See: PROCO™ "Chemical To Elastomer Guide"

Styles	PROCO Material Code	Elastomer	Nominal Body Thickness	No. of Reinforcement Plies	Maximum Operating Temp °F	Maximum Pressure Rating (PSI)
540	BB	Chlorobutyl	3/16"	1	300°	±2
	EE	EPDM			300°	
	HH	Hypalon®			225°	
	NH	Neoprene/Hypalon®	1/4"	2	225°	±3
	NN	Neoprene			212°	
	NP	Neoprene/Buna-N	3/8"	2	212°	±5
	VV	Viton®			400°	

NOTES:
1. Hypalon and Viton are registered trademarks of DuDont Dow Elastomers
2. Expansion Joint "Cover" (outside) can be Hypalon painted on special order.
3. Standard fabric reinforcement is polyester. Other high temperature materials are available upon request.
4. For vacuum applications, all fabric elements should retain sufficient setback from the duct to ensure that belting does not protrude into the flow stream.

Non-Metallic Fan/Duct Connector Weight
(pounds per square foot of periphery)

Nominal Body Thickness	Elastomers							Retaining Rings/Bars Linear/Foot
	Chloro-butyl	EPDM	Hypalon®	Neoprene/ Hypalon®	Neoprene	Neoprene/ Buna-N	Viton®	
1/4"	1.6	1.6	1.8	1.8	1.8	1.8	2.5	3.5
3/8"	2.5	2.5	2.6	2.6	2.6	2.6	4.8	

Maximum Movement Capabilities

6" Face To Face			9" Face To Face			12" Face To Face		
Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)	Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)	Axial Compression (Inches)	Axial Extension (Inches)	Lateral Offset (Inches)
1.5	.50	.75	2.0	.75	1.5	3.75	1.0	2.5

NOTES:
1. Lateral Offsets shown above are based on movements prior to axial compression. Greater lateral offset may be obtained if the fan/duct connector encounters simultaneous compression.
2. Axial extension may be increased by pre-compression of the fan/duct connector during installation. any pre-compression of the fan/duct connector will equally reduce the rated axial compression movement.

Design Data Sheet Fan/Duct Connector - Style 540

Item	Tag No.:	
	Quantity:	
Application	Equipment Adjacent The Connector:	
	Media: Gas or Air (circle one)	G A
	Location of Joint: (Inlet, Discharge, Bypass)	
Size	Duct I.S. or Diameter:	
	Face To Face:	IN.
Temperature	Operating:	°F
	Design:	°F
Pressure	Operating:	PSI
	Design:	PSI
Movements	Axial Compression:	IN.
	Axial Extension:	IN.
	Lateral Offset:	IN.

PROCO™

SERIES 500

non-metallic flexible fan/duct connectors

Style 501
flat belt type

Style 502
flat belt arch-type

Style 190-K
navy fan connector

Style 501: Known as a "Flat Belt Type", this non-metallic connector is primarily used for low pressure vibration applications and can be attached to existing metal frames or duct work. The PROCO Series 500, Style 501 duct connector can be manufactured in round or rectangular shapes and can be attached to metal surfaces using clamps (round applications), or backing bars (rectangular applications). The Style 501 can be manufactured in a variety of elastomers and can be sent to the field spliced endless and/or prepared for cold field splice. See Table 1 for material considerations.

Style 502: Known as a "Flat Belt Arch-Type", this non-metallic connector is used for low pressure applications where movements are required and can be attached to existing metal frames or duct work. The PROCO Series 500, Style 502 duct connector can be manufactured in round or rectangular shapes and can be attached to metal surfaces using clamps (round applications), retaining rings (round applications), or backing bars (rectangular applications). The Style 502 Flat Belt Arch-Type can be manufactured in a variety of elastomers and can be sent to the field in an endless connection only. See Table 1 for material considerations.

Style 190-K: Known as a "Navy Fan Connector", the Style 190K is manufactured of 3/16" thick polyester fabric reinforced neoprene MIL-R-6855, Class 2, Durometer 40. The Style 190-K Navy Fan Connector can be manufactured in U-Type or Arch-Type forms depending upon application requirements. U-Type connectors can be manufactured with a minimum 3" face-to-face overall length. Arch-Type connectors can be manufactured with a minimum 6" face-to-face overall length. PROCO can manufacture the Series 500, Style 190-K in both round and rectangular shapes. If flange drilling is required for the Style 190-K Navy Fan Connectors, PROCO can drill per customer's specifications. Retaining rings and/or backing bars can be furnished (drilled or undrilled) upon request. See Table 1 for material considerations.

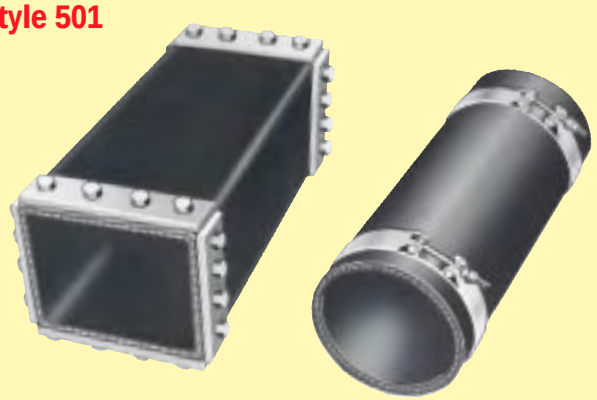
Table 1: Available Styles /Materials

For Specific Elastomer Recommendations, See: PROCO™ **"Chemical To Elastomer Guide"**

Styles	PROCO Material Code	Elastomer	Nominal Body Thickness	No. of Reinforcement Plies	Maximum Pressure Rating (PSI)
501	BB	Chlorobutyl	3/16"	1	±1
	EE	EPDM			
	HH	Hypalon®	1/4"	2	±2
	NH	Neoprene/Hypalon®			
	NN	Neoprene	3/8"	2	±2
	NP	Neoprene/Buna-N			
	VV	Viton®			
502	BB	Chlorobutyl	3/16"	1	±1
	EE	EPDM			
	HH	Hypalon®	1/4"	2	±2
	NH	Neoprene/Hypalon®			
	NN	Neoprene	3/8"	2	±2
	NP	Neoprene/Buna-N			
	VV	Viton®			
190-K	NN	Neoprene	3/16"	1	±2
	VV	Viton®			

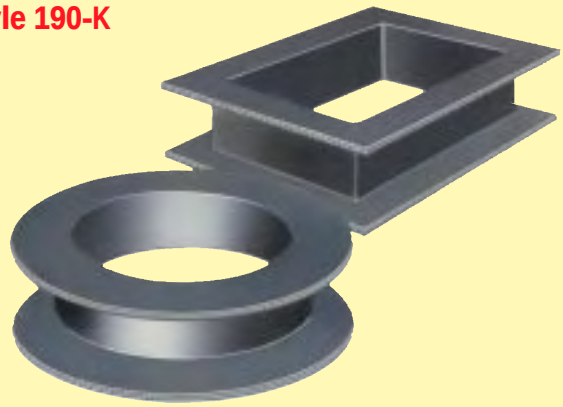
NOTES:
1. Hypalon and Viton are registered trademarks of DuDont Dow Elastomers
2. Expansion Joint "Cover" (outside) can be Hypalon painted on special order.
3. Standard fabric reinforcement is polyester. Other high temperature materials are available upon request.
4. For vacuum applications, all fabric elements should retain sufficient setback from the duct to ensure that belting does not protrude into the flow stream.

Style 501



Style 502

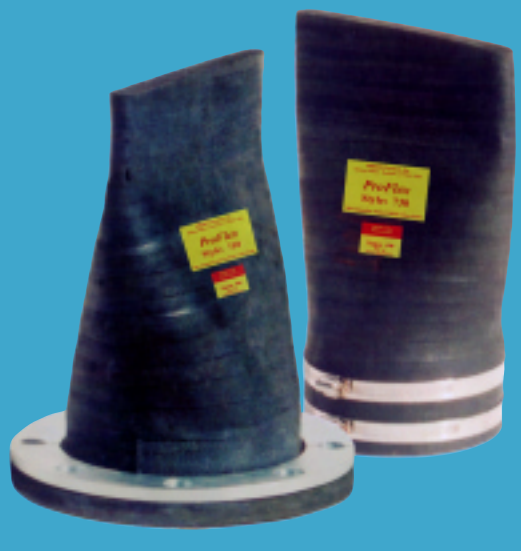
Style 190-K



PROCO™

STYLES 710/730

ProFlex rubber check valves



The PROCO Series 700 *ProFlex* Rubber Check Valve is a cost effective way to control back pressures from sewage treatment plants, outfalls and tidal operations. They are a fully passive flow device requiring neither maintenance, outside sources of power or manual assistance to operate.

The PROCO Series 700 *ProFlex* Rubber Check Valves are offered as direct replacements for ineffective and maintenance-ridden flap type check valves, which are commonly known to seize, rust and bind in unwanted positions. Unlike flap type valves, the *ProFlex* rubber check valves will handle large obstructions without jamming or having swing gates binding open. Specify the PROCO Series 700 *ProFlex* Rubber Check Valves to provide backflow protection from: (1) Sewage slurries, (2) Outfalls to ocean fronts from heavy rainfall activity, (3) Prevention from land erosion due to back flow conditions, (4) Protection from saltwater to fresh water ponds or catch basins and numerous other water based applications. Our history in the manufacture of rubber piping products dates back to 1930. When an engineered solution is needed to solve a piping or backflow problem, call PROCO.

The introduction of the PROCO Series 700 *ProFlex* Rubber Check Valves is the latest addition to the PROCO line, which has been specifically designed for the Water and Waste Water industry.

With current global awareness for clean water and the urgency to have all water treatment plants operating under stricter standards, the PROCO Series 700 *ProFlex* Rubber Check Valves will also be available in NSF61 approved Nitrile for all potable water and sewage applications. This will include water treatment plants, direct installation on potable water pump systems and other piping systems directly related to the potable water industry.

The PROCO Series 700 *ProFlex* Rubber Check Valves are available in a Flanged Type (Style 710), or a Sleeved Type (Style 730).

- **Style 710 — Flanged Type:** Designed to bolt directly to existing flanges or new installations, flanges are drilled 150# standard. Other drilling standards such as: ANSI 250/300#, British Standard BS-10, JIS, and DIN as well as square flanges are also available upon request. The Style 710 can be installed in either a vertical or horizontal application.
- **Style 730 — Sleeve Type:** Designed to easily slip over existing pipe and affixed with heavy-duty Stainless Steel clamps. The Style 730 can be installed in either a vertical or horizontal application.

Elastomers: All of the PROCO Series 700 *ProFlex* Rubber Check Valves are available in a various selection of elastomers (see Table 1 below) and back pressure capabilities to suit most applications.

The PROCO Series 700 *ProFlex* Rubber Check Valves will not freeze or deform and function solely on inlet and back pressures which will be present in most applications.

Each valve is carefully constructed using the finest of engineered materials and built by the most experienced rubber technicians in the industry. All check valves are engineered in precise detail to ensure proper operation and will provide years of unhindered operation and trouble-free service.

Benefits of the PROCO Series 700 *ProFlex* Rubber Check Valves:

- **All rubber construction resists abrasive slurries**
- **NSF61 approved materials**
- **Very quiet operation with no water hammer**
- **Unique design prevents backflow**
- **Negligible maintenance and energy costs**
- **Will not warp or freeze**
- **Quick interchange with any flap type check valve**
- **Available in sizes 1" to 96"**
- **Available with special IDs to suit concrete pipe**

For your complete project requirement PROCO also maintains the largest inventory of expansion joints in the world. Rubber, PTFE Lined, Plastic or Metal Hose — PROCO can ship the products you need when you need them! In fact, when it comes to expansion joints, **if PROCO doesn't have them in stock ... nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays ... the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

Toll-Free Phone . . . . 800 / 344-3246 USA/CANADA
International Calls . . 209 / 943-6088
Fax . . . . . 209 / 943-0242
Email . . . . . sales@procoproducts.com
Website . . . . . www.procoproducts.com

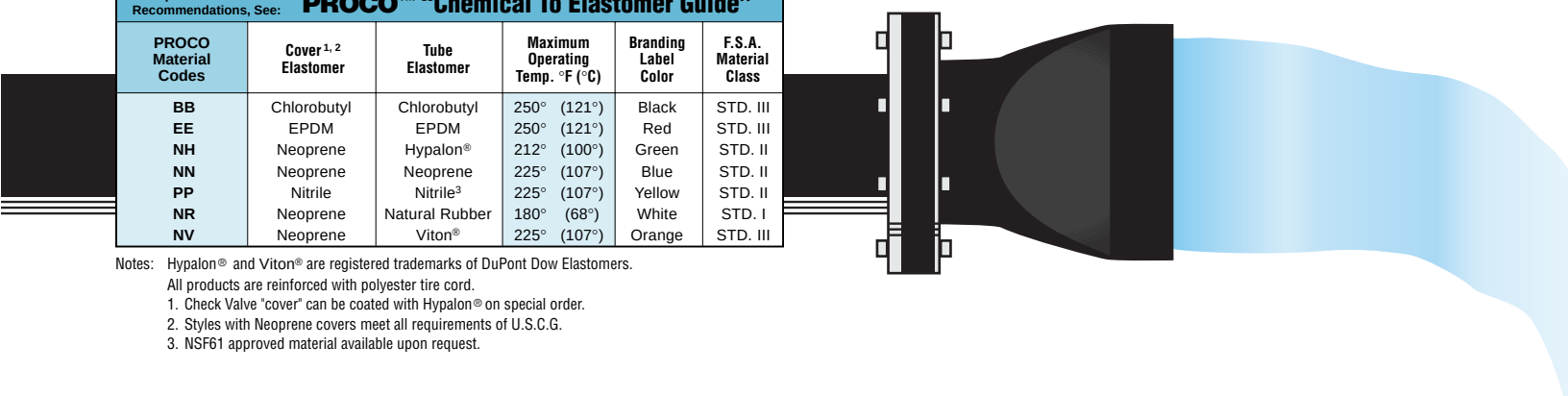
Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

Table 1: Available Materials • Temperatures

For Specific Elastomer Recommendations, See: **PROCO™ "Chemical To Elastomer Guide"**

PROCO Material Codes	Cover[1,2] Elastomer	Tube Elastomer	Maximum Operating Temp. °F (°C)	Branding Label Color	F.S.A. Material Class
BB	Chlorobutyl	Chlorobutyl	250° (121°)	Black	STD. III
EE	EPDM	EPDM	250° (121°)	Red	STD. III
NH	Neoprene	Hypalon®	212° (100°)	Green	STD. II
NN	Neoprene	Neoprene	225° (107°)	Blue	STD. II
PP	Nitrile	Nitrile[3]	225° (107°)	Yellow	STD. II
NR	Neoprene	Natural Rubber	180° (68°)	White	STD. I
NV	Neoprene	Viton®	225° (107°)	Orange	STD. III

Notes: Hypalon® and Viton® are registered trademarks of DuPont Dow Elastomers.
All products are reinforced with polyester tire cord.
1. Check Valve "cover" can be coated with Hypalon® on special order.
2. Styles with Neoprene covers meet all requirements of U.S.C.G.
3. NSF61 approved material available upon request.



PROCO™

STYLE 710

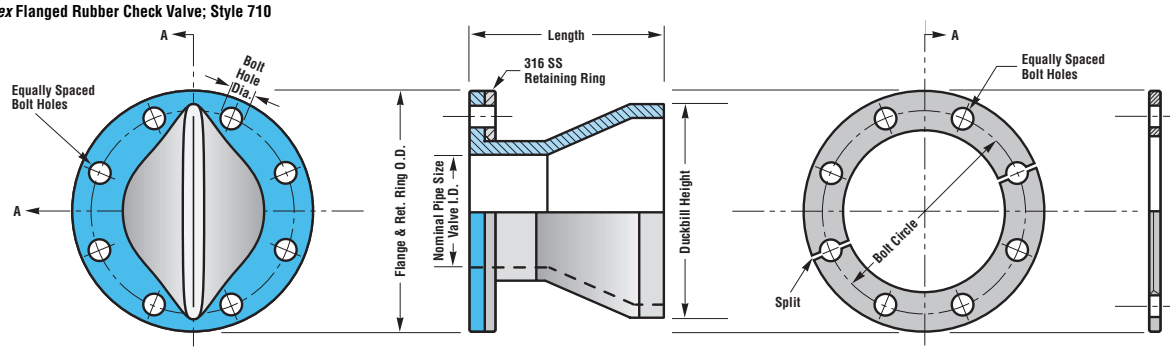
ProFlex flanged rubber check valves

Table 2: Sizes • Drilling • Weights

NOMINAL [1] PIPE SIZE Inch / (mm)		Standard Dimensions for PROCO Style 710				Standard Drilling for PROCO Style 710						WEIGHT [2] lbs / (kgs)	
		Length Inch / (mm)		Duckbill Height Inch / (mm)		Flange O.D. Inch / (mm)		Bolt Circle Inch / (mm)		No. of Holes	Size of Holes Inch / (mm)		
1	(25)	4	(102)	2.125	(54)	4.25	(107.95)	3.13	(79.50)	4	0.625	(15.9)	3 (1.4)
1.5	(40)	5	(127)	2.625	(67)	5.00	(127.00)	3.88	(98.55)	4	0.625	(15.9)	4 (1.8)
2	(50)	6.5	(165)	3.875	(99)	6.00	(152.40)	4.75	(120.65)	4	0.750	(19.1)	6 (2.7)
2.5	(65)	7.5	(191)	4.625	(118)	7.00	(177.80)	5.50	(139.70)	4	0.750	(19.1)	8 (3.6)
3	(80)	8.5	(216)	5.500	(140)	7.50	(190.50)	6.00	(152.40)	4	0.750	(19.1)	10 (4.5)
4	(100)	10	(254)	7.375	(188)	9.00	(228.60)	7.50	(190.50)	8	0.750	(19.1)	14 (6.4)
5	(125)	12	(305)	8.750	(223)	10.00	(254.00)	8.50	(215.90)	8	0.875	(22.2)	17 (7.7)
6	(150)	13	(330)	10.500	(267)	11.00	(279.40)	9.50	(241.30)	8	0.875	(22.2)	22 (10.0)
8	(200)	15	(381)	13.750	(350)	13.50	(342.90)	11.75	(298.45)	8	0.875	(22.2)	27 (12.2)
10	(250)	17	(423)	17.000	(432)	16.00	(406.40)	14.25	(361.95)	12	1.000	(25.4)	39 (17.7)
12	(300)	19	(483)	19.625	(499)	19.00	(482.60)	17.00	(431.80)	12	1.000	(25.4)	62 (28.1)
14	(350)	21	(533)	24.750	(629)	21.00	(533.40)	18.75	(476.25)	12	1.250	(31.8)	81 (36.7)
16	(400)	24	(610)	26.500	(674)	23.50	(596.90)	21.25	(539.75)	16	1.250	(31.8)	125 (56.7)
18	(450)	26	(661)	29.750	(756)	25.00	(635.00)	22.75	(577.85)	16	1.250	(31.8)	210 (95.3)
20	(500)	32	(813)	31.500	(801)	27.50	(698.50)	25.00	(635.00)	20	1.250	(31.8)	312 (141.5)
24	(600)	42	(1067)	43.000	(1093)	32.00	(812.80)	29.50	(749.30)	20	1.375	(34.9)	410 (186.0)
28	(700)	45	(1143)	46.000	(1169)	36.50	(927.10)	34.00	(863.60)	28	1.375	(34.9)	483 (219.1)
30	(750)	47	(1194)	49.000	(1245)	38.75	(984.25)	36.00	(914.40)	28	1.375	(34.9)	555 (251.7)
32	(800)	53	(1346)	51.000	(1296)	41.75	(1060.45)	38.50	(977.90)	28	1.625	(41.3)	605 (274.4)
36	(900)	58	(1473)	55.250	(1404)	46.00	(1168.40)	42.75	(1085.85)	32	1.625	(41.3)	665 (301.6)
42	(1050)	62	(1575)	66.250	(1683)	53.00	(1346.20)	49.50	(1257.30)	36	1.625	(41.3)	965 (437.7)
48	(1200)	72	(1829)	74.500	(1893)	59.50	(1511.30)	56.00	(1422.40)	44	1.625	(41.3)	1005 (455.9)
54	(1350)	74	(1880)	78.250	(1988)	66.25	(1682.75)	62.75	(1593.85)	44	2.000	(50.8)	1085 (492.1)
60	(1500)	82	(2083)	85.000	(2159)	73.00	(1854.20)	69.25	(1758.95)	52	2.000	(50.8)	1285 (582.9)
72	(1800)	98	(2489)	105.000	(2667)	86.50	(2197.10)	82.50	(2095.50)	60	2.000	(50.8)	1500 (680.4)

Notes: 1. Larger sizes available upon request.
2. Weights are approximate.

Detail of *ProFlex* Flanged Rubber Check Valve; Style 710



PROCO™

STYLE 730

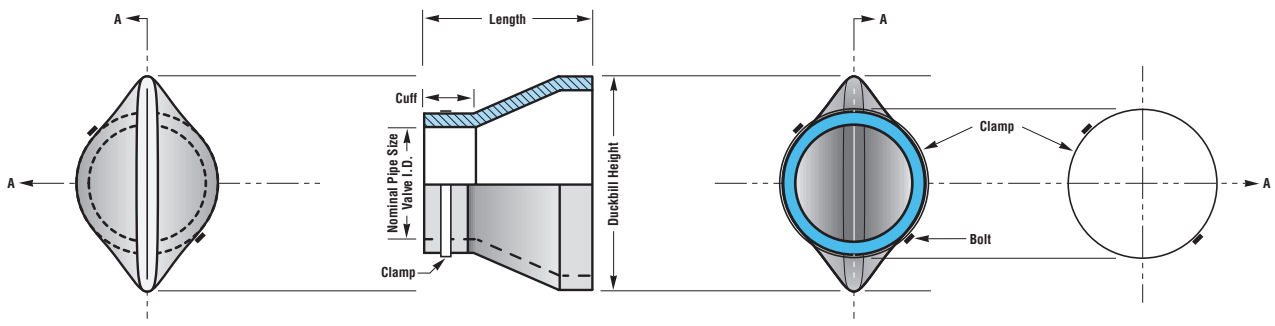
ProFlex sleeved rubber check valves

Table 3: Sizes • Weights

NOMINAL [1] PIPE SIZE Inch / (mm)		Standard Dimensions for PROCO Style 730						WEIGHT [2] lbs / (kgs)	
		Length Inch / (mm)		Collar Width Inch / (mm)		Duckbill Height Inch / (mm)			
1	(25)	4	(102)	1.000	(25)	2.125	(54)	2	(0.9)
1.5	(40)	5	(127)	1.000	(25)	2.625	(67)	4	(1.8)
2	(50)	6.5	(165)	1.500	(38)	3.875	(98)	5	(2.3)
2.5	(65)	7.5	(191)	2.000	(51)	4.625	(117)	8	(3.6)
3	(80)	8.5	(216)	3.000	(76)	5.500	(140)	11	(5.0)
4	(100)	12	(305)	3.000	(76)	7.375	(187)	12	(6.8)
5	(125)	14	(356)	3.000	(76)	8.750	(222)	15	(7.7)
6	(150)	16	(406)	4.000	(102)	10.500	(267)	19	(9.5)
8	(200)	17	(432)	4.000	(102)	13.750	(349)	22	(11.3)
10	(250)	19	(483)	4.000	(102)	17.000	(432)	35	(16.3)
12	(300)	25	(635)	6.000	(152)	19.625	(498)	54	(25.9)
14	(350)	27	(686)	6.000	(152)	24.750	(629)	69	(33.1)
16	(400)	29	(737)	6.000	(152)	26.500	(673)	115	(54.9)
18	(450)	31	(787)	6.000	(152)	29.750	(756)	190	(90.3)
20	(500)	33	(838)	8.000	(203)	31.500	(800)	295	(138.3)
24	(600)	42	(1067)	8.000	(203)	43.000	(1092)	375	(174.2)
28	(700)	44	(1118)	8.000	(203)	46.000	(1168)	455	(206.4)
30	(750)	46	(1168)	10.000	(254)	49.000	(1245)	529	(240.0)
32	(800)	53	(1346)	10.000	(254)	51.000	(1295)	583	(264.4)
36	(900)	58	(1473)	10.000	(254)	55.250	(1403)	625	(283.5)
42	(1050)	61	(1549)	12.000	(305)	66.250	(1683)	910	(412.8)
48	(1200)	72	(1829)	12.000	(305)	74.500	(1892)	952	(431.8)
54	(1350)	74	(1880)	12.000	(305)	78.250	(1988)	1025	(454.9)
60	(1500)	81	(2057)	12.000	(305)	85.000	(2159)	1212	(549.8)
72	(1800)	98	(2489)	14.000	(358)	105.000	(2667)	1362	(617.8)

Notes: 1. Larger sizes available upon request.
2. Weights are approximate.

Detail of *ProFlex* Sleeved Rubber Check Valve; Style 730



FAQs

Frequently Asked Questions to help you understand the ProFlex Rubber Check Valves

1. Does the ProFlex Rubber Check Valve have to be installed in a certain position?
Yes. It should be installed in a vertical position with the bill being the vertical. However, in zero-clearance situations the valve can be rotated up to 30° to gain bottom clearance if required.

2. Is there a preferable angle in which the ProFlex Rubber Check Valve has to be installed?
Because the valve is not reliant on any hinges, gates, or weights the *ProFlex* Rubber Check Valve can be installed in any angle from vertical to horizontal.

3. What is "Back Pressure"?
When the *ProFlex* Rubber Check Valve is submerged in a liquid it is subjected to external pressure. It is critical that the maximum depth that the valve will be submerged is specified as this will be considered the maximum back pressure to which the valve will be subjected.

4. What is the required inlet pressure to allow the valve to open?
Typically 1" to 2" of water column over back pressure will normally drain a pipe.

5. What back pressures can the ProFlex Rubber Check Valve withstand?
Back pressures are in direct relation to the size of the valve, on the smaller diameters it is acceptable to specify up to 200 psi of back pressure and on larger diameters a back pressure limitation would be approximately 12 psi. Each *ProFlex* Rubber Check Valve is manufactured to the exact inlet pressure, back pressure and flow rates which we require from you for manufacture.

6. What are the most common installations?
The *ProFlex* 710 Flanged Rubber Check Valve is bolted directly to a head wall replacing an existing flap gate. The *ProFlex* 730 Sleeved Rubber Check Valve is clamped directly to a fabricated flanged nipple or clamped directly to an existing pipe.

7. Can I use the ProFlex Rubber Check Valve on potable water applications?
Yes. One of the optional materials for the *ProFlex* Rubber Check Valves is the NSF61 approved Nitrile elastomer. Due to the large demand for clean water and potable applications, PROCO is the leading supplier of NSF61 approved material. This will eliminate the concerns commonly affiliated with contaminants or leaching of elastomers in potable water systems.

8. Can the ProFlex Rubber Check Valve be installed on an "out-of-round" pipe?
Yes, please have the approximate outside dimensions of the pipe from four (4) different angles to provide proper sizing.

9. Can river currents and ocean waves damage the valves?
In most cases river currents and ocean waves will not damage the *ProFlex* Rubber Check Valves, but if currents or waves in question are of an abnormal nature, it is suggested that side walls or rock pilings be utilized.

10. Can the ProFlex Rubber Check Valve be used as a back pressure valve?
No, the *ProFlex* Rubber Check Valves have been designed to offer superior service as a back flow preventer and should not be considered for a back pressure valve.

11. Can PROCO make a special design to suit my requirements?
In most instances the *ProFlex* Rubber Check Valve can be fabricated to suit different applications. Contact PROCO for your requirements.

12. What types of elastomers are available?
The *ProFlex* Rubber Check Valve can be manufactured and supplied to withstand almost any type of media. Most commonly supplied are Nitrile (NSF61 approved), Neoprene, Natural Rubber, Hypalon®, Chlorobutyl, EPDM, and Viton®.

13. What types of materials are available for the retaining rings and banding clamps?
ProFlex Rubber Check Valves are supplied with 316 stainless steel retaining rings and 304 stainless steel clamps as standard. Other materials are available upon request.

14. Can the ProFlex 710 be supplied with special flanges or drilling?
Yes, the standard drilling pattern is ANSI 125/150# drilling. Other drilling standards such as, ANSI 250/300#, BS-10, DIN NP-10 and DIN NP-16, JIS-5K and JIS-10K are available upon special request.

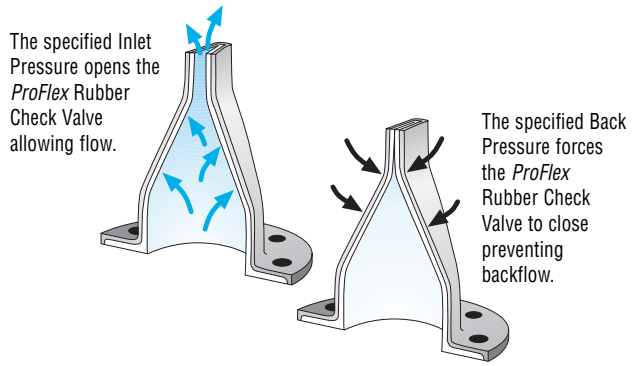
15. Can I install a ProFlex Rubber Check Valve near a residential area?
Yes, one of the unique features of the *ProFlex* Rubber Check Valve is the design of the bill section. While the bill will open and allow passage of fluid when inlet pressure is present, the bill will close and not allow children or animals to crawl inside when there is no inlet pressure. And since the *ProFlex* Rubber Check Valve is manufactured entirely of rubber compounds there is no chance of loud banging which is commonly heard from flap type valves.

16. Can I use a ProFlex Rubber Check Valve in winter conditions?
Yes, as in any installation the *ProFlex* Rubber Check Valve will not be hindered by winter or sub-zero installations. If the valve is installed in a running water application the valve will continue to operate satisfactorily, due to the elastomers' unique chemical makeup. If unusual circumstances occur the *ProFlex* Rubber Check Valve will freeze without any damage and will return to operation upon thaw.

17. Will the ProFlex Rubber Check Valve operate if buried in sand or sediment?
In normal conditions the discharge flow will create a small flow pattern which will then be followed by the flow velocity of the media. This velocity will flush the rest of the sediment away from the valve's opening.

18. What is the maximum temperature that the ProFlex Rubber Check Valve can handle?
Temperatures can range from –65° F (-54° C) to +250° F (+121° C) depending on the specified elastomer.

19. Is the ProFlex Rubber Check Valve suitable for direct sunlight and UV areas?
Yes, all *ProFlex* Rubber Check Valves are manufactured with a highly UV-resistant elastomer cover. In some applications the *ProFlex* Rubber Check Valve may be subjected to oil sludges which make Nitrile the perfect choice for protection.



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REPRESENTED BY:

PROCO™

STYLES 720/740

ProFlex™ in-line rubber check valves

The PROCO Series 700 *ProFlex* In-Line Rubber Check Valve is a cost effective way to control back pressures from sewage treatment plants, outfalls and tidal operations. They are a fully passive flow device requiring neither maintenance, outside sources of power or manual assistance to operate.

The PROCO Series 700 *ProFlex* In-Line Rubber Check Valves are offered as direct replacements for ineffective and maintenance-ridden check valves, which are commonly known to seize, rust and bind in unwanted positions. Unlike flap type valves, the *ProFlex* In-Line Rubber Check Valves will handle large obstructions without jamming or having gates binding open. Specify the PROCO Series 700 *ProFlex* In-Line Rubber Check Valves to provide backflow protection and protect pumps from: (1) Sewage slurries, (2) Outfalls to ocean fronts from heavy rainfall activity. Our history in the manufacture of rubber piping products dates back to 1930. When an engineered solution is needed to solve a piping or backflow problem, call PROCO.

With current global awareness for clean water and the urgency to have all water treatment plants operating under stricter standards, the PROCO Series 700 *ProFlex* In-Line Rubber Check Valves will also be available in NSF61 approved Nitrile for all potable water and sewage applications. This will include water treatment plants, direct installation on potable water pump systems and other piping systems directly related to the potable water industry.

The PROCO Series 700 *ProFlex* In-Line Rubber Check Valves are available in a Flanged Type (Style 720), or a Slip-In Type (Style 740).

- **Style 720 — Flanged Type:** Designed to bolt directly between two existing pipe flanges. Flanges are drilled 150# standard. Other drilling standards such as: ANSI 250/300#, British Standard BS-10, JIS, and DIN as well as square flanges are also available upon request. The Style 720 can be installed in either a vertical or horizontal application.
- **Style 740 — Slip-In Type:** Designed to easily slip into an existing pipe and affixed with a heavy-duty Stainless Steel expandable clamp. The Style 740 can be installed in either a vertical or horizontal application.

Elastomers: All of the PROCO Series 700 *ProFlex* In-Line Rubber Check Valves are available in a various selection of elastomers (see Table 1 below) and back pressure capabilities to suit most applications.

The PROCO Series 700 *ProFlex* In-Line Rubber Check Valves will not freeze or deform and function solely on inlet and back pressures which will be present in most applications.

Each valve is carefully constructed using the finest of engineered materials and built by the most experienced rubber technicians in the industry. All check valves are engineered in precise detail to ensure proper operation and will provide years of unhindered operation and trouble-free service.

Benefits of the PROCO Series 700 *ProFlex* In-Line Rubber Check Valves:

- **All rubber construction resists abrasive slurries**
- **NSF61 approved materials**
- **Very quiet operation with no water hammer**
- **Unique design prevents backflow**
- **Negligible maintenance and energy costs**
- **Will not warp or freeze**
- **Quick interchange with any type of check valve**
- **Available in sizes 1" to 72"**
- **Available to suit all type IDs**

For your complete project requirement PROCO also maintains the largest inventory of expansion joints in the world. Rubber, PTFE Lined, Plastic or Metal Hose — PROCO can ship the products you need when you need them! In fact, when it comes to expansion joints, **if PROCO doesn't have them in stock ... nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays ... the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

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International Calls . . 209 / 943-6088
Fax . . . . . 209 / 943-0242
Email . . . . . sales@procoproducts.com
Website . . . . . www.procoproducts.com

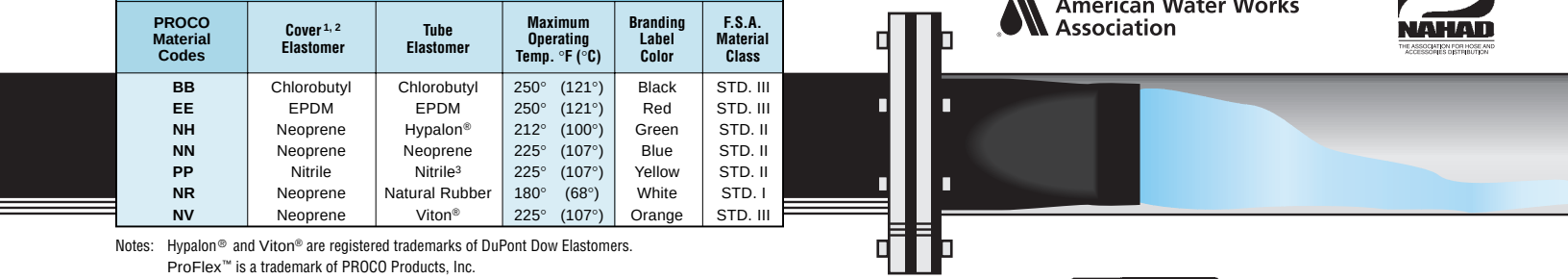
Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.

Table 1: Available Materials • Temperatures

For Specific Elastomer Recommendations, See: **PROCO™ "Chemical To Elastomer Guide"**

PROCO Material Codes	Cover[1,2] Elastomer	Tube Elastomer	Maximum Operating Temp. °F (°C)	Branding Label Color	F.S.A. Material Class
BB	Chlorobutyl	Chlorobutyl	250° (121°)	Black	STD. III
EE	EPDM	EPDM	250° (121°)	Red	STD. III
NH	Neoprene	Hypalon®	212° (100°)	Green	STD. II
NN	Neoprene	Neoprene	225° (107°)	Blue	STD. II
PP	Nitrile	Nitrile[3]	225° (107°)	Yellow	STD. II
NR	Neoprene	Natural Rubber	180° (68°)	White	STD. I
NV	Neoprene	Viton®	225° (107°)	Orange	STD. III

Notes: Hypalon® and Viton® are registered trademarks of DuPont Dow Elastomers.
ProFlex™ is a trademark of PROCO Products, Inc.
All products are reinforced with polyester tire cord.
1. Check Valve "cover" can be coated with Hypalon® on special order.
2. Styles with Neoprene covers meet all requirements of U.S.C.G.
3. NSF61 approved material available upon request.



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PROCO™ STYLE 720

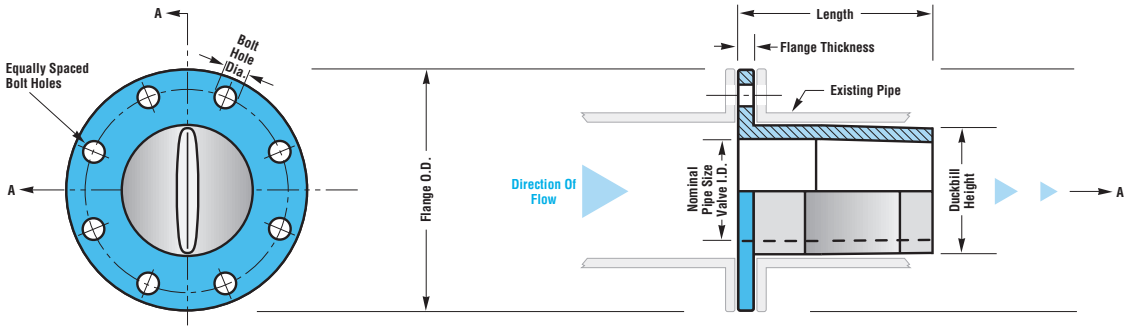
ProFlex™ in-line flanged rubber check valves

Table 2: Sizes • Drilling • Working Pressures • Weights

NOMINAL [1] PIPE SIZE Inch / (mm)		Standard Dimensions for PROCO Style 720				Standard Drilling for PROCO Style 720						MAXIMUM WORKING PRESSURE (PSIG)	WEIGHT [2] lbs / (kgs)	
		Length Inch / (mm)		Duckbill Height Inch / (mm)		Flange O.D. Inch / (mm)		Bolt Circle Inch / (mm)		No. of Holes	Size of Holes Inch / (mm)			
2	(50)	5.75	(146)	1.875	(48)	6.00	(152.40)	4.75	(120.65)	4	0.750	(19.1)	125	5 (2.3)
3	(80)	9	(229)	2.875	(73)	7.50	(190.50)	6.00	(152.40)	4	0.750	(19.1)	125	8 (3.6)
4	(100)	12	(305)	3.875	(98)	9.00	(228.60)	7.50	(190.50)	8	0.750	(19.1)	100	11 (5.0)
5	(125)	15	(381)	4.875	(124)	10.00	(254.00)	8.50	(215.90)	8	0.875	(22.2)	75	13 (5.9)
6	(150)	15.5	(394)	5.875	(149)	11.00	(279.40)	9.50	(241.30)	8	0.875	(22.2)	75	17 (7.7)
8	(200)	16.5	(419)	7.875	(200)	13.50	(342.90)	11.75	(298.45)	8	0.875	(22.2)	75	20 (9.1)
10	(250)	21	(533)	9.875	(250)	16.00	(406.40)	14.25	(361.95)	12	1.000	(25.4)	50	29 (13.2)
12	(300)	26	(660)	11.875	(302)	19.00	(482.60)	17.00	(431.80)	12	1.000	(25.4)	50	47 (21.3)
14	(350)	25	(635)	13.000	(349)	21.00	(533.40)	18.75	(476.25)	12	1.250	(31.8)	50	61 (27.7)
16	(400)	27	(686)	15.000	(400)	23.50	(596.90)	21.25	(539.75)	16	1.250	(31.8)	50	94 (42.6)
18	(450)	29	(737)	17.000	(451)	25.00	(635.00)	22.75	(577.85)	16	1.250	(31.8)	25	158 (71.7)
20	(500)	34	(864)	19.000	(502)	27.50	(698.50)	25.00	(635.00)	20	1.250	(31.8)	25	234 (106.1)
24	(600)	44	(1118)	23.000	(603)	32.00	(812.80)	29.50	(749.30)	20	1.375	(34.9)	25	308 (139.7)
28	(700)	47	(1194)	27.000	(687)	36.50	(927.10)	34.00	(863.60)	28	1.375	(34.9)	25	362 (164.2)
30	(750)	49	(1245)	29.000	(737)	38.75	(984.25)	36.00	(914.40)	28	1.375	(34.9)	25	417 (189.1)
32	(800)	54	(1372)	31.000	(787)	41.75	(1060.45)	38.50	(977.90)	28	1.625	(41.3)	25	454 (206.0)
36	(900)	59	(1499)	35.000	(889)	46.00	(1168.40)	42.75	(1085.85)	32	1.625	(41.3)	25	499 (226.3)
42	(1050)	63	(1600)	41.000	(1041)	53.00	(1346.20)	49.50	(1257.30)	36	1.625	(41.3)	25	729 (330.7)
48	(1200)	74	(1880)	47.000	(1194)	59.50	(1511.30)	56.00	(1422.40)	44	1.625	(41.3)	25	754 (342.0)
54	(1350)	75	(1905)	53.000	(1346)	66.25	(1682.75)	62.75	(1593.85)	44	2.000	(50.8)	25	813 (368.8)
60	(1500)	83	(2108)	59.000	(1499)	73.00	(1854.20)	69.25	(1758.95)	52	2.000	(50.8)	25	964 (437.3)
72	(1800)	99	(2515)	71.000	(1803)	86.50	(2197.10)	82.50	(2095.50)	60	2.000	(50.8)	25	1125 (510.3)

Notes: Higher back pressures can be obtained by using Internal Supports, contact PROCO.
Dimensions are approximate and may change due to pipe dimension changes, inlet, back pressures and flow rates.
1. Larger sizes available upon request.
2. Weights are approximate.

Detail of *ProFlex* In-Line Flanged Rubber Check Valve; Style 720



PROCO™

STYLE 740

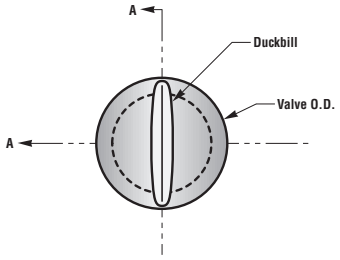
ProFlex™ in-line slip-in rubber check valves

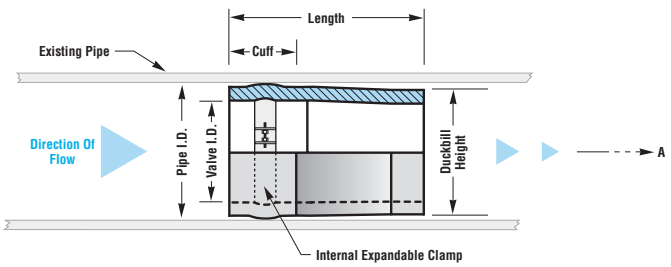
Table 3: Sizes • Working Pressures • Weights

NOMINAL [1] PIPE SIZE Inch / (mm)		Standard Dimensions for PROCO Style 740						MAXIMUM WORKING PRESSURE (PSIG)	WEIGHT [2] lbs / (kgs)	
		Valve I.D. Inch / (mm)		Length Inch / (mm)		Duckbill Height Inch / (mm)				
2	(50)	1.250	(32)	6.750	(171)	1.875	(48)	125	4	(1.8)
3	(80)	2.250	(57)	9.000	(229)	2.875	(73)	125	9	(4.1)
4	(100)	3.000	(80)	13.000	(330)	3.875	(98)	100	10	(4.5)
5	(125)	4.000	(100)	16.000	(406)	4.875	(124)	75	12	(5.4)
6	(150)	5.000	(125)	17.000	(432)	5.875	(149)	75	15	(6.8)
8	(200)	6.625	(168)	19.000	(483)	7.875	(200)	75	18	(8.2)
10	(250)	8.625	(219)	21.000	(533)	9.875	(251)	50	28	(12.7)
12	(300)	10.000	(250)	27.000	(686)	11.875	(302)	50	43	(19.5)
14	(350)	11.500	(292)	28.000	(711)	13.000	(349)	50	55	(24.9)
16	(400)	13.500	(343)	31.000	(787)	15.000	(401)	50	92	(41.8)
18	(450)	15.250	(387)	33.000	(838)	17.000	(451)	25	152	(68.9)
20	(500)	17.000	(432)	35.000	(889)	19.000	(502)	25	236	(107.0)
24	(600)	20.500	(521)	37.000	(940)	23.000	(603)	25	300	(136.1)
28	(700)	24.500	(622)	46.000	(1168)	27.000	(686)	25	364	(165.1)
30	(750)	26.500	(673)	51.000	(1295)	29.000	(737)	25	423	(191.9)
32	(800)	28.500	(724)	58.000	(1473)	31.000	(787)	25	466	(211.4)
36	(900)	32.500	(826)	63.000	(1600)	35.000	(889)	25	501	(227.2)
42	(1050)	38.250	(972)	65.000	(1651)	41.000	(1041)	25	728	(330.2)
48	(1200)	44.250	(1073)	74.000	(1880)	47.000	(1194)	25	762	(345.6)
54	(1350)	50.250	(1276)	77.000	(1956)	53.000	(1346)	25	820	(371.9)
60	(1500)	56.000	(1422)	85.000	(2159)	59.000	(1499)	25	969	(439.5)
72	(1800)	68.000	(1727)	102.000	(2591)	71.000	(1803)	25	1089	(494.0)

Notes: Higher back pressures can be obtained by using Internal Supports, contact PROCO.
Dimensions are approximate and may change due to pipe dimension changes, inlet, back pressures and flow rates.
1. Larger sizes available upon request.
2. Weights are approximate.

Detail of *ProFlex* In-Line Slip-In Rubber Check Valve; Style 740





FAQs

Frequently Asked Questions to help you understand the ProFlex™ In-Line Rubber Check Valves

1. Does the ProFlex In-Line Rubber Check Valve have to be installed in a certain position?
The *ProFlex* In-Line Rubber Check Valve can be installed in any position although it is suggested that if installed in a horizontal plane, the bill should be vertical to the plane.

2. In which degree can the ProFlex In-Line Rubber Check Valve be installed?
Because the valve is not reliant on any hinges, gates, or weights the *ProFlex* In-Line Rubber Check Valve can be installed in any angle from vertical to horizontal.

3. What is "Back Pressure"?
When the *ProFlex* In-Line Rubber Check Valve is submerged in a liquid it is subjected to external pressure. It is critical that the maximum depth that the valve will be submerged is specified as this will be considered the maximum back pressure to which the valve will be subjected.

4. What is the cracking pressure to allow the valve to open?
Required head pressure will be slightly higher on the in-line valve due their shape.

5. What back pressures can the ProFlex In-Line Rubber Check Valve withstand?
Back pressures are in direct relation to the size of the valve, on the smaller diameters it is acceptable to specify up to 200 psi of back pressure and on larger diameters a back pressure limitation would be approximately 12 psi. Each *ProFlex* In-Line Rubber Check Valve is manufactured to the exact line pressure, back pressure and flow rates which we require from you for manufacture.

6. What are the most common installations?
The *ProFlex* 720 In-Line Flanged Rubber Check Valve is bolted between two pipe flanges replacing typical internal swing type check valves, the *ProFlex* 740 In-Line Slip-In Rubber Check Valves are clamped internally utilizing a stainless steel expanding clamp. The in-line valves are commonly used as pump protection and can be used in vacuum applications.

7. Can I use the ProFlex In-Line Rubber Check Valve on potable water applications?
The standard material for the *ProFlex* In-Line Rubber Check Valve is NSF61 approved Nitrile. Due to the large demand for clean water and potable applications, PROCO will be the leader in supplying NSF61 as its check valve material of choice. This will eliminate the concerns commonly affiliated with contaminants or leaching of elastomers in potable water systems.

8. Can the ProFlex In-Line Rubber Check Valve be installed on an "out-of-round" pipe?
Yes, the 740 Slip-In Style is especially suited for out-of-round or badly worn pipe as the expandable clamp applies pressure to the I.D. of the check valve forcing complete sealing against the pipe I.D.

9. Can the ProFlex In-Line Rubber Check Valves be used to create back pressure?
Due to their designs, the 720 and 740 *ProFlex* In-Line Rubber Check Valves will inevitably create back pressure. The valves have been designed to fit inside an existing pipe, therefore the nominal pipe I.D. has been reduced by at least one pipe diameter creating higher head loss and higher inlet pressure to open the valve.

10. Can PROCO make a special design to suit my requirements?
In most instances the *ProFlex* In-Line Rubber Check Valve can be fabricated to suit different applications. Contact PROCO for your requirements.

11. What types of elastomer are available?
The *ProFlex* In-Line Rubber Check Valve can be manufactured and supplied to withstand almost any type of media. Most commonly supplied are Nitrile (NSF61 approved), Neoprene, Gum Rubber, Hypalon®, Chlorobutyl, EPDM, and Viton®.

12. What types of materials are available for the internal clamps?
The *ProFlex* In-Line Slip-In Rubber Check Valves (Style 740) are supplied with 316 stainless steel internal expanding clamps. Other materials are available upon request. The In-Line Flanged Rubber Check Valve (Style 720) does not require a backing ring as it is installed between mating pipe flanges. A gasket is not required as the Style 720 creates its own sealing face.

13. Can the ProFlex 720 In-Line Flanged Rubber Check Valve be supplied with special flanges or drilling?
Yes, the standard drilling pattern is ANSI 125/150# drilling. Other drilling standards such as: ANSI 250/300#, BS-10, DIN NP-10 and DIN NP-16, JIS-5K and JIS-10K, and square flanges are available upon special request.

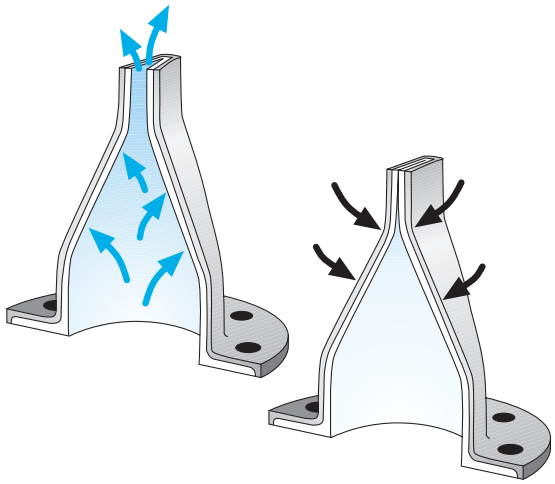
14. Can I install a ProFlex In-Line Rubber Check Valve near a residential area?
Yes, one of the unique features of the *ProFlex* In-Line Rubber Check Valve is the design of the bill section. While the bill will open and allow passage of fluid when head pressure is present, the bill will close and not allow children or animals to crawl inside when there is no head pressure.

15. Can the ProFlex In-Line Rubber Check Valve be used to prevent the common problem often affiliated with manhole flooding?
Yes. The *ProFlex* In-Line Rubber Check Valve is uniquely designed to fit directly inside a manhole which will prevent reverse flow from flooded manholes.

16. Can I use a ProFlex In-Line Rubber Check Valve in winter conditions?
Yes, as in any installation the *ProFlex* In-Line Rubber Check Valve will not be hindered by winter or sub-zero installations. If the valve is installed in a running water application the valve will continue to operate satisfactorily, due to the elastomers' unique chemical makeup.

17. What is the maximum temperature that the ProFlex In-Line Rubber Check Valve can handle?
Temperature capabilities can range from –65° F (-54° C) to +250 (+121° C) depending on the specified elastomer.

The specified Inlet Pressure opens the *ProFlex* In-Line Rubber Check Valve allowing flow.



The specified Back Pressure forces the *ProFlex* In-Line Rubber Check Valve to close preventing backflow.

PROCO PRODUCTS, INC.
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P.O. Box 590 • Stockton, CA
95201-0590 • USA

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(209) 943-6088 INTERNATIONAL
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website: http://www.procoproducts.com

REPRESENTED BY:

PROCO™

SERIES 4400

convoluted heavy-duty molded PTFE bellows

The PROCO Series 4400 PTFE Molded Bellows Expansion Joints are used for corrosive applications found in: Chemical-Petrochemical, Industrial Process Piping Systems, Power Generating Plants, Pulp/Paper Plants, Water/Wastewater Sewage and Pollution Control Systems where metallic joints/lap joints of PTFE & FEP-lined rubber expansion joints may have been previously used or specified. Specify PROCO Series 4400 Expansion Joints for installation between anchor points or next to mechanical equipment such as: Absorption Machines, Blowers, Chillers, Compressors, Fans, Graphite Heat Exchangers, Glass Lined Vessels, Pumps, and Exotic Alloy/Glass Lined Piping Systems. The Series 4400 Expansion Joints are designed to: (1) Absorb Pipe Movements/Stress, (2) Reduce System Noise, (3) Reduce Mechanical Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-up/Surge Forces. Our history in the manufacture of expansion joint products dates back to 1930. When an engineered solution is needed to solve a piping problem, call PROCO.

Engineered For Your Application. The PROCO Series 4400 PTFE Expansion Joints are hot formed from a PTFE tube made with a tape wrapping process. The tube is processed so that the PTFE has a low level of crystallinity, which translates into an improved service life. The seamless PTFE tube is also engineered to have a controlled wall thickness and production methods ensure optimum hoop strength, therefore providing an excellent pressure/vacuum to temperature ratio in the finished product. In most cases this can match that of PTFE lined steel pipe and fittings.

The PROCO Series 4400 is available in 2 convolute through 10 convolute configurations. Each convolution profile offers different overall lengths (face-to-face dimensions) and movements to fit the required specification.

Absorbs Pipe-Wall And Fluid-Borne Noise. The PROCO quiet-operating Series 4400 expansion joints are a replacement for "sound transmitting" metallic/lap joints. Pipe-Wall sound loses energy and is absorbed as the noise carried by the piping enters and exits the PTFE section. Fluid-Borne noise is absorbed by the volumetric expansion (breathing of the connector). This action cushions water hammer and smoothes out pumping impulses.

Isolates Vibration And Motion. PROCO Series 4400 PTFE Expansion Joints should be installed right after and ahead of equipment generating vibration in order to isolate the rotating/vibrating equipment from the rest of the piping system. This layout will improve the overall operating performance of the piping system. For optimum performance, the Series 4400 expansion joints should be installed horizontally to the shaft. Vertical and perpendicular installations are also acceptable, as these expansion joints will accept axial, lateral and angular movements as well as vibration. **Note: For maximum vibration transmission reduction, the pipe section beyond the PTFE expansion joints must be anchored or sufficiently rigid.**

Reduces System Stress and Strain. Rigid attachment of piping to critical or mechanical equipment can produce excessive loading. Thermal or mechanically created strain/stress/shock are cushioned and absorbed with the installation of a flexible PROCO Series 4400 PTFE Expansion Joint. The Series 4400 expansion joint adds a flexible component to the system that automatically self-corrects for misalignment created by structural movements caused by settling, pipe expansion or ground shifts.

Tested Force Pound And Spring Rate Tables. At PROCO we have machine tested several sizes of the Series 4400 expansion joints for Axial Spring Rates and can provide Thrust/Force factors so designers can properly design system restraints. It should be noted that the Series 4400 Molded PTFE Expansion Joints are in accordance with the performance characteristics of the Fluid Sealing Association's Rubber Expansion Joint Division, Technical Handbook Section on Convoluted PTFE Bellows.

Flange And Limit Rods. All PROCO Series 4400 expansion joint flange configurations are made of ductile iron, coated with a rust inhibitive primer to prevent corrosion and are dimensionally tapped to ANSI 125/150# Standards. Hole drilling on centerline, other drilling standards, or other flange materials, (such as epoxy coated flanges), are available on special order. In addition, all PTFE expansion joints are supplied with factory set limit rods to prevent over-extension during operation.

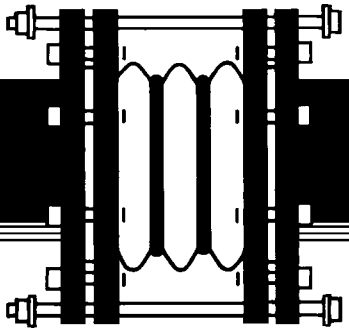
Chemical Service Capability at Minimal Cost. Expensive, exotic metal or PTFE or FEP lined rubber expansion joints for severe chemical service can be replaced with the PROCO Series 4400 PTFE Expansion Joints. The PTFE bellows are vanstoned to ductile iron flanges, which allows all wetted surfaces to come in contact with the PTFE material. Specify the Series 4400 expansion joints where high temperatures coupled with lower pressures or lower temperatures coupled with higher pressures are proposed. Molded from PTFE materials, the Series 4400 offers a low-cost expansion joint that is impervious to chemical attack. Use the PROCO "Chemical to Elastomer Guide" for reference on chemical compatibility.

Services And Locations. PROCO Series 4400 PTFE Expansion Joints have been supplied to, and successfully used by a range of customers worldwide in the process industries for use in both organic and inorganic chemical processing and production, including such demanding applications as agrochemical and pharmaceutical chemical production, acid processing and food manufacture.

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays … the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us.

Toll-Free Phone ..... 800 / 344-3246 USA/CANADA
International Calls .... 209 / 943-6088
Fax ..... 209 / 943-0242
Email ..... sales@procoproducts.com
Website ..... www.procoproducts.com

Weekday office hours are 5:30 a.m. to 5:15 p.m. Pacific Time.



Rev. 1 3/02

The Expansion Joint People

Protecting Piping And Equipment Systems From Stress/Motion

Water Environment Federation® Preserving & Enhancing the Global Water Environment MEMBER

FLUID SEALING ASSOCIATION FSA

ISD INDEPENDENT SEALING DISTRIBUTORS

NAHAD NATIONAL ASSOCIATION OF HOSE AND ACCESSORIES DISTRIBUTORS

PROCO™

STYLE 4402

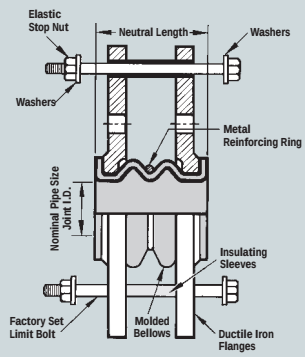
two convolution heavy-duty molded PTFE bellows

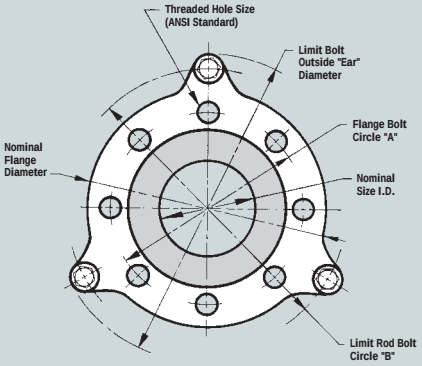
TABLE 1

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON TWO CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	1.772	.276	.157	16	1485	971	2342	4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50	29.9" @ 390°F	4
1.25	1.969	.315	.157	16	1485	971	2342	4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 390°F	6
1.50	2.165	.315	.157	16	1485	971	2342	4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 390°F	8
2.00	2.362	.433	.236	12	1999	971	2342	4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50	29.9" @ 390°F	9
2.50	2.362	.433	.236	12	2170	971	2342	4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50	29.9" @ 390°F	10
3.00	2.560	.512	.276	11	2627	1085	2570	4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50	29.9" @ 390°F	12
4.00	2.756	.591	.315	10	2627	1142	2741	8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50	29.9" @ 390°F	14
5.00	2.953	.591	.315	9	3083	1313	3026	8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50	29.9" @ 390°F	18
6.00	2.953	.630	.315	8	3655	1485	3940	8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	29.9" @ 390°F	22
8.00	2.953	.669	.315	7	4229	1771	5082	8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50	29.9" @ 260°F	32
10.00	3.150	.748	.354	7	4968	1999	5539	12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50	29.9" @ 260°F	49
12.00	3.347	.748	.354	6	5621	2341	6338	12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	29.9" @ 260°F	57
14.00	3.346	.787	.394	5				12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50	14.9" @ 70°F	74
16.00	3.543	.787	.394	5				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50	14.9" @ 70°F	107
18.00	3.740	.787	.433	4				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50	14.9" @ 70°F	127
20.00	3.937	.787	.433	4				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50	14.9" @ 70°F	150
22.00	3.937	.709	.354	3				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50	14.9" @ 70°F	182
24.00	4.134	.709	.354	3				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50	14.9" @ 70°F	224

ENGINEERED PER SPECIFICATIONS

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*





MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4402**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4403

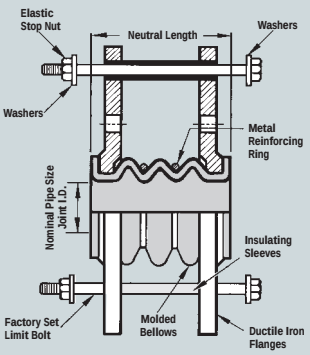
three convolution heavy-duty molded PTFE bellows

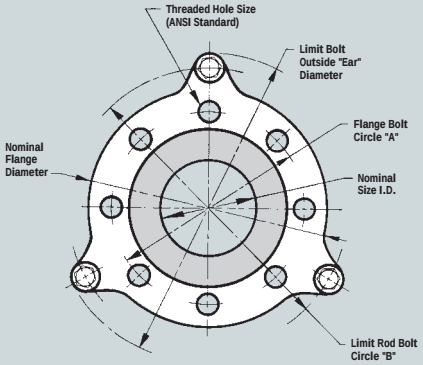
TABLE 2

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON THREE CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	2.165	.472	.236	19	857	571	1599	4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50	29.9" @ 350°F	4
1.25	2.559	.748	.236	18	910	571	1599	4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 350°F	6
1.50	2.756	.748	.236	18	971	571	1599	4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 350°F	8
2.00	2.756	.748	.354	16	1142	571	1599	4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50	29.9" @ 350°F	9
2.50	3.150	.748	.354	16	1256	571	1599	4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50	29.9" @ 350°F	10
3.00	3.346	.984	.472	15	1370	571	1599	4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50	29.9" @ 350°F	12
4.00	3.543	.984	.472	14	1370	685	1884	8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50	29.9" @ 350°F	14
5.00	3.740	.984	.472	12	1542	799	1999	8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50	29.9" @ 350°F	20
6.00	3.937	1.102	.551	11	1770	857	2227	8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	29.9" @ 350°F	23
8.00	4.134	1.102	.551	10	2227	1085	2798	8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50	29.9" @ 212°F	33
10.00	4.331	1.181	.591	10	2684	1256	3198	12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50	29.9" @ 212°F	51
12.00	4.528	1.181	.591	10	3141	1485	3883	12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	29.9" @ 212°F	59
14.00	4.528	1.181	.591	8				12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50	14.9" @ 70°F	77
16.00	4.921	1.181	.591	8				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50	14.9" @ 70°F	110
18.00	5.512	1.181	.591	6				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50	14.9" @ 70°F	132
20.00	5.315	1.181	.591	6				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50	14.9" @ 70°F	154
22.00	5.315	.984	.472	5				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50	14.9" @ 70°F	187
24.00	5.512	.984	.472	5				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50	14.9" @ 70°F	231

ENGINEERED PER SPECIFICATIONS

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*

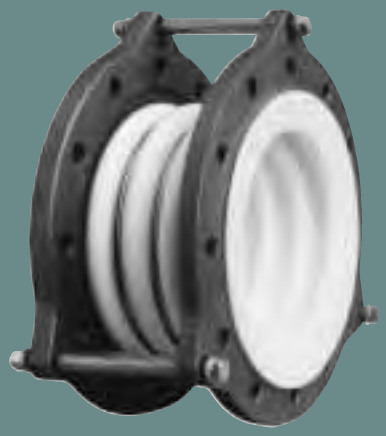




MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4403**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4404



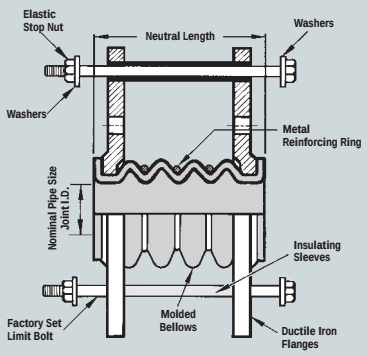
four convolution heavy-duty molded PTFE bellows

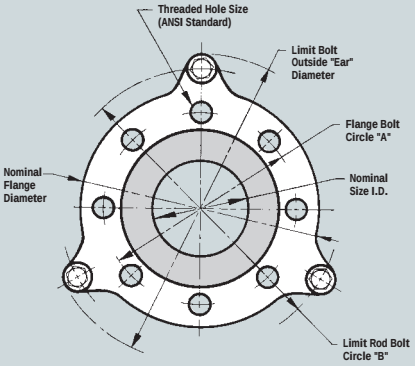
TABLE 3

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON FOUR CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	2.560	.591	.315	25	686	457	1200	4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50	29.9" @ 350°F	4
1.25	2.969	.709	.315	24	686	457	1200	4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 350°F	6
1.50	3.346	.709	.315	24	743	457	1200	4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 350°F	8
2.00	3.346	.906	.551	23	971	486	1257	4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50	29.9" @ 350°F	9
2.50	3.937	1.024	.591	21	1028	486	1257	4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50	29.9" @ 350°F	10
3.00	4.134	1.181	.591	19	1199	486	1342	4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50	29.9" @ 350°F	12
4.00	4.528	1.181	.591	18	1199	571	1542	8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50	29.9" @ 350°F	15
5.00	4.921	1.260	.630	16	1285	657	1656	8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50	29.9" @ 350°F	22
6.00	5.118	1.260	.669	15	1542	743	1942	8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	29.9" @ 350°F	24
8.00	5.315	1.299	.669	13	1913	943	2484	8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50	29.9" @ 212°F	34
10.00	5.709	1.339	.709	12	2370	1114	2941	12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50	29.9" @ 212°F	52
12.00	5.906	1.339	.709	11	2742	1314	3427	12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	29.9" @ 212°F	62
14.00	5.906	1.339	.709	10				12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50	14.9" @ 70°F	80
16.00	6.300	1.378	.709	10				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50	14.9" @ 70°F	113
18.00	6.300	1.378	.709	8				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50	14.9" @ 70°F	136
20.00	6.496	1.378	.709	8				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50	14.9" @ 70°F	159
22.00	6.496	1.260	.591	7				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50	14.9" @ 70°F	193
24.00	6.102	1.260	.591	6				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50	14.9" @ 70°F	236

ENGINEERED PER SPECIFICATIONS

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*





MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4404**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4405

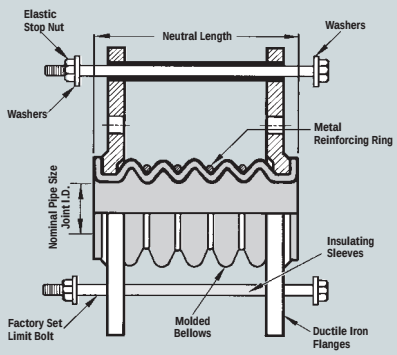
five convolution heavy-duty molded PTFE bellows

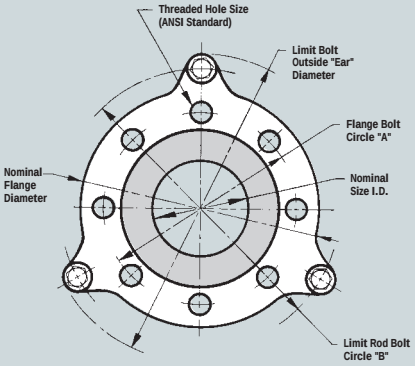
TABLE 4

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON FIVE CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	2.560	.779	.394	30	514	343	800	4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50	29.9" @ 350°F	4
1.25	3.150	.984	.472	30	514	343	800	4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 350°F	6
1.50	3.937	.984	.472	30	514	343	800	4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50	29.9" @ 350°F	8
2.00	3.937	1.107	.551	26	800	400	914	4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50	29.9" @ 350°F	9
2.50	4.724	1.230	.591	25	800	400	914	4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50	29.9" @ 350°F	10
3.00	5.118	1.393	.669	24	1028	400	1085	4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50	29.9" @ 350°F	13
4.00	5.512	1.475	.709	22	1028	457	1200	8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50	29.9" @ 350°F	15
5.00	5.906	1.516	.709	19	1028	514	1313	8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50	29.9" @ 350°F	24
6.00	6.103	1.557	.748	17	1314	629	1656	8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	29.9" @ 350°F	25
8.00	6.693	1.598	.748	15	1599	800	2170	8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50	29.9" @ 212°F	36
10.00	6.890	1.598	.748	13	2056	971	2684	12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50	29.9" @ 212°F	54
12.00	7.087	1.639	.787	13	2342	1142	2970	12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	29.9" @ 212°F	65
14.00	7.087	1.680	.787	12				12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50	14.9" @ 70°F	81
16.00	7.480	1.721	.827	12				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50	14.9" @ 70°F	117
18.00	7.480	1.721	.827	10				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50	14.9" @ 70°F	141
20.00	7.677	1.762	.827	10				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50	14.9" @ 70°F	163
22.00	7.677	1.762	.866	8				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50	14.9" @ 70°F	198
24.00	7.874	1.762	.866	8				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50	14.9" @ 70°F	243

ENGINEERED PER SPECIFICATIONS

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*

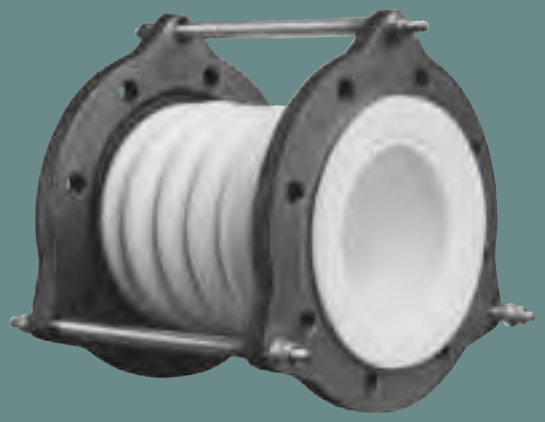




MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4405**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4406

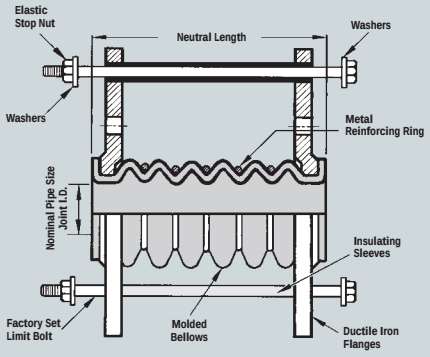


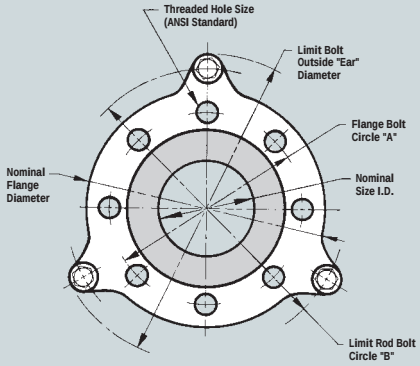
six convolution heavy-duty molded PTFE bellows

TABLE 5

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON SIX CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																	
1.00	3.622	.945	.472	38				4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50		4
1.25	4.528	1.181	.591	36				4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50		6
1.50	4.528	1.181	.591	36				4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50	NOT	8
2.00	4.528	1.260	.669	32	ENGINEERED			4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50		9
2.50	5.315	1.496	.748	30				4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50		11
3.00	6.496	1.614	.787	28				4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50	DESIGNED	13
4.00	6.496	1.654	.827	27				8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50		15
5.00	6.890	1.693	.827	23				8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50		26
6.00	7.087	1.732	.866	19	PER			8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	FOR	26
8.00	7.874	1.772	.866	17				8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50		36
10.00	8.071	1.772	.906	15				12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50		55
12.00	8.268	1.850	.906	15				12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	VACUUM	67
14.00	8.268	1.890	.945	14	SPECIFICATIONS			12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50		82
16.00	8.661	1.969	.984	14				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50		121
18.00	8.661	1.969	.984	12				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50	SERVICE	145
20.00	8.858	2.008	.984	12				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50		168
22.00	8.858	2.047	1.024	11				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50		203
24.00	9.055	2.047	1.024	10				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50		249

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*

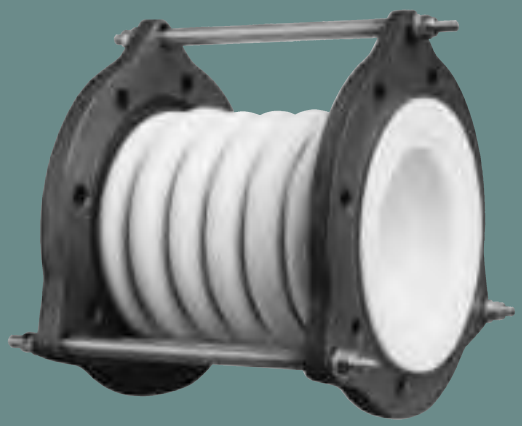




MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4406**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4407

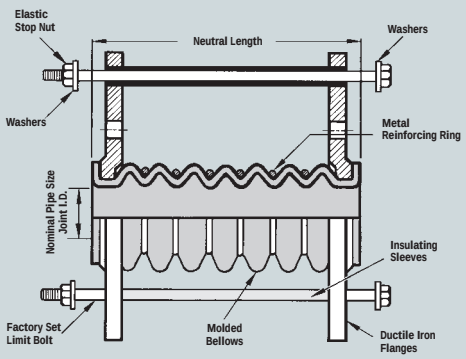


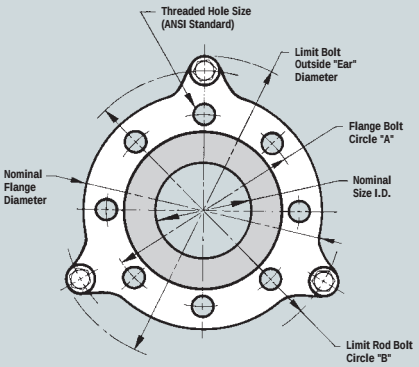
seven convolution heavy-duty molded PTFE bellows

TABLE 6

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON SEVEN CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	4.134	1.181	.669	45				4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50		4
1.25	5.118	1.378	.866	42				4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50	NOT	6
1.50	5.118	1.378	.866	42				4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50		8
2.00	5.315	1.535	.866	42	ENGINEERED			4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50		9
2.50	6.102	1.654	.945	36				4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50	DESIGNED	11
3.00	7.480	1.772	.984	33				4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50		13
4.00	7.480	1.890	1.024	30				8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50		16
5.00	8.268	1.929	1.063	27				8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50		28
6.00	8.268	1.969	1.102	23	PER			8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	FOR	33
8.00	9.055	2.008	1.102	20				8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50		38
10.00	9.252	2.047	1.181	18				12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50		57
12.00	9.449	2.087	1.260	17				12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	VACUUM	69
14.00	9.449	2.165	1.339	16	SPECIFICATIONS			12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50		85
16.00	9.843	2.323	1.339	16				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50	SERVICE	125
18.00	9.843	2.362	1.378	14				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50		150
20.00	10.039	2.362	1.378	14				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50		174
22.00	10.039	2.441	1.417	13				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50		210
24.00	10.236	2.441	1.417	11				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50		255

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*

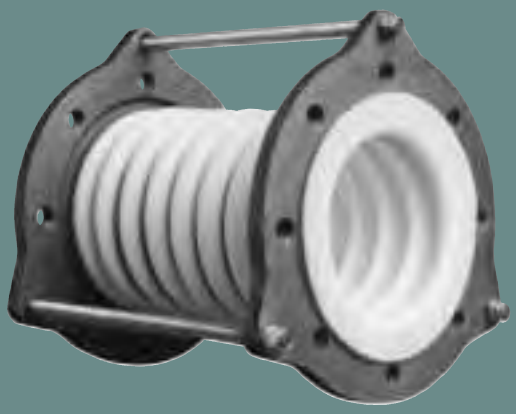




MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4407**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4408

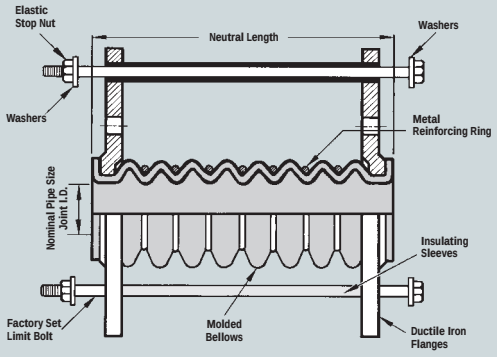


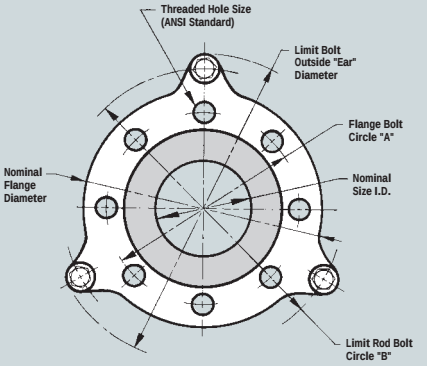
eight convolution heavy-duty molded PTFE bellows

TABLE 7

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON EIGHT CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	4.528	1.339	.787	51				4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50		4
1.25	5.709	1.496	1.024	47				4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50		6
1.50	5.709	1.496	1.024	47				4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50	NOT	8
2.00	5.906	1.654	1.063	46	ENGINEERED			4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50		10
2.50	6.890	1.772	1.102	41				4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50		11
3.00	8.071	1.929	1.181	37				4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50	DESIGNED	13
4.00	8.661	2.087	1.220	34				8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50		16
5.00	8.858	2.165	1.260	31				8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50		20
6.00	9.055	2.244	1.339	27	PER			8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	FOR	27
8.00	10.236	2.244	1.378	23				8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50		39
10.00	10.630	2.283	1.457	21				12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50		58
12.00	10.630	2.362	1.496	20				12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	VACUUM	72
14.00	10.630	2.559	1.575	18	SPECIFICATIONS			12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50		88
16.00	11.024	2.717	1.575	18				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50		123
18.00	11.024	2.913	1.654	16				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50	SERVICE	148
20.00	11.220	2.913	1.654	16				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50		172
22.00	11.220	2.953	1.693	15				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50		207
24.00	11.614	2.953	1.693	13				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50		252

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*

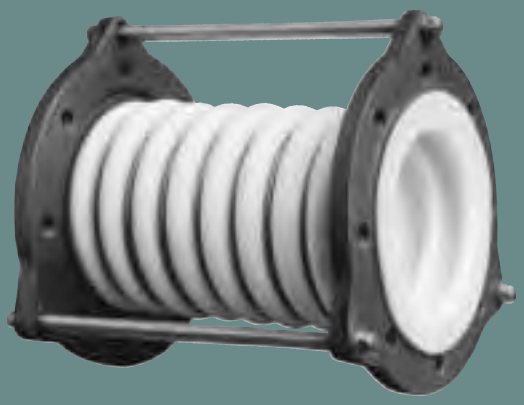




MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4408**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4409

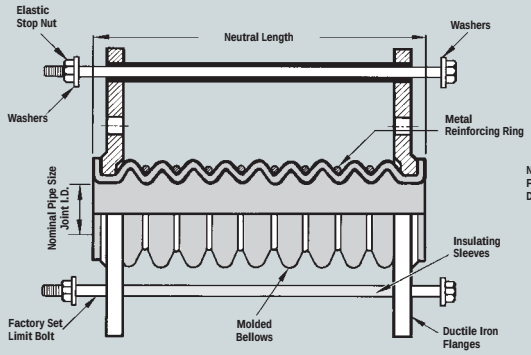


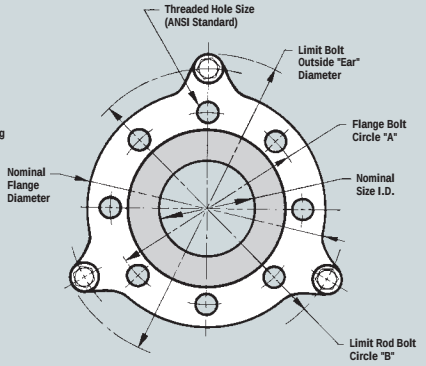
nine convolution heavy-duty molded PTFE bellows

TABLE 8

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON NINE CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	4.921	1.535	.906	55				4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50		4
1.25	6.300	1.654	1.220	52				4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50	NOT	6
1.50	6.300	1.654	1.220	52				4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50		8
2.00	6.496	1.811	1.260	50	ENGINEERED			4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50		10
2.50	7.677	1.929	1.299	46				4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50	DESIGNED	11
3.00	9.055	2.087	1.378	41				4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50		13
4.00	9.449	2.283	1.417	37				8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50		17
5.00	10.236	2.362	1.457	35				8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50		32
6.00	10.433	2.480	1.575	31	PER			8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	FOR	36
8.00	11.417	2.598	1.614	26				8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50		40
10.00	11.811	2.677	1.693	23				12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50		60
12.00	11.811	2.756	1.732	22				12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	VACUUM	74
14.00	11.811	2.913	1.811	20	SPECIFICATIONS			12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50		91
16.00	12.205	3.110	1.811	20				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50	SERVICE	127
18.00	12.205	3.307	1.850	18				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50		152
20.00	12.402	3.307	1.890	18				20	1 1/8- 7	25.000	.866	27.500	.375	28.500	29.134	232	183	150	104	90	75	62	50		176
22.00	12.402	3.346	1.890	16				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50		212
24.00	12.992	3.346	1.929	15				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50		258

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*

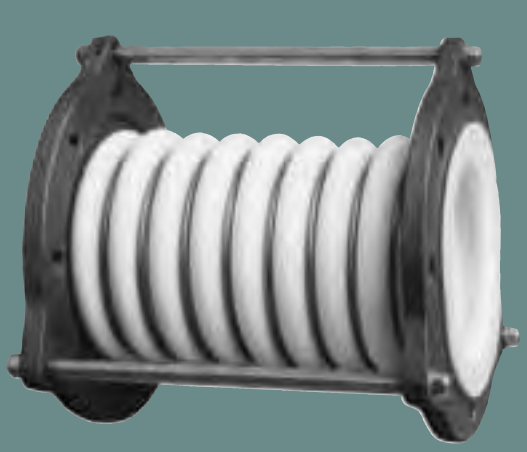




MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4409**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

PROCO™

STYLE 4410

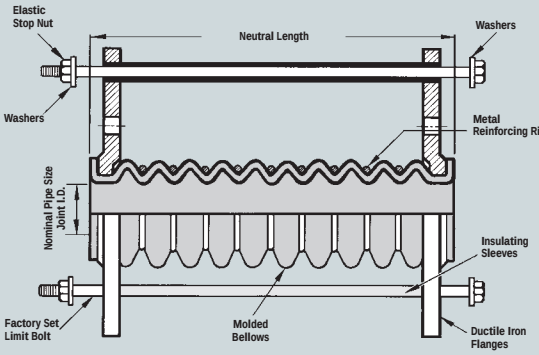


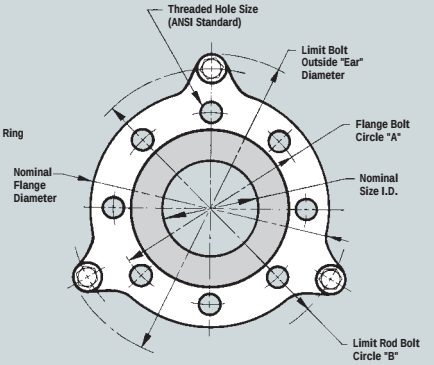
ten convolution heavy-duty molded PTFE bellows

TABLE 9

NOMINAL SIZE I.D.	NEUTRAL LENGTH INCHES	MOVEMENT CAPABILITIES BASED ON TEN CONVOLUTION DESIGN			SPRING RATE CAPABILITY BASED ON 1" OF MOVEMENT AT ZERO PRESSURE CONDITIONS			EXPANSION JOINT FLANGE DRILLING								PRESSURE AT TEMPERATURE (PSIG) @ °F *All units are hydrostatically tested at 1.5 times rated pressure after manufacturing.*								VACUUM	WEIGHT / LBS
		± AXIAL (Δx) MOVEMENT	LATERAL (Δy) DEFLECTION	ANGULAR DEFLECTION	FORCE LBS PER 1" RATED EXTENSION	FORCE LBS PER 1" RATED COMPRESSION	FORCE LBS PER 1" RATED LATERAL DEFLECTION	# HOLES	THREADED HOLE SIZE	BOLT CIRCLE FLANGE "A"	FLANGE THICKNESS	NOMINAL FLANGE DIAMETER	LIMIT BOLT DIAMETER	BOLT CIRCLE LIMIT BOLT "B"	LIMIT BOLT "EAR" O.D.	70°	100°	150°	200°	250°	300°	350°	400°	Hg at Temp.	
		IN	IN	DEG.	LB/IN	LB/IN	LB/IN																		
1.00	5.315	1.732	1.063	61				4	1/2- 13	3.125	.551	4.250	.250	5.300	6.102	232	183	150	104	90	75	62	50		4
1.25	6.890	1.890	1.378	58				4	1/2- 13	3.500	.551	4.625	.250	6.700	7.480	232	183	150	104	90	75	62	50		6
1.50	6.890	1.890	1.378	58				4	1/2- 13	3.875	.630	5.000	.250	6.700	7.480	232	183	150	104	90	75	62	50	NOT	8
2.00	7.087	2.008	1.496	55	ENGINEERED			4	5/8- 11	4.750	.630	6.000	.250	7.300	8.071	232	183	150	104	90	75	62	50		10
2.50	8.465	2.047	1.535	51				4	5/8- 11	5.500	.630	7.000	.250	8.100	8.858	232	183	150	104	90	75	62	50		11
3.00	10.040	2.244	1.575	45				4	5/8- 11	6.000	.630	7.500	.250	8.700	9.449	232	183	150	104	90	75	62	50	DESIGNED	14
4.00	10.433	2.480	1.654	40				8	5/8- 11	7.500	.630	9.000	.250	9.400	10.236	232	183	150	104	90	75	62	50		17
5.00	11.614	2.598	1.732	38				8	3/4- 10	8.500	.630	10.000	.375	11.000	11.417	232	183	150	104	90	75	62	50		34
6.00	11.417	2.756	1.811	35	PER			8	3/4- 10	9.500	.709	11.000	.375	12.400	13.583	232	183	150	104	90	75	62	50	FOR	38
8.00	11.417	2.913	1.850	28				8	3/4- 10	11.750	.709	13.500	.375	14.600	15.748	232	183	150	104	90	75	62	50		42
10.00	12.600	3.071	1.890	26				12	7/8- 9	14.250	.709	16.000	.375	16.700	17.913	232	183	150	104	90	75	62	50		62
12.00	13.189	3.150	1.929	24				12	7/8- 9	17.000	.709	19.000	.375	19.700	21.260	232	183	150	104	90	75	62	50	VACUUM	76
14.00	13.189	3.346	1.969	22	SPECIFICATIONS			12	1- 8	18.750	.787	21.000	.375	22.200	22.244	232	183	150	104	90	75	62	50		94
16.00	13.386	3.346	1.969	22				16	1- 8	21.250	.787	23.500	.375	24.300	25.000	232	183	150	104	90	75	62	50	SERVICE	130
18.00	13.386	3.543	2.087	20				16	1 1/8- 7	22.750	.866	25.000	.375	25.800	27.362	232	183	150	104	90	75	62	50		156
20.00	13.583	3.543	2.087	20				20	1 1/8- 7	25.000	.866	27.500	.375	28.800	29.134	232	183	150	104	90	75	62	50		181
22.00	13.583	3.583	2.165	18				20	1 1/4- 7	27.250	.945	29.500	.375	30.500	31.890	232	183	150	104	90	75	62	50		218
24.00	14.173	3.583	2.205	17				20	1 1/4- 7	29.500	.945	32.000	.375	32.900	34.646	232	183	150	104	90	75	62	50		264

Larger diameters, custom lengths, and perfomance requirements available upon request.
Pressure Rating Note:
316 Stainless Steel Anti-Squirm Flanges are available for higher pressure applications. *(See Back Cover.)*





MATERIALS OF CONSTRUCTION	
DESCRIPTION	**STYLE 4410**
BELLOWS	WHITE PTFE
FLANGES	DUCTILE IRON
REINFORCING RINGS	304 SS
LIMIT BOLTS	CARBON STEEL
NUTS	CARBON STEEL
INSULATING SLEEVES	POLYETHYLENE
WASHERS	CARBON STEEL / NYLON

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.

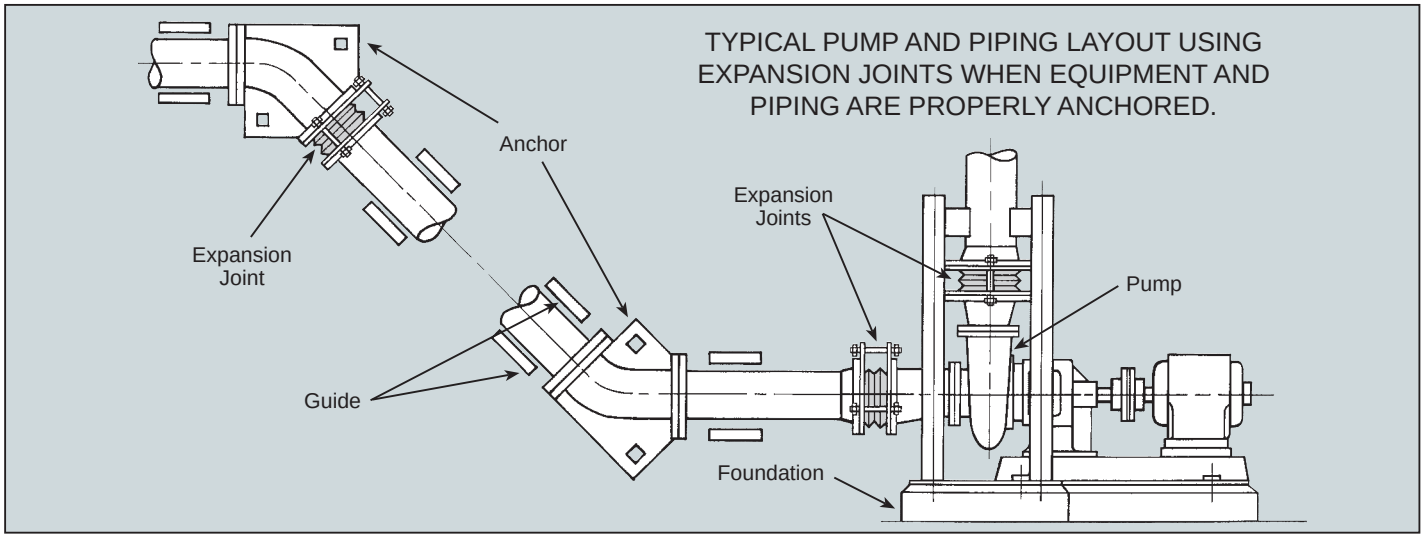
c. Install expansion joints to the prescribed neutral lengths. If expansion joints are used in high temperature processes, it is recommended that units be installed at near extended values. For cold process installations, expansion joints should be installed in a nearly compressed length. These settings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



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:

$$T_p = P \bullet T_f$$

T_p is the pressure thrust (lb_f), **P** is the system operating pressure (Psig) and T_1 is the thrust factor (or bellows effective area [in^2]). The pressure thrust, T_p, will act in the axial direction and must be added to the axial spring force **(Fx•Δx)** to give the total axial reaction force, **Rx**.

$$Rx = T_p + (Fx \bullet \Delta x)$$

Rx is the pipe support reaction force (lb_f), T_p is the pressure thrust (lb_f), **Fx** is the axial spring force of the unit and **Δx** 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 time due to thermoplastic creep if units are operated under pressure.

PROCO™ Expansion Joint Accessories

Spray Shields

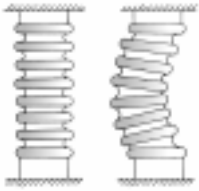
PROCO Spray Shields are used to help prevent injury to personnel or damage to equipment in the event of a leak or sprayout at expansion joint connections of acids, caustics, chlorine and other dangerous liquids.

- Same quality design as other cloth shields
- pH indicating patch to signal leaks
- Weep holes behind patch allow indicator to change color
- Attached by Velcro fasteners and drawstrings
- Allows for full movement of the expansion joint
- Available for all PROCO style joints

Anti-Squirm Flanges

When under pressure, a longer bellows will react the same as a column when subjected to compression. At some point both will buckle or "squirm". PROCO can offer a solution to prevent this squirming effect during operation or testing.

Squirm can cause a catastrophic failure of the expansion joint, and serious thought must be given to this condition at time of system engineering. If desired, PROCO can offer a design that will eliminate the squirming effect . Once manufactured, a hydrostatic test of the joint provides assurance that it will hold its form under pressure. If a hydrostatic test is required, it should be specified at the time of quotation.



STABLE BELLOWS SQUIRMED BELLOWS

"When personnel safety and equipment performance are concerns … contact PROCO."

Demand the best — insist on PROCO™.

- Same-day shipping
- Knowledgeable sales staff that has average of 12 years experience with expansion joints
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- Preselected freight carriers to minimize "interline transfer"
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- Complete expansion joint product line
- Largest inventory in North America

Same Day Shipment From Order Placement

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2431 North Wigwam Dr. (95205)
P.O. Box 590 • Stockton, CA
95201-0590 • USA

TOLL-FREE PHONE: (800) 344-3246
FACSIMILE: (209) 943-0242
(209) 943-6088
email: sales@procoproducts.com
website: http://www.procoproducts.com

NATIONWIDE AND CANADA

INTERNATIONAL

DISTRIBUTED BY:

PROCO™

SERIES 190-D
SERIES 450
sleeve type pipe connectors

The PROCO Series 450 Sleeve Type Pipe Connectors are used for tough demanding applications found in: Refridgeration Pump Systems, Industrial Process Piping Systems, Power Generating Plant Pump Systems, Pulp/Paper Plant Pump Systems, Water-Wastewater Sewage and control systems where lower pressure and sleeve ends are used in lieu of flanged spool type rubber expansion joints. The Series 450 Sleeve Type Pipe Connectors are constructed of Neoprene rubber and reinforced with impregnated woven nylon.

The PROCO Series 190-D Navy Sleeve Type Pipe Connectors are used for tough demanding marine applications found in: Shipboard Fuel Oil, Ballast and Bilge Drainage Systems. (The PROCO Series 190-D Navy Sleeve Type Pipe Connectors are constructed of the same materials as the Series 450 and come with an aluminized glass cloth outer cover to meet Mil-E-15330 Class B specification.)

Dimensions			Allowable Movements			Operating Conditions			Force To Move (Lbs.)		Wt.- Lbs.
Nominal Pipe Size	O.D. of Pipe I.D. of Joint	Length of Joint	Axial		Angular ± Degrees	Pressure (PSIG) Note 1	Vacuum (In. Hg.)	Temp F° Note 2	Axial Extension	Axial Compression	Sleeve
			Extension	Compression							
1.5	1.900	7.0	.5	1.0	10°	75	20	225	30	26	1.4
2.0	2.375	7.0	.5	1.0	10°	75	20	225	35	30	1.6
2.5	2.875	7.0	.5	1.0	10°	75	20	225	40	34	1.8
3.0	3.5	7.0	.5	1.0	10°	75	20	225	45	40	2.0
3.5	4.0	7.0	.5	1.0	10°	75	20	225	48	43	2.2
4.0	4.5	7.0	.5	1.0	10°	75	20	225	50	45	2.4
4.5	5.0	7.0	.5	1.0	10°	75	20	225	53	52	2.7
5.0	5.563	7.0	.5	1.0	10°	75	20	225	57	60	2.9
6.0	6.625	7.0	.5	1.0	10°	75	20	225	65	75	3.4
8.0	8.625	7.0	.5	1.0	10°	75	20	225	100	145	4.3
10.0	10.750	7.0	.5	1.0	10°	75	20	225	265	255	5.1
12.0	12.750	7.0	.5	1.0	10°	75	20	225	650	400	6.7

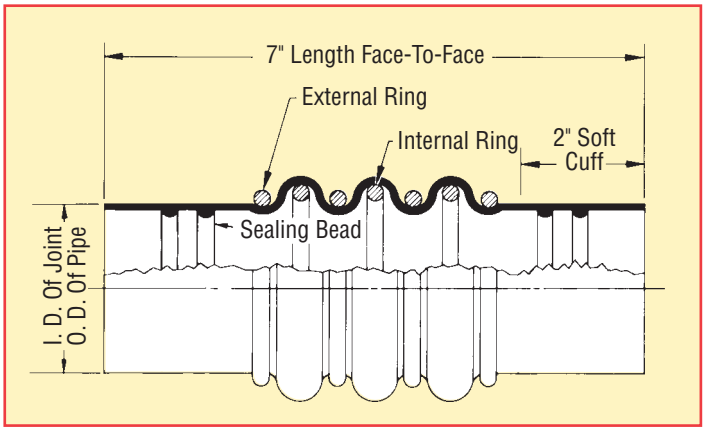
Coupling to be slipped over pipe to a depth of 2".
Coupling is a flexible member, and pipe must be properly anchored and guided.
All dimensions are in inches.

Notes: 1. Burst pressure rated at four times operating pressure.
2. Can withstand an intermittent temperature of 275° F.

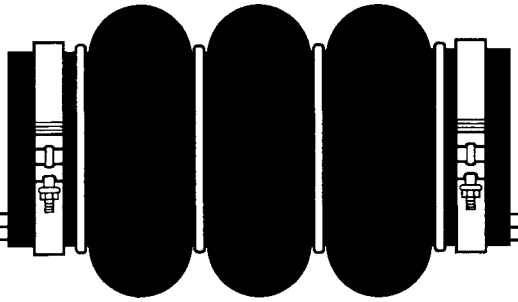
Specify the PROCO Series 190-D and Series 450 for installations near mechanical equipment in piping systems to: (1) Absorb Pipe/Movement/Stress, (2) Reduce system Noise, (3) Isolate Vibration, (4) Eliminate Electrolysis, (5) Compensate Alignment/Offset & (6) Protect Against Start-Up/Surge Forces. Our history in expansion joint products dates back to 1930. When you need an engineered solution to a piping systems problem, call PROCO.

Construction of Sleeve Type Pipe Connectors: The Series 190-D and Series 450 Sleeve Type Connectors are constructed of neoprene rubber and reinforced with impregnated woven nylon. Sealing beads are molded on the interior of the sleeve and provide extra sealing action for the clamping area. Internal reinforcing rings prevent deformation of the connector during surge or temporary negative pressure conditions. The outer reinforcement rings are provided to add external reinforcement.

Fastening Method: The Series 190-D and Series 450 Sleeve Type Pipe Connectors require heavy duty, stainless steel, 1" wide "T" bolt clamps to provide proper clamping strength. Clamps are not stocked by PROCO Products, Inc. and are to be provided by others.



The Expansion Joint People



Protecting Piping And Equipment Systems From Stress/Motion

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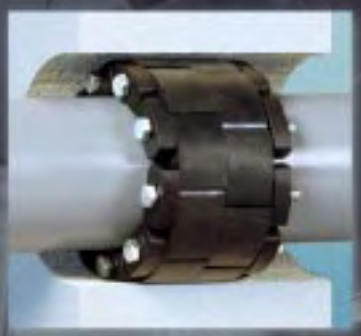
Comparative Properties Of Typical Proco Products, Inc. Elastomers

ANSI/ASTM D1418-77	CIIR	EPDM	CSM	CR	NBR	NR/IR
Elastomer Common Name	Chlorobutyl	EPDM/EPT	Hypalon	Neoprene	Nitrile/Buna-N	Gum/Natural
ASTM D-2000; SAE J-200	**AA-BA**	**BA-CA-DA**	**CE**	**BC-BE**	**BF-BG--BK-CH**	**AA**
Military: MIL STD 417	**RS**	**RS**	**SC**	**SC**	**SB**	**RN**
Proco's Code	**B*D*O**	**E*Q**	**H**	**F*N**	**J*P**	**G*R**
Chemical Name	Chloro-Isobutylene	Ethylene Propylene	Chlor-Sulfonated	Poly-Chlorprene	Butadiene	Polyisoprene
Definition	Isoprene	Polymer	Polyethylene		Acro-Nitrile	
Hardness Range: Duro A	40-75	40-90	40-95	40-95	40-95	30-90
Specific Gravity Of Base	0.92	0.86	1.12-1.28	1.23	1.00	0.93
Low Temp.- Min Service °F	-10 to -60	-20 to -60	-30 to -60	-10 to -50	+30 to -40	-20 to -60
High Temp. -Max. Service °F	250 to 300	300	275	220	240	185
Abrasion	Good	Good To Excel	Excellent	Excellent	Good	Excellent
Absorption, Water	Very Good	V.Good To Excel	Very Good	Good	Good	Very Good
Acid - Concentrated	Good	Excellent	Very Good	Good	Good	Fair To Good
Acid - Dilute	Excellent	Excellent	Excellent	Excellent	Good	Fair To Good
Adhesion to Fabrics	Good	Good	Good	Excellent	Good	Excellent
Adhesion To Metals	Good	Good To Excel.	Excellent	Excellent	Excellent	Excellent
Chemicals	Excellent	Excellent	Excellent	Fair To Good	Fair To Good	Fair To Good
Cold	Good	Excellent	Good	Good	Fair To Good	Excellent
Dielectric Strength	Excellent	Excellent	V.Good To Excel.	Good	Poor	Excellent
Dynamic Properties	Fair	Good to Excel.	Fair	Fair	Good To Excel.	Excellent
Electrical Insulation	Good To Excel.	Excellent	Good	Fair To Good	Poor	Good To Excel.
Flame	Poor	Poor	Good	Good	Poor	Poor
Heat	Very Good	Excellent	Excellent	Very Good	Good	Good
Heat Aging	Very Good	Excellent	Very Good	Good	Good	Fair
Hydrocarbons-Aliphatic	Poor	Poor	Fair To Good	Fair To Good	Excellent	Poor
Hydrocarbons - Aromatic	Poor	Poor	Fair	Fair	Good	Poor
Hydrocarbons - Oxygenated	Good	Good To V.Good	Poor To Fair	Poor	Poor	Fair To Good
Impermeability	Very Low	Fairly Low	Low To Very Low	Low	Low	Fairly Low
Oil - Animal & Vegetable	Very Good	Good	Good	Good	Very Good	Poor To Good
Oil And Gasoline	Poor	Poor	Good	Good	Excellent	Poor
Oxidation	Excellent	Excellent	Excellent	V.Good To Excel.	Good	Good
Ozone	Excellent	Outstanding	Outstanding	V.Good To Excel.	Fair	Poor To Fair
Radiation	Good	Outstanding	Very Good	Very Good	Very Good	Excellent
Rebound - Cold	Poor	Very Good	Fair To Good	Very Good	Good	Excellent
Rebound - Hot	Very Good	Very Good	Good	Very Good	Good	Excellent
Set, Compression	Fair	Good	Fair	Fair To Good	Good	Good
Solvents, Lacquer	Fair To Good	Poor To Fair	Poor	Poor	Fair	Poor
Steam	Good	Excellent	Fair	Fair	Fair To Good	Fair To Good
Sunlight Aging	Very Good	Outstanding	Outstanding	Very Good	Poor	Poor
Swelling In Oil	Poor	Poor	Good To Excel.	Good	Very Good	Poor
Tear	Good	Fair To Good	Fair	Good	Fair	Good To V.Good
Tensile Strength	Good	Good To Excel.	Fair	Good	Good To Excel.	Excellent
Water	Good	Excellent	Fair	Fair	Fair To Good	Fair To Good
Weather	Good To Excel.	Excellent	Excellent	Excellent	Fair	Fair
Generally Resistant To:	Animal And Veg. Oils, Fats, Greases, Air, Gas, Water, Many Oxidizing Chemicals, And Ozone	Vegetable And Animal Fats, Oils, Ozone, Many Strong And oxidizing Chemicals, Ketones, Alcohol's	Strong Acids and Bases, Freons, Hydroxides, Ozone, Alcohol's, Etching, Alkaline and Hypochlorite Solutions.	Moderate Acids and Chemicals, Ozone, Oils, Fats, and Many solvents. Oily Abrasive Applications.	Most Hydrocarbons, Fats, Oils Greases, Hydraulic Fluids, Chemicals and Solvents	Water, Air, Average Concentration Acids, Bases, Alcohol's, Salts, Ketones, Best Abrasion Resistance.
Generally Affected Or Attacked By:	Not For: Oils, Solvents, and Aromatic Hydrocarbons.	Not For: Mineral Oils, Solvents, and Aromatic Hydrocarbons.	Not For: Ketones, Esters, and Certain Chlorinated Oxidizing Acids. Chlorinated, Nitro and Aromatic Hydrocarbons	Not For: Oxidizing Acids, Esters and Ketones, Aromatic, Chlorinated and Nitro Hydrocarbons.	Not For: Ozone, Ketones, Esters, Aldehydes, Nitro and Chlorinated, Hydrocarbons, Polar Solvents, MEK.	Not For: Ozone, Strong Acids, Bases, Oils Solvents, Most Hydrocarbons

PEN•SEAL



Pipe Penetration Seals

PROCO
PROCO PRODUCTS, INC.

The Expansion Joint People

PEN-SEAL

Pipe Penetration Seals

PROCO's PEN-SEAL Pipe Penetration Seals have been designed to assist in achieving an efficient, low-cost mechanical seal between any Electrical Conduit, Concrete, Cast Iron, Steel, Copper, or PVC/CPVC pipes passing through Walls, Floors, Tanks, Pipeline Casings, and Vaults. The PEN-SEAL, while being used to seal the gap in electrical conduit lines, will also act as an insulator.

The PEN-SEAL has been designed to provide a gas and watertight seal. All sizes have been tested to withstand a hydrostatic seal up to 20 psig or 40 feet of head pressure in addition to withstanding temperatures up to 250° F.

PEN-SEAL's standard elastomer material is EPDM, which is suitable for temperatures ranging from -40° F to 250° F. EPDM is suitable for most applications in water—above ground and direct burial—and will provide the electrical insulation where cathodic protection is required. Silicone material is also available for higher temperature applications up to 400° F.

Where the PEN-SEAL may come in contact with Hydrocarbons, Oil, Gas, Jet Fuel, and miscellaneous solvents, a Nitrile material is available with temperatures ranging from -40° F to 210° F.

The PEN-SEAL utilizes glass-reinforced plastic for the pressure plates and all hardware is manufactured from Steel Zinc Dichromate. For corrosion resistance, Stainless Steel hardware is available upon request.

Various applications for the PROCO PEN-SEAL:

- Wall Sleeves
- Floor Sleeves
- Interior Piping
- Noise Dampener
- Electrical Contractors
- Pulp & Paper
- Precast Concrete
- Mining
- Marine
- Water & Wastewater
- HVAC
- Power Generation
- Valve Pits
- Offshore Oil Platforms
- Telecommunications
- Dual Containment Seal
- Underground Steel Tanks
- Coal Preparation Plants

Sizing Table for Standard Weight Steel, PVC and CPVC Pipe

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
0.5	0.840	2.000	2.067	**PS-200**	4	1.0	2.000	**PS-200**	4	1.0
0.75	1.050	2.500	2.469	**PS-275**	5	1.0	2.500	**PS-275**	5	1.0
1	1.315	2.500	2.469	**PS-200**	5	1.0	3.000	**PS-300**	4	1.0
1.25	1.660	3.000	3.068	**PS-275**	7	1.0	3.000	**PS-275**	7	1.0
1.5	1.900	3.500	3.548	**PS-300**	5	2.5	3.500	**PS-300**	5	2.5
2	2.375	4.000	4.026	**PS-300**	6	2.5	4.000	**PS-300**	6	2.5
2.5	2.875	4.000	4.026	**PS-200**	9	1.0	4.000	**PS-200**	9	1.0
3	3.500	5.000	5.047	**PS-300**	8	2.5	5.000	**PS-300**	8	2.5
3.5	4.000	6.000	6.065	**PS-325**	5	6.0	6.000	**PS-325**	5	6.0
4	4.500	6.000	6.065	**PS-300**	10	2.5	6.000	**PS-300**	10	2.5
5	5.563	8.000	7.981	**PS-425**	6	10.0	8.000	**PS-425**	6	10.0
6	6.625	10.000	10.020	**PS-475**	10	11.0	10.000	**PS-475**	10	11.0
8	8.625	12.000	12.000	**PS-475**	12	11.0	12.000	**PS-475**	12	11.0
10	10.750	14.000	13.250	**PS-425**	10	10.0	14.000	**PS-400**	10	12.0
12	12.750	16.000	15.250	**PS-425**	12	10.0	16.000	**PS-400**	12	12.0
14	14.000	18.000	17.250	**PS-400**	13	12.0	16.000	**PS-325**	15	6.0
16	16.000	20.000	19.250	**PS-400**	15	12.0	18.000	**PS-325**	17	6.0
18	18.000	24.000	23.250	**PS-500**	16	23.0	22.000	**PS-575**	20	20.0
20	20.000	24.000	23.250	**PS-400**	18	12.0	24.000	**PS-575**	22	20.0
22	22.000	26.000	25.250	**PS-400**	20	12.0	26.000	**PS-575**	24	20.0
24	24.000	30.000	29.250	**PS-500**	21	23.0	28.000	**PS-575**	26	20.0
26	26.000	30.000	29.250	**PS-400**	23	12.0	30.000	**PS-575**	28	20.0
28	28.000	34.000	33.250	**PS-500**	24	23.0	32.000	**PS-575**	30	20.0
30	30.000	36.000	35.250	**PS-500**	26	23.0	34.000	**PS-575**	32	20.0
32	32.000	38.000	37.250	**PS-500**	27	23.0	36.000	**PS-575**	34	20.0
34	34.000	40.000	39.250	**PS-500**	29	23.0	38.000	**PS-575**	36	20.0
36	36.000	42.000	41.250	**PS-500**	31	23.0	40.000	**PS-575**	38	20.0
42	42.000	48.000	47.250	**PS-500**	36	23.0	46.000	**PS-575**	44	20.0
48	48.000	54.000	53.250	**PS-500**	41	23.0	52.000	**PS-575**	50	20.0

Notes: 1. **Minimum recommended sleeve length or wall thickness is 4" for PEN-SEAL Model PS-325 and smaller and 6" for Models PS-400 and larger.**

2. **PEN-SEAL weights are based on a ten (10) link belt.**

**** PEN-SEAL sets are sold in belts of ten (10) links.**

Sizing Table for Copper Tubing

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
0.5	0.625	2.000	2.067	PS-275	4	1.0	2.000	PS-275	4	1.0
0.75	0.875	2.000	2.067	PS-200	4	1.0	2.000	PS-200	4	1.0
1	1.125	2.500	2.469	PS-275	5	1.0	3.000	PS-315	4	3.5
1.25	1.375	3.000	3.068	PS-300	4	2.5	3.000	PS-300	4	2.5
1.5	1.625	3.000	3.548	PS-275	7	1.0	3.000	PS-275	7	1.0
2	2.125	3.500	4.026	PS-275	8	1.0	3.500	PS-275	8	1.0
2.5	2.625	4.000	4.026	PS-275	10	1.0	4.000	PS-275	10	1.0
3	3.125	5.000	5.047	PS-325	4	6.0	5.000	PS-325	4	6.0
4	4.125	6.000	6.065	PS-325	5	6.0	6.000	PS-325	5	6.0
6	6.125	8.000	7.981	PS-325	7	6.0	8.000	PS-325	7	6.0
8	8.125	10.000	10.020	PS-325	9	6.0	10.000	PS-325	9	6.0
10	10.125	14.000	12.000	PS-400	10	12.0	14.000	PS-475	14	11.0
12	12.125	16.000	15.250	PS-400	12	12.0	16.000	PS-475	16	11.0

Sizing Table for Electrical Metallic Tubing (EMT)

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
0.5	0.706	2.000	2.067	PS-275	4	1.0	2.000	PS-275	4	1.0
0.75	0.922	2.000	2.067	PS-200	4	1.0	2.000	PS-200	4	1.0
1	1.163	3.000	3.068	PS-315	4	3.5	3.000	PS-315	4	3.5
1.25	1.510	3.000	3.068	PS-300	4	2.5	3.000	PS-300	4	2.5
1.5	1.740	3.500	3.548	PS-315	5	3.5	3.500	PS-315	7	3.5
2	2.197	4.000	4.026	PS-315	6	3.5	4.000	PS-315	8	3.5
2.5	2.875	4.000	4.026	PS-200	9	1.0	4.000	PS-200	10	1.0
3	3.500	5.000	5.047	PS-300	8	2.5	5.000	PS-300	4	2.5
3.5	4.000	6.000	6.065	PS-325	5	6.0	6.000	PS-325	5	6.0
4	4.500	6.000	6.065	PS-300	10	2.5	6.000	PS-300	7	2.5

Sizing Table for Intermediate Metal Conduit (IMC)

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
0.5	0.815	2.000	2.067	PS-200	4	1.0	2.000	PS-200	4	1.0
0.75	1.029	2.000	2.067	PS-200	4	1.0	2.500	PS-275	6	1.0
1	1.290	2.500	2.469	PS-275	6	1.0	3.000	PS-300	4	2.5
1.25	1.638	3.500	3.548	PS-315	5	3.5	3.000	PS-275	7	1.0
1.5	1.883	3.500	3.548	PS-300	5	2.5	3.500	PS-300	5	2.5
2	2.360	4.000	4.026	PS-300	6	2.5	4.000	PS-300	6	2.5
2.5	2.857	4.000	4.026	PS-200	9	1.0	4.000	PS-200	9	1.0
3	3.476	5.000	5.047	PS-300	8	2.5	5.000	PS-300	8	2.5
3.5	3.971	6.000	6.065	PS-325	5	6.0	6.000	PS-325	5	6.0
4	4.466	6.000	6.065	PS-300	10	2.5	6.000	PS-300	10	2.5

Notes:
1. Minimum recommended sleeve length or wall thickness is 4" for PEN-SEAL Model PS-325 and smaller and 6" for Models PS-400 and larger.
2. PEN-SEAL weights are based on a ten (10) link belt.

** PEN-SEAL sets are sold in belts of ten (10) links.

Sizing Table for Rigid Steel Conduit (RSC)

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
0.5	0.840	2.000	2.067	**PS-200**	4	1.0	2.000	**PS-200**	4	1.0
0.75	1.050	2.500	2.469	**PS-275**	6	1.0	2.500	**PS-275**	6	1.0
1	1.315	2.500	2.469	**PS-200**	5	1.0	3.000	**PS-300**	4	2.5
1.25	1.660	3.500	3.548	**PS-315**	5	3.5	3.000	**PS-275**	7	1.0
1.5	1.900	3.500	3.548	**PS-300**	5	2.5	3.500	**PS-200**	5	1.0
2	2.375	4.000	4.026	**PS-300**	6	2.5	4.000	**PS-300**	6	2.5
2.5	2.875	4.000	4.026	**PS-200**	9	1.0	4.000	**PS-200**	9	1.0
3	3.500	5.000	5.047	**PS-300**	8	2.5	5.000	**PS-300**	8	2.5
3.5	4.000	6.000	6.065	**PS-325**	5	6.0	6.000	**PS-325**	5	6.0
4	4.500	6.000	6.065	**PS-300**	10	2.5	6.000	**PS-300**	10	2.5
5	5.563	8.000	7.981	**PS-425**	6	10.0	8.000	**PS-425**	6	10.0
6	6.625	8.000	7.981	**PS-300**	15	2.5	10.000	**PS-475**	10	11.0

Sizing Table for Ductile Iron Pipe (AWWA-Type)

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
2	2.500	4.000	4.026	**PS-300**	6	2.5	4.000	**PS-300**	6	2.5
2.25	2.750	5.000	5.047	**PS-325**	4	6.0	5.000	**PS-325**	5	6.0
3	3.960	6.000	6.065	**PS-325**	5	6.0	6.000	**PS-325**	5	6.0
4	4.800	8.000	7.981	**PS-400**	5	12.0	8.000	**PS-400**	5	12.0
6	6.900	10.000	10.020	**PS-400**	7	12.0	10.000	**PS-400**	7	12.0
8	9.050	12.000	12.000	**PS-400**	9	12.0	12.000	**PS-400**	9	12.0
10	11.100	14.000	13.250	**PS-325**	12	6.0	14.000	**PS-400**	10	12.0
12	13.200	16.000	15.250	**PS-325**	14	6.0	16.000	**PS-425**	12	10.0
14	15.300	18.000	17.250	**PS-325**	16	6.0	18.000	**PS-425**	14	10.0
16	17.400	20.000	19.250	**PS-315**	39	3.5	20.000	**PS-425**	16	10.0
18	19.500	24.000	23.250	**PS-475**	25	11.0	22.000	**PS-425**	18	10.0
20	21.600	26.000	25.250	**PS-475**	28	11.0	26.000	**PS-525**	19	21.0
24	25.800	30.000	29.250	**PS-400**	23	12.0	30.000	**PS-575**	28	20.0
30	32.000	38.000	37.250	**PS-500**	27	23.0	36.000	**PS-575**	34	20.0
36	38.300	42.000	41.250	**PS-400**	34	12.0	43.000	**PS-525**	33	21.0
42	44.500	48.000	47.250	**PS-425**	39	10.0	49.000	**PS-525**	38	21.0
48	50.800	54.000	53.250	**PS-425**	45	10.0	56.000	**PS-500**	43	23.0

Notes:
1. **Minimum recommended sleeve length or wall thickness is 4" for PEN-SEAL Model PS-325 and smaller and 6" for Models PS-400 and larger.**
2. **PEN-SEAL weights are based on a ten (10) link belt.**

**** PEN-SEAL sets are sold in belts of ten (10) links.**

Sizing Table for Cast Iron Soil Pipe (Extra Heavy)

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
2	2.380	4.000	4.026	**PS-300**	6	2.5	4.000	**PS-300**	6	2.5
3	3.500	5.000	5.047	**PS-300**	8	2.5	5.000	**PS-300**	8	2.5
4	4.500	6.000	6.065	**PS-300**	10	2.5	6.000	**PS-300**	10	2.5
5	5.500	8.000	7.981	**PS-425**	6	10.0	8.000	**PS-425**	6	10.0
6	6.500	10.000	10.020	**PS-475**	10	11.0	10.000	**PS-475**	10	11.0
8	8.620	12.000	12.000	**PS-475**	12	11.0	12.000	**PS-475**	12	11.0
10	10.750	14.000	13.250	**PS-425**	10	10.0	14.000	**PS-400**	10	12.0
12	12.750	16.000	15.250	**PS-425**	12	10.0	16.000	**PS-400**	12	12.0
15	15.880	20.000	19.250	**PS-400**	15	12.0	20.000	**PS-575**	18	20.0

Sizing Table for Cast Iron Soil Pipe (Service Weight)

NOMINAL PIPE SIZE (Inches)	ACTUAL PIPE O.D. (Inches)	Standard Weight Steel or PVC Pipe Sleeve[1]					Cast or Core Bit Drilled Hole[1]			
		SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]	HOLE I.D. (Inches)	PEN-SEAL PART NUMBER	REQUIRED NUMBER OF LINKS	PEN-SEAL WEIGHT (lbs)[2]
2	2.300	4.000	1.026	**PS-300**	6	2.5	4.000	**PS-300**	6	2.5
3	3.300	5.000	5.047	**PS-315**	8	3.5	5.000	**PS-315**	8	3.5
4	4.300	6.000	6.065	**PS-315**	10	3.5	6.000	**PS-315**	10	3.5
5	5.300	8.000	10.020	**PS-425**	6	10.0	8.000	**PS-425**	6	12.0
6	6.300	10.000	10.020	**PS-475**	10	11.0	10.000	**PS-475**	10	12.0
8	8.380	12.000	12.000	**PS-475**	12	11.0	12.000	**PS-475**	12	12.0
10	10.500	14.000	13.250	**PS-425**	10	10.0	14.000	**PS-475**	14	10.0
12	12.500	16.000	15.250	**PS-425**	12	10.0	16.000	**PS-475**	17	10.0
15	15.620	20.000	19.250	**PS-475**	21	11.0	18.000	**PS-425**	15	10.0

Notes: 1. **Minimum recommended sleeve length or wall thickness is 4" for PEN-SEAL Model PS-325 and smaller and 6" for Models PS-400 and larger.**

2. **PEN-SEAL weights are based on a ten (10) link belt.**

**** PEN-SEAL sets are sold in belts of ten (10) links.**

CALCULATING PEN-SEAL SIZES

Use the following method if you cannot find the correct pipe size or wall sleeve from the Sizing Charts on pages 4 through 7.

Step 1 Calculate the Annular Space

The Annular Space is the space between the Outside Diameter of the pipe and the Inside Diameter of the Wall Sleeve or opening. This is calculated by using the following formula:

$$\textbf{Annular Space} = \frac{\textbf{Wall Opening I.D. - Pipe O.D.}}{\textbf{2}}$$

Step 2 Selecting the PEN-SEAL Model

Select the proper PEN-SEAL model from the Dimensional Chart (shown below) by comparing the Annular Space to the Neutral State and Expanded State Thickness. The Annular Space calculated must fall between the Neutral State Thickness and the Expanded State Thickness.

Step 3 Calculate the Number of Links Required

First, calculate the Bolt Circle:

$$\textbf{Bolt Circle} = \frac{\textbf{Wall Opening I.D. + Pipe O.D.}}{\textbf{2}}$$

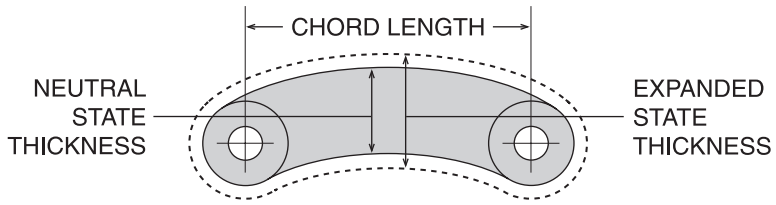
Then, determine the number of links required by using the following formula. Chord Length is found in the PEN-SEAL Dimensional Chart shown below.

$$\textbf{Number of Links} = \frac{\textbf{Bolt Circle x 3.14 } (\pi)}{\textbf{Chord Length}}$$

Finally, the number of links determined must be rounded down to the next whole number.

Please Note: PEN-SEAL sets are sold in belts of ten (10) links.

PEN-SEAL Dimensional Chart



SIZE	SEALING RANGE		
	NEUTRAL STATE THICKNESS (Inches)	EXPANDED STATE THICKNESS (Inches)	CHORD LENGTH (Inches)
PS-200	0.500	0.620	1.125
PS-275	0.620	0.780	0.910
PS-300	0.710	0.880	1.510
PS-315	0.820	1.030	1.470
PS-325	0.940	1.180	3.100
PS-400	1.430	1.810	3.625
PS-425	1.130	1.450	3.625
PS-475	1.620	1.900	2.625
PS-500	2.370	2.810	3.860
PS-525	2.180	2.500	3.860
PS-575	1.810	2.350	3.100
PS-600	3.200	4.000	4.000

Materials Guide

TYPE	SEAL MATERIAL	PRESSURE PLATES	BOLTS & NUTS	TEMPERATURE RANGE (°F)	APPLICATIONS*
E	EPDM Black	GLASS REINFORCED PLASTIC	STEEL Zinc Dichromate	-40° to +250°	Suitable for most applications in water, above ground and direct burial. Provides electrical insulation where cathodic protection is required.
ES	EPDM Black	GLASS REINFORCED PLASTIC	STAINLESS STEEL (18-8)	-40° to +250°	Suitable for environments where the corrosion resistance of stainless steel hardware is required.
P	NITRILE	GLASS REINFORCED PLASTIC	STEEL Zinc Dichromate	-40° to +210°	Resistant to most hydrocarbons, oil, gas, jet fuel, and many solvents.
PS	NITRILE	GLASS REINFORCED PLASTIC	STAINLESS STEEL (18-8)	-40° to +210°	Same as above, but with corrosion resistance of stainless steel hardware.
K	SILICONE	STEEL Zinc Dichromate	STEEL Zinc Dichromate	-40° to +400°	High temperature applications.

***For more details and complete chemical compatibility contact PROCO.**

PEN·SEAL

Standard Weight Steel or PVC Pipe Sleeves

Available in steel or PVC, wall sleeves are positioned in the wall before the concrete is poured. Wall sleeves offer a cleaner installation for every engineered piping system.

SLEEVE NOMINAL PIPE SIZE (Inches)	SLEEVE ACTUAL I.D. (Inches)	STANDARD SLEEVE LENGTH (Inches)	STANDARD WATERSTOP HEIGHT (Inches)	SLEEVE WEIGHT (lbs)	
				STEEL	PVC
2.00	2.07	12.00	2.00	6.00	0.75
2.50	2.47	12.00	2.00	8.00	1.50
3.00	3.07	12.00	2.00	10.00	1.50
3.50	3.55	12.00	2.00	12.00	1.75
4.00	4.03	12.00	2.00	14.00	2.00
5.00	5.05	12.00	2.00	18.00	2.75
6.00	6.07	12.00	2.00	23.00	2.75
8.00	7.98	12.00	2.00	34.00	3.75
10.00	10.02	12.00	2.00	47.00	5.00
12.00	12.00	12.00	2.00	57.00	5.00
14.00	13.25	12.00	2.00	62.00	6.50
16.00	15.25	12.00	2.00	72.00	7.25
18.00	17.25	12.00	2.00	80.00	11.25
20.00	19.25	12.00	2.00	T.B.D.	12.00
22.00	21.25	12.00	2.00	T.B.D.	17.50
24.00	23.25	12.00	2.00	T.B.D.	22.00
26.00	25.25	12.00	2.00	T.B.D.	23.00
28.00	27.25	12.00	2.00	T.B.D.	T.B.D.
30.00	29.25	12.00	2.00	T.B.D.	T.B.D.
32.00	31.25	12.00	2.00	T.B.D.	T.B.D.
34.00	33.25	12.00	2.00	T.B.D.	T.B.D.
36.00	35.25	12.00	2.00	T.B.D.	T.B.D.
38.00	37.25	12.00	2.00	T.B.D.	T.B.D.
40.00	39.25	12.00	2.00	T.B.D.	T.B.D.
42.00	41.25	12.00	2.00	T.B.D.	T.B.D.
44.00	43.25	12.00	2.00	T.B.D.	T.B.D.
46.00	45.25	12.00	2.00	T.B.D.	T.B.D.
48.00	47.25	12.00	2.00	T.B.D.	T.B.D.
50.00	49.25	12.00	2.00	T.B.D.	T.B.D.
52.00	51.25	12.00	2.00	T.B.D.	T.B.D.
54.00	53.25	12.00	2.00	T.B.D.	T.B.D.

Custom lengths and heights available upon request.

PEN-SEAL Order Form / RFQ

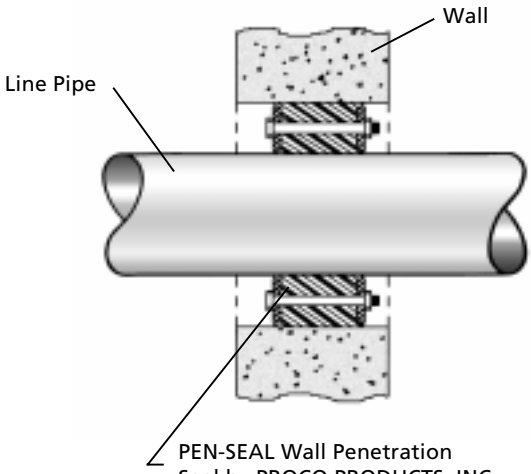
PEN-SEAL / MODEL PS

The PROCO PRODUCTS PEN-SEAL forms a mechanical rubber seal between pipes going through walls, floors, vaults, tanks, and pipeline casings and makes a watertight seal between a pipe and a wall hole. It can also be used to seal a gap between an inner pipe and an outer pipe sleeve or pipeline casing. The PEN-SEAL also will seal the gap between the electrical conduit and the outer conduit, or between the electrical conduit and the wall hole it passes through.

PROCO PRODUCTS PEN-SEAL is designed to form a hydrostatic seal of up to 20 psig and up to 40 feet of head. The PEN-SEAL, in addition to its sealing properties, helps absorb vibrations, shocks, and sound waves. It also insulates the inner pipe from all other outer structures, including outer pipe sleeves, pipeline casings, walls and tanks.

The PEN-SEAL is made from synthetic rubber with heavy-duty plastic pressure plates, which are resistant to sunlight and ozone. All bolts and nuts are plated with an anti-corrosive coating. Stainless steel nuts and bolts are also available.

IPS	=	Schedule 40 or Standard Weight Pipe Plastic Pipe API Pipe Electrical Conduit Any pipe with same O.D.
CT	=	Copper Tubing Any pipe with same O.D.
EMT	=	Electrical Metallic Tubing
IMC	=	Intermediate Metal Conduit
RSC	=	Rigid Steel Conduit
DI	=	Ductile Iron Pipe Plastic Pipe Any pipe with same O.D.
CI (EH)	=	Cast Iron (Extra Heavy)
CI (SW)	=	Cast Iron (Service Weight)



To use as Order Form or Request For Quotation (RFQ), photocopy this page and fax your information to PROCO PRODUCTS, INC. at (209) 943-0242.

QTY.	NOMINAL PIPE SIZE (Inches)	TYPE OF PIPE	PIPE O.D.	INNER PIPE THROUGH A CORE DRILLED HOLE			INNER PIPE THROUGH A WALL SLEEVE			NOTES
				HOLE DIA. (Inches)	PEN-SEAL MODEL NUMBER	REQUIRED NUMBER OF LINKS	SLEEVE I.D. (Inches)	PEN-SEAL MODEL NUMBER	REQUIRED NUMBER OF LINKS	

CUSTOMER _____

PROJECT _____

ENGINEER _____

ARCHITECT _____

ORDER NO. _____

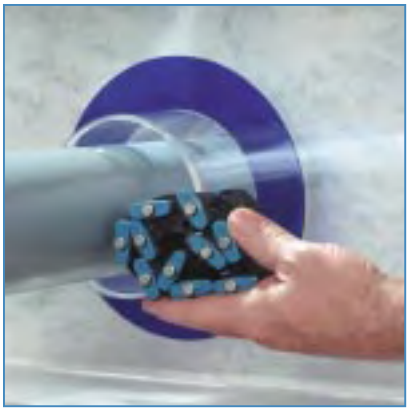
PROCO PRODUCTS, INC.
The Expansion Joint People

DESCRIPTION: **PEN-SEAL / MODEL PS**

DRAWN BY:	DATE:	DRAWING:
MWL	**4/02**	**PEN-SEAL**

PEN·SEAL

Easy Installation



1. Properly select the size of the PEN-SEAL required to seal the penetration using the Sizing Charts on pages 4 through 7.

2. Wrap the PEN-SEAL around the pipe and connect the ends.

3. Slide the PEN-SEAL into position.

4. Tighten each bolt on each pressure plate about 2–3 turns, going around the pipe ***(do not cross-tighten bolts)*** *until a proper seal is formed. A socket or offset wrench for 5/16, 1/2, 3/8, 9/16, 3/4, or 1-13/16" bolts will handle all installations.*