

Excellence in Manufacturing
UNAFLEX[®] LLC.

ISO 9001:2008 CERTIFIED



PTFE-FEP

2011 Revision

Expansion Joints and Flexible Connections
(Engineering Guide)



Industry Leader in COMBINED Technology

Unaflex® is the industry leader in “combined” technologies for the Expansion Joint and Flexible Hose industries. Since 1972 Unaflex® has been dedicated to state-of-the-art technologies combined with proven processes.

Our expertise and manufacturing capabilities include a full range of Rubber Expansion Joints, Flue Ducts, Expansion Joint Sound Absorbers, Custom Rubber Hose, Metal Hose, Pump Connectors, and Metal Bellows Type Expansion Joints....now, all available in any combination of PTFE, Metal and Rubber, to suit your application.

This catalog outlines selection and installation of our Metal/Elastomeric/PTFE Bellows type expansion joint, Metal/Elastomeric/PTFE Hose and Pump Connectors for use in pipelines and process vessels to absorb motion and vibration in the system. Our designs incorporate the latest recommendation of the Expansion Joint Manufacturers Association and the Fluid Sealing Association.

Unaflex® is a full service engineering organization offering a full range of products in the highest grades of elastomers and stainless steel, as well as exotic alloys including Monel®, Inconel®, and Hastelloy®.

Quality control is rigorous and complies with requirements of MIL-1-45208 and MIL-Q-9858. We are ISO 9001:2008 certified and our expansion joints also comply with U.S. Coast Guard requirements. Certification is available.

Special PTFE Products

- Large diameter solid PTFE joints similar to styles 112, 113 and 155 available in sizes to 124' in diameter.
- PTFE lined metal hose—superior strength combined with chemical resistance.
- Corrugated PTFE sleeves—built to your specifications.
- PTFE lined flue duct —for superior resistance to corrosive ducting applications.
- PTFE tubes—various diameters and lengths, complete fittings also available.
- PTFE gasket material—precut or roll form.





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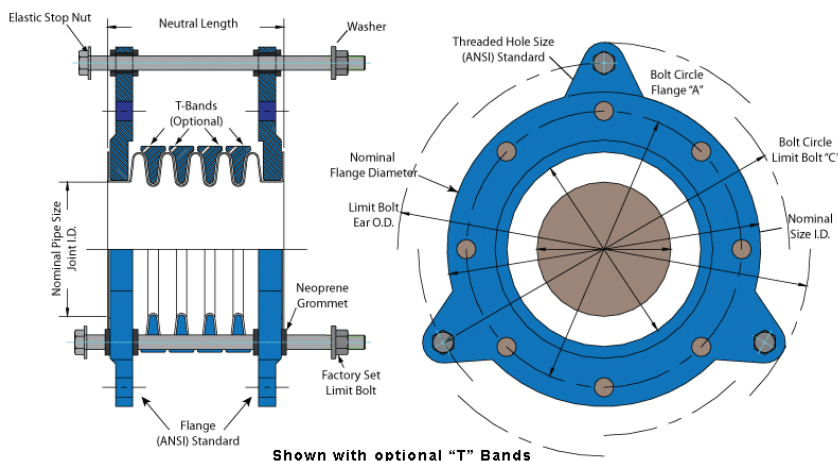
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UNALON Styles 112A&E, 113A&E and 115A&E

Unaflex® “Multi-Purpose” PTFE Expansion Joint styles 112, 113 and 115 are solid-molded of PTFE and specially designed to withstand the higher pressures and temperatures of today’s piping systems. Their design allows a shorter face-to-face dimension, making them ideal for installation where space limitations are a factor. They are lightweight in design and corrosion resistant. Available in sizes 1” to 48” I.D. and for temperatures ranging from -300°F to +400°F.

Materials of Construction



112A & 112E, 113A & 113E, 115A & 115E

112A & 112E, 113A & 113E, 115A & 115E	
Description	1"-12"
Bellows	PTFE T-62
Flanges	Ductile Iron
Reinforcing Rings	Stainless Steel
Limit Bolts	Carbon Steel
Nuts	Carbon Steel
Grommets	Neoprene
Washers	Carbon Steel

Note: Stainless Steel or Monel reinforcing rings available
 For greater pressures or safety requirements than shown, special overlays are available.
 Optional flow liners are available in: PTFE, Metallic, Elastomeric Stainless Steel, Nickel Alloy and Tantalum internal vacuum rings are available.

Consult our engineering department for further details.

Style 112A **Sizes • Spring Rates • Temperatures • Vacuum • Weights**

Movement Capabilities Based on Two Convolution Design¹
Spring Rate Capability²
Vacuum Rating³



Nominal Size I.D.	Neutral Length Inches.	± Axial (Δx) Movement (1)IN	Lateral (Δy) Movement (1)IN	Angular Deflection DEG	Compression Spring Rate LB ₂ /IN	Extension Spring Rate LB ₂ /IN	Lateral Spring Rate LB ₂ /IN	Thrust Factor	Pressure at Temperature (PSIG @ °F)								Weight/Lbs.	
									70°	100°	150°	200°	250°	300°	350°	400°		³ Hg at Temp
1.0	1.375	0.250	.125	7	102	79	102	2.7	185	170	148	130	115	100	84	68	29"@425°F	2
1.25	1.375	0.250	.125	7	60	135	396	2.2	185	170	148	130	115	100	84	68	29"@425°F	5
1.50	1.375	0.250	.125	7	316	178	221	4.6	185	170	148	130	115	100	84	68	29"@425°F	3
2.00	1.563	0.250	.125	7	506	297	237	7.0	185	170	148	130	115	100	84	68	29"@425°F	7
2.50	2.250	0.313	.125	7	452	275	324	9.6	185	170	148	130	115	100	84	68	29"@425°F	10
3.00	2.250	0.375	.188	7	641	316	315	15.9	185	170	148	130	115	100	84	68	29"@425°F	10
4.00	2.625	0.500	.250	7	475	277	396	23.7	185	170	148	130	115	100	84	68	29"@400°F	18
5.00	3.250	0.500	.250	7	435	435	316	33.1	185	170	148	130	115	100	84	68	29"@400°F	24
6.00	2.750	0.500	.250	7	435	382	435	50.2	185	170	148	130	115	100	84	68	29"@400°F	29
8.00	4.00	0.500	.250	7	445	386	475	83.4	164	150	129	112	100	87	73	60	29"@250°F	47
10.00	5.250	0.500	.250	7	752	594	574	108.3	164	150	129	112	100	87	73	60	29"@250°F	64
12.00	6.000	0.500	.250	7	1287	415	693	176.6	70	59	48	40	35	30	26	22	29.9"@75°F	115

***Safety Shields are recommended

Style 112E **Sizes • Spring Rates • Temperatures • Vacuum • Weights**

Movement Capabilities Based on Two Convolution Design¹
Spring Rate Capability²
Vacuum Rating³



Nominal Size I.D.	Neutral Length Inches.	± Axial (Δx) Movement (1)IN	Lateral (Δy) Movement (1)IN	Angular Deflection DEG	Compression Spring Rate LB ₂ /IN	Extension Spring Rate LB ₂ /IN	Lateral Spring Rate LB ₂ /IN	Thrust Factor	Pressure at Temperature (PSIG @ °F)								Weight/Lbs.	
									70°	100°	150°	200°	250°	300°	350°	400°		³ Hg at Temp
1.0	1.750	.344	.250	16	138	142	118	2.7	185	170	148	130	115	100	84	68	29"@425°F	3
1.50	1.813	.344	.250	13	237	198	237	4.6	185	170	148	130	115	100	84	68	29"@425°F	4
2.00	1.875	.344	.281	12	425	346	435	7.0	185	170	148	130	115	100	84	68	29"@425°F	7
3.00	2.188	.406	.313	10	643	316	346	15.9	185	170	148	130	115	100	84	68	29"@425°F	10
4.00	2.281	.438	.313	9	356	277	623	23.7	185	170	148	130	115	100	84	68	29"@400°F	17
6.00	2.531	.469	.375	7	455	346	712	50.2	185	170	148	130	115	100	84	68	29"@400°F	27
8.00	2.750	.531	.406	6	297	227	792	81.4	164	150	129	112	100	87	73	60	29"@250°F	35
10.00	2.969	.563	.438	5	1152	861	990	108.3	164	150	129	112	100	87	73	60	29"@250°F	52
12.00	3.094	.594	.469	5	376	237	990	175.6	70	59	48	40	35	30	26	22	29"@75°F	107

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Style 113A Sizes • Spring Rates • Temperatures • Vacuum • Weights

Movement Capabilities Based on Three Convolution Design¹
Spring Rate Capability²
Vacuum Rating³



Nominal Size I.D.	Neutral Length Inches.	± Axial (Δx) Movement (1)IN	Lateral (Δy) Movement (1)IN	Angular Deflection DEG	Compression Spring Rate LB ₂ /IN	Extension Spring Rate LB ₂ /IN	Lateral Spring Rate LB ₂ /IN	Thrust Factor	Pressure at Temperature (PSIG @ °F)										Weight/Lbs.
									70°	100°	150°	200°	250°	300°	350°	400°	³ Hg at Temp		
1.0	1.750	.500	.250	14	188	81	95	2.8	138	126	107	90	115	64	53	45	29"@400°F	2	
1.25	1.810	.500	.250	14	39	118	310	2.2	128	120	96	85	72	56	42	36	29"@400°F	5	
1.50	2.000	.500	.250	14	83	65	106	5.0	138	126	107	90	115	64	53	45	29"@400°F	4	
2.00	2.750	.750	.375	14	68	75	107	9.1	138	126	107	90	115	64	53	45	29"@400°F	8	
2.50	3.188	.750	.375	14	90	96	158	11.4	138	126	107	90	115	64	53	45	29"@400°F	11	
3.00	3.625	1.000	.500	14	122	123	192	16.9	138	126	107	90	115	64	53	45	29"@400°F	13	
4.00	3.625	1.000	.500	14	217	153	261	25.4	138	126	107	90	115	64	53	45	29"@400°F	19	
5.00	4.000	1.000	.500	14	316	207	320	34.4	138	126	107	90	115	64	53	45	29"@300°F	25	
6.00	4.000	1.125	.563	14	286	185	263	50.2	138	126	107	90	115	64	53	45	29"@300°F	30	
8.00	6.000	1.125	.563	14	176	215	418	83.4	138	110	94	80	100	57	47	38	29"@125°F	48	
10.00	7.000	1.188	.500	14	415	525	848	128.5	82	70	64	52	46	39	34	30	19.0"@125°F	60	
12.00	7.875	1.188	.625	14	735	536	848	144.7	82	70	64	52	46	40	34	30	10.0"@125°F	77	

***Safety Shields are recommended

Style 113E Sizes • Spring Rates • Temperatures • Vacuum • Weights

Movement Capabilities Based on Three Convolution Design¹
Spring Rate Capability²
Vacuum Rating³



Nominal Size I.D.	Neutral Length Inches.	± Axial (Δx) Movement (1)IN	Lateral (Δy) Movement (1)IN	Angular Deflection DEG	Compression Spring Rate LB ₂ /IN	Extension Spring Rate LB ₂ /IN	Lateral Spring Rate LB ₂ /IN	Thrust Factor	Pressure at Temperature (PSIG @ °F)										Weight/Lbs.
									70°	100°	150°	200°	250°	300°	350°	400°	³ Hg at Temp		
1.0	2.313	0.500	.375	24	128	128	257	2.8	138	126	107	90	76	64	53	45	29"@400°F	3	
1.50	2.406	0.531	.375	20	79	69	108	5.0	138	126	107	90	76	64	53	45	29"@400°F	5	
2.00	2.500	0.531	.406	17	69	79	158	9.1	138	126	107	90	76	64	53	45	29"@400°F	8	
3.00	2.906	0.625	.469	15	138	158	188	16.9	138	126	107	90	76	64	53	45	29"@400°F	14	
4.00	3.063	0.656	.500	13	217	158	188	25.4	138	126	107	90	76	64	53	45	29"@400°F	19	
6.00	3.375	0.719	.531	10	346	188	534	50.2	138	126	107	90	76	64	53	45	29"@300°F	30	
8.00	3.656	0.781	.594	9	445	168	742	81.4	120	110	94	80	67	57	47	38	29"@125°F	39	

Style 115A **Sizes • Spring Rates • Temperatures • Vacuum • Weights**

Movement Capabilities Based on Five Convolution Design¹
Spring Rate Capability²
Vacuum Rating³



Nominal Size I.D.	Neutral Length Inches.	± Axial (Δx) Movement (1)IN	Lateral (Δy) Movement (1)IN	Angular Deflection DEG	Compression Spring Rate LB ₂ /IN	Extension Spring Rate LB ₂ /IN	Lateral Spring Rate LB ₂ /IN	Thrust Factor	Pressure at Temperature (PSIG @ °F)								Weight/Lbs.	
									70°	100°	150°	200°	250°	300°	350°	400°		³ Hg at Temp
1.0	3.000	0.500	.500	20	29	43	21	2.7	72	61	46	40	34	29	27	24	29"@425°F	2
1.25	2.670	0.394	.470	20	35	112	169	2.2	62	56	42	36	30	26	22	22	29"@425°F	5
1.50	3.500	0.750	.500	20	74	82	45	4.6	72	61	46	40	34	29	27	24	29"@425°F	3
2.00	4.000	1.000	.500	20	59	46	49	7.0	72	61	46	40	34	29	27	24	29"@425°F	7
2.50	4.600	0.980	.510	20	114	315	282	9.6	62	56	42	36	30	26	22	22	29"@425°F	10
3.00	5.000	1.000	.500	20	54	59	168	15.9	72	61	46	40	34	29	27	24	29"@425°F	10
4.00	5.250	1.250	.625	20	71	59	79	23.7	72	61	46	40	34	29	27	24	29"@400°F	18
5.00	6.000	1.250	.625	20	138	384	396	33.1	62	56	42	36	30	26	22	22	29"@400°F	24
6.00	6.000	1.250	.625	20	188	128	193	50.2	72	61	46	40	34	29	27	24	29"@400°F	29
8.00	8.000	1.250	.625	20	300	384	452	83.4	48	42	34	30	26	22	22	22	29"@250°F	47
10.00	8.750	1.250	.625	20	453	384	452	108.3	48	42	34	30	26	22	22	22	29"@250°F	64
12.00	9.000	1.375	.688	20	523	440	452	176.6	48	42	34	30	26	22	22	22	29.9"@75°F	115

***Safety Shields are recommended

Style 115E **Sizes • Spring Rates • Temperatures • Vacuum • Weights**

Movement Capabilities Based on Five Convolution Design¹
Spring Rate Capability²
Vacuum Rating³



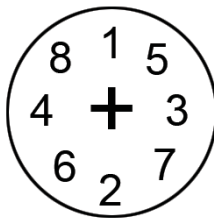
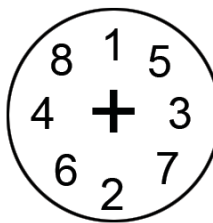
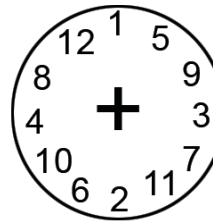
Nominal Size I.D.	Neutral Length Inches.	± Axial (Δx) Movement (1)IN	Lateral (Δy) Movement (1)IN	Angular Deflection DEG	Compression Spring Rate LB ₂ /IN	Extension Spring Rate LB ₂ /IN	Lateral Spring Rate LB ₂ /IN	Thrust Factor	Pressure at Temperature (PSIG @ °F)								Weight/Lbs.	
									70°	100°	150°	200°	250°	300°	350°	400°		³ Hg at Temp
1.0	3.500	0.844	.625	39	49	108	49	2.8	72	61	46	40	34	29	27	24	Consult Factory for Vacuum Rating	3
1.50	3.625	0.875	.656	32	74	79	49	5.0	72	61	46	40	34	29	27	24		7
2.00	3.750	0.875	.656	29	59	49	49	9.1	72	61	46	40	34	29	27	24		10
3.00	4.375	1.031	.781	25	54	59	168	16.9	72	61	46	40	34	29	27	24		16
4.00	4.563	1.094	.813	21	69	59	79	25.4	72	61	46	40	34	29	27	24		23
6.00	5.031	1.188	.906	17	188	128	193	50.2	72	61	46	40	34	29	27	24		34

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Installation Instructions for Unaflex Expansion Joints Styles 112A&E, 113A&E and 115A&E

- Do not remove flange covers (and spacer sleeves) until expansion joint is to be bolted into position or sealing forces may become warped or damaged.
- Limit bolts with elastic stop nuts are factory set at the maximum travel position to prevent over-extension. Severe damage or personal injury can result if the limit bolts and stop nuts are removed, replaced, or altered to exceed the factory setting, or if non-locking nuts are installed. Install expansion joint and nominal setting except, when used to handle hot material, the units should be installed at nearly extended length to permit compression when piping expands due to heat. If used in chilled line, install at nearly compressed length to permit piping to contract.
- Sealing faces of expansion joints and adjacent flanges must be clean and smooth. Sharp corners and burrs on adjacent flange faces, and any extended scratches in either face, should be removed with fine emery cloth. If surface irregularities cannot be completely removed, it may be necessary to install a 1/16" thick gasket to obtain adequate sealing. Gaskets are recommended when connecting to flanges of dissimilar materials.
- Do not install nuts or connecting bolt heads behind expansion joint flanges or accidental wrench damage may occur to the TFE element. Expansion joint flanges are tapped with thread sizes to accommodate ANSI class 150 or optionally glass pipe bolt sizes. At most, two bolt threads should extend behind expansion joint flanges to prevent interference and possible damage when expansion joint is compressed. Do not bore cut threads.
- Do not overtighten bolts
- Expansion joints should not be tested to more than 1-1/2 times the working pressure as indicated in the following pressure/temperature curves. Anchors must also be designed to withstand test pressure conditions and all anchors and guides must be installed and checked prior to testing.

Nominal Size (inches)	1	1-1/2	2	2-1/2	3	4	5	6	8	10	12	
Flange Bolt Torque, ft.-lbs.*	10	15	25	30	40	30	40	60	75	70	75	
No. of Holes per Flange	4	4	4	4	4	8	8	8	8	12	12	
*Note: The values in this table are a guide. In some instances, higher torque may be required. However, excessive torque should be avoided. Do not exceed twice the given values.												

Bolt Torque Sequence

UNALON® Style 9500 Heavy Duty PTFE/Metallic Expansion Joints

The Unalon® 9500 series is an expansion joint that combines the properties of The Unalon® 9500 series is an expansion joint that combines the properties of metal and PTFE into the most advance, versatile expansion joint on the market today.

Unlike ordinary solid PTFE or Elastomeric type expansion joints, should up-set conditions exceeding 500°F occur, Unalon® series 9500 will maintain it's pressure carrying capacity up to 1200°F, adequate time for system shut-down and replacement.

Safety

The Unalon® 9500 series PTFE or FEP tubes are formed into a Stainless Steel, Inconel®, Monel®, or Hastelloy® corrugated tube.

Additional Types of Expansion Joints: Lined, Hinged, Dual and Universal Tied

Note: For environmentally corrosive applications; laminated, (multi-ply) bellows as well as the optional features listed below are available.

- Highly corrosive chemical-petrochemical systems
- Abrasive industrial process piping systems
- Power generating and waste water treatment plants
- Pulp/paper systems and marine services
- Pollution control systems

Optional Testing Procedures

- Radiography of longitudinal bellows seam weld
- (PMI) Positive Material Identification of Bellows

Optional Coatings

- Four-part epoxy coating for flanges
- Fluoropolymer coated flanges, threaded rod and nuts

The Unalon® 9500 Series will:

- Absorb pipe movement and stress
- Isolate mechanical vibration
- Reduce system noise
- Protect against surge forces

Working temperature from -300°F to +400°F

Working Pressure: 50, 150 and 300 PSIG (please specify). For pressure above 300 PSIG, consult factory.



Standard Testing Procedures

- Dye penetrant test of all pressure boundary welds
- **Spark test at 30,000 volts, exceeds industry standard of 10,000 volts**
- Hydro test at 1.5 times the design pressure for 10 minutes

Optional Features

- Special flange construction, configuration and materials
- Internal vacuum rings for full vacuum service constructed of Stainless Steel, Nickel Alloys and Tantalum
- Protective covers available in Stainless Steel and Nickel Alloys
- Internal flow liners available in Stainless Steel, Nickel Alloys and TEFLON®



UNALON® Style 9500

Design Movements

Movements as described are for axial compression and extension. For lateral movements, consult factory.

9500 Movements/Number of Convolutions

Size N.D. In.	4 Conv.		5 Conv.		6 Conv.		7 Conv.		8 Conv.		9 Conv.		10 Conv.		11 Conv.		12 Conv.	
	EXT	COM	EXT	COM	EXT	COM	EXT	COM	EXT	COM	EXT	COM	EXT	COM	EXT	COM	EXT	COM
1-1/2"	0.10	0.40	0.13	0.54	0.17	0.67	0.20	0.81	0.24	0.94	0.27	1.08	0.30	1.21	0.34	1.34	0.37	1.48
2"	0.10	0.39	0.13	0.52	0.16	0.66	0.20	0.79	0.23	0.92	0.26	1.05	0.30	1.18	0.33	1.31	0.36	1.44
3"	0.10	0.39	0.13	0.53	0.16	0.66	0.20	0.79	0.23	0.92	0.26	1.05	0.30	1.18	0.33	1.32	0.36	1.45
4"	0.11	0.42	0.14	0.56	0.18	0.70	0.21	0.84	0.25	0.98	0.28	1.12	0.32	1.26	0.35	1.40	0.39	1.54
6"	0.14	0.55	0.18	0.73	0.23	0.91	0.27	1.09	0.32	1.28	0.36	1.46	0.41	1.64	0.46	1.82	0.50	2.01
8"	0.14	0.55	0.18	0.73	0.23	0.91	0.27	1.10	0.32	1.28	0.37	1.46	0.41	1.65	0.46	1.83	0.50	2.01
10"	0.14	0.55	0.18	0.73	0.23	0.92	0.27	1.10	0.32	1.28	0.37	1.47	0.41	1.65	0.46	1.83	0.50	2.02
12"	0.17	0.67	0.22	0.90	0.28	1.12	0.34	1.34	0.39	1.57	0.45	1.79	0.50	2.02	0.56	2.24	0.62	2.46
14"	0.24	0.94	0.31	1.26	0.39	1.57	0.47	1.89	0.55	2.20	0.63	2.52	0.71	2.83	0.79	3.15	0.87	3.46
16"	0.21	0.85	0.28	1.14	0.36	1.42	0.43	1.71	0.50	1.99	0.57	2.28	0.64	2.56	0.71	2.85	0.78	3.13
18"	0.21	0.85	0.28	1.14	0.36	1.42	0.43	1.71	0.50	1.99	0.57	2.28	0.64	2.56	0.71	2.85	0.78	3.13
20"	0.23	0.91	0.30	1.22	0.38	1.52	0.46	1.83	0.53	2.13	0.61	2.44	0.69	2.74	0.76	3.05	0.84	3.35
24"	0.27	1.06	0.35	1.42	0.44	1.77	0.53	2.13	0.62	2.48	0.71	2.84	0.80	3.19	0.89	3.55	0.98	3.90

Note: Axial extension may be increased by reducing compression and number of convolutions consult factory

9500 Face-to-Face Dimensions

Size N.D. In.	4 Conv.	5 Conv.	6 Conv.	7 Conv.	8 Conv.	9 Conv.	10 Conv.	11 Conv.	12 Conv.
1-1/2"	4	4.5	5	5.5	6	6.5	7	7.5	8
2"	4	4.5	5	5.5	6	6.5	7	7.5	8
3"	4.75	5.3125	5.875	6.4375	7	7.5625	8.125	8.6875	9.25
4"	5.125	5.75	6.375	7	7.625	8.25	8.875	9.5	10.125
6"	5.75	6.5	7.25	8	8.75	9.5	10.25	11	11.75
8"	6.5	7.3125	8.125	8.9375	9.75	10.563	11.375	12.138	13
10"	7	7.875	8.75	9.625	10.5	11.375	12.25	13.125	14
12"	7.75	8.75	9.75	10.75	11.75	12.75	13.75	14.75	15.75
14"	8.75	9.9375	11.125	12.313	13.5	14.688	15.875	17.063	18.25
16"	9.25	10.5	11.75	13	14.25	15.5	16.75	18	19.25
18"	9.75	11	12.25	13.5	14.75	16	17.25	18.5	19.75
20"	10.5	11.875	13.25	14.625	16	17.375	18.75	20.125	21.5
24"	11.25	12.688	14.125	15.563	17	18.438	19.875	21.313	22.75

Note: Standard face-to-face dimensions as shown. Other dimensions available on request, consult factory

***Deflection Force/Spring Rate**

Consult factory.

WARNINGS: Safety shields must be used at all times in hazardous services to protect against serious personal injury in the event of expansion joint failure. Liner sleeves must be used in abrasive service or where sharp-edged solids are or may be present.

Dura-Perm PTFE Lined Spool Type Expansion Joints

Unaflex® “DURA-PERM” *FEP-lined Expansion Joints combine the features of FEP/PTFE for chemical resistance, anti-stick properties, thermal stability, and resistance to age cracking—with the best features of elastomeric expansion joints—good noise and vibration dampening, flexibility and high-pressure ratings. Temperature ratings to 400°F available. Sizes of 1” to 48” I.D. in standard face-to-face dimensions, or special lengths.

1/2”-12” are PTFE lined. 14” and above are FEP lined (Fluorinated Ethylene Propylene Copolymer).

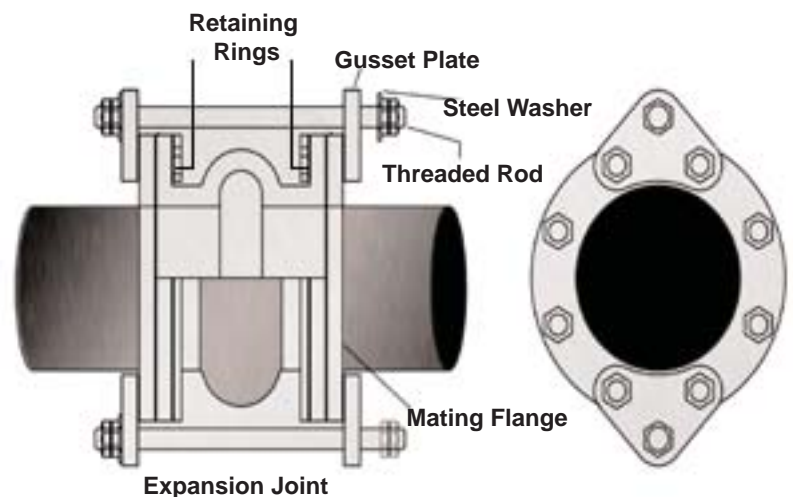


- They are recommended for use in the chemical and pulp paper industries because of their capabilities to resist corrosive attack, high temperatures and pressures.
- Chemical resistance/anti-stick properties
- Noise and vibration dampening/high flexibility
- Thermal stability/resistance to age cracking
- High pressure rating/temperature rating of 400 degrees

Control Units

Excess elongation, caused by shifting of pipelines may seriously damage rubber expansion joints. This damage can occur when:

- Necessary support is not provided for the weight of the pipeline
low temperatures in the line are encountered
- The lines on the pressure side of the air compressors are not anchored properly. Such destructive elongation can be controlled with Unaflex® control units.



In general, control units are always recommended as an additional safety factor, preventing damage to the connector and associated equipment. Our experts will recommend the units appropriate for your installation. PTFE, more commonly known by the brand name Teflon® by DuPont™ is Polytetrafluoroethylene). PTFE is a synthetic fluoropolymer which finds numerous applications.

Construction Details Styles 150, 200, 200XL and 1000

Tube

The tube is a single-molded PTFE leakproof lining extending flange to flange. The outside of the PTFE tube is etched to adhere to the elastomeric overlay.

Carcass

This is a high strength woven polyester or Kevlar® reinforcing fabric between the PTFE tube and the cover.

Steel Reinforcements

These are the chemically treated solid round endless rings or high tensile strength helical wire embedded in the carcass. The steel reinforcement provides additional strength for pressure and vacuum service.

Cover

This is the exterior elastomeric overlay designed to protect the carcass from external elements.

Options

Flow liners are available in PTFE, metallic, or elastomeric type.

Special Constructions

Hinged, gimbal and dual. (consult factory)

Temperature Limits for Continuous Service

Series	Temperature F	Elastomeric Cover
150	250	Neoprene or Nitrile
200	250	Neoprene or Nitrile
200XL	250	Neoprene or Nitrile
150 HT	300	Butyl or EPDM
200 HT	300	Butyl or EPDM
200 XL/HT	300	Butyl or EPDM
150 V	400	Viton®
200 V	400	Viton®
200 XL/V	400	Viton®

DURA-PERM PTFE Lined Spool Type Expansion Joints

UNAFLEX® does not use marginal constructions which reduce safety factors and cause pressure reductions with slight operating temperature increases.

Dimensions for DURA-PERM PTFE/FEP-Lined Style 1000 Expansion Joints

Joint Size N.D.	Face-to-Face	Flange O.D.	Bolt Circle Dia.	No. of Bolts	Bolt Hole Dia.	Retaining Ring I.D.	A-Flange Thickness B-Body Thickness C-Internal Arch Height D-Arch Width E-Arch Thickness					Style 1000 Max. PSI	Movements			Weights		
							A	B	C	D	E		Axial Compression	Axial Extension	Lateral Deflection	Joint Weight/lbs.	Retaining Rings/lbs.	Control Units Lbs.
1/2	6	3-1/2	2-3/8	4	9/16	1-1/4	1/2	7/8	1	1-3/4	3/8	225	1-3/4	3/4	3/4	1	1.5	6
3/4	6	3-7/8	2-3/4	4	9/16	1-5/8	1/2	7/8	1	1-3/4	3/8	225	1-3/4	3/4	3/4	1.5	2	6
1	6	4-1/4	3-1/8	4	5/8	1-7/8	9/16	7/8	1	1-3/4	3/8	225	1-3/4	3/4	3/4	2	2.25	6
1-1/4	6	4-5/8	3-1/2	4	5/8	2-1/8	9/16	7/8	1-1/8	1-3/4	7/16	225	1-3/4	3/4	3/4	2.5	2.5	6
1-1/2	6	5	3-7/8	4	5/8	2-3/8	9/16	7/8	1-1/8	1-3/4	7/16	225	1-3/4	3/4	3/4	3	3	6
2	6	6	4-3/4	4	3/4	3-1/8	9/16	29/32	1-1/4	1-3/4	1/2	225	1-3/4	3/4	3/4	4	4	7
2-1/2	6	7	5-1/2	4	3/4	4-1/8	9/16	29/32	1-1/4	1-3/4	1/2	225	1-3/4	3/4	3/4	4.5	5.5	7
3	6	7-1/2	6	4	3/4	4-5/8	9/16	29/32	1-1/4	1-3/4	1/2	225	1-3/4	3/4	3/4	5.5	6	7
4	6	9	7-1/2	8	3/4	5-7/8	9/16	7/8	1-1/4	1-3/4	1/2	225	1-3/4	3/4	3/4	8	7.5	8
5	6	10	8-1/2	8	7/8	6-7/8	9/16	7/8	1-1/4	1-3/4	1/2	225	1-3/4	3/4	3/4	9	8	8
6	6	11	9-1/2	8	7/8	7-7/8	5/8	1	1-1/4	1-3/4	1/2	225	1-3/4	3/4	1	11	9	9
8	6	13-1/2	11-3/4	8	7/8	9-7/8	3/4	1	1-1/2	1-3/4	5/8	225	1-3/4	3/4	1	15	12	12
10	8	16	14-1/4	12	1	12-1/8	3/4	1-5/32	1-1/2	1-3/4	11/16	225	1-3/4	3/4	1	23	16	16
12	8	19	17	12	1	14-1/2	3/4	1-5/32	1-1/2	1-3/4	11/16	225	1-3/4	3/4	1	34	22	16
14	8	21	18-3/4	12	1-1/8	16-1/2	7/8	1-5/32	2	1-3/4	3/4	225	1-3/4	3/4	1	40	25	20
16	8	23-1/2	21-1/4	16	1-1/8	18-1/2	7/8	1-5/32	2	1-3/4	3/4	160	1-3/4	3/4	1	47	27	20
18	8	25	22-3/4	16	1-1/4	20-1/2	7/8	1-5/32	2	1-3/4	3/4	160	1-3/4	3/4	1	56	29	21
20	8	27-1/2	25	20	1-1/4	22-5/8	1	1-5/32	2	1-3/4	25/32	130	1-3/4	3/4	1	67	35	21
22	10	29-1/2	27-1/4	20	1-3/8	24-5/8	1	1-5/32	2	1-3/4	25/32	130	1-3/4	3/4	1	70	44	32
24	10	32	29-1/2	20	1-3/8	26-5/8	1	1-5/32	2	1-3/4	25/32	130	1-3/4	1	1	79	46	32
26	10	34-1/4	31-3/4	24	1-3/8	28-7/8	1	1-3/16	2-1/4	1-3/4	13/16	110	1-3/4	1	1	100	50	32
28	10	36-1/2	34	28	1-3/8	30-7/8	1	1-3/16	2-1/4	1-3/4	13/16	110	1-3/4	1	1	102	55	32
30	10	38-3/4	36	28	1-3/8	32-7/8	1	1-3/16	2-1/4	1-3/4	13/16	95	1-3/4	1	1	117	58	32
34	10	43-3/4	40-1/2	32	1-5/8	37	1	1-3/16	2-1/4	1-3/4	13/16	95	1-3/4	1	1	122	91	43
36	10	46	42-3/4	32	1-5/8	39	1	1-3/16	2-1/4	2-1/4	13/16	90	2-1/4	1	1	143	99	43
40	10	50-3/4	47-1/4	36	1-5/8	43	1	1-3/16	2-1/4	2-1/4	13/16	90	2-1/4	1	1	173	108	43
42	12	53	49-1/2	36	1-5/8	45-1/4	1-3/16	1-1/4	2-1/2	2-1/4	29/32	90	2-1/4	1	1	193	110	44
44	12	55-1/4	51-3/4	40	1-3/4	47-1/4	1-3/16	1-1/4	2-1/2	2-1/4	29/32	90	2-1/4	1	1	198	136	44
48	12	59-1/2	56	44	1-5/8	51-1/4	1-3/16	1-1/4	2-1/2	2-1/4	29/32	90	2-1/4	1	1	211	154	87

PTFE-FEP

2011 Revision

PTFE/Flexible Rubber Pipe Connectors

“Super-Quiet” Styles 3150 and 3250

Unaflex® “Super-Quiet” Styles 3150 (150 psi WP) and 3250 (250 psi WP) sound absorbers are built with molded rubber flanged ends with bolt holes that accommodate standard steel flanges. Available with or without helical wire reinforcement. Special tubes can be made to meet unique requirements for either suction or discharge.



IMPORTANT: Unaflex® Vibration and Sound Absorbers are not designed to accommodate the movement in a piping system caused by temperature change or other conditions. See Spool-Type Expansion Joints for such applications.

Percentage of Reduction of Vibration Input with Frequency and Pressure as Compared to Steel Pipe

Center Freq. Hz	8" I.D. x 24" F-F Vibration Joint		
	10 psig	50 psig	80 psig
440	87%	91%	93%
68	95%	96%	99%
125	98%	99%	99%
250	96%	97%	99%
500	91%	93%	94%
1000	82%	91%	96%
2000	99%	99%	99%
4000	99%	99%	99%
8000	97%	97%	98%

EXAMPLE: If a steel piping system had a major vibration frequency of 1,000 Hz at 50 PSIG and 8" rubber expansion joint was installed in the pipeline, the percentage of reduction of vibration would be 96%. Above data taken from the Fluid Sealing Association Handbook.

Specify Unaflex® Flexible Connectors		
Style 3150	150# W.P.	180°F
Style 3250	250# W.P.	180°F
Style 3150 HT	150# W.P.	250°F
Style 3250 HT	250# W.P.	250°F

Joint Size N.D.(in.)	Face-to-Face		Style 3150 (Conforms to ANSI 150# Drilling)						Style 3250 (Conforms to ANSI 300# Drilling)					
	Min (in.)	Max (in.)	Ring I.D. (in.)	Flange Diam. (in.)	Flange Thick. (in.)	Bolt Cir. Diam. (in.)	Bolt Holes No.	Bolt Holes Diam. (in.)	Ring I.D. (in.)	Flange Diam. (in.)	Flange Thick. (in.)	Bolt Cir. Diam. (in.)	Bolt Holes No.	Bolt Holes Diam. (in.)
1-1/2	12	24	2-7/8	5	11/16	3-7/8	4	5/8	2-7/8	6-1/8	23/32	4-1/2	4	7/8
2	12	24	3-5/8	6	11/16	4-3/4	4	3/4	3-5/8	6-1/2	23/32	5	8	3/4
3	12	36	4-5/8	7-1/2	27/32	6	4	3/4	4-5/8	8-1/4	27/32	6-5/8	8	7/8
4	12	36	5-7/8	9	27/32	7-1/2	8	3/4	5-7/8	10	7/8	7-7/8	8	7/8
5	12	36	6-7/8	10	15/16	8-1/2	8	7/8	6-7/8	11	15/16	9-1/4	8	7/8
6	18	36	7-7/8	11	31/32	9-1/2	8	7/8	7-7/8	12-1/2	15/16	10-5/8	12	7/8
8	24	48	9-7/8	13-1/2	31/32	11-3/4	8	7/8	9-7/8	15	1-1/16	13	12	1
10	24	48	12-1/8	16	1-3/16	14-1/4	12	1	12-1/8	17-1/2	1-11/32	15-1/4	16	1-1/8
12	24	48	14-1/2	19	1-7/32	17	12	1	14-1/2	20-1/2	1-11/32	17-3/4	16	1-1/4

PTFE Lined Serpent Hose

Unaflex® combines the advantages of lightweight yet durable rubber hose, with PTFE's unsurpassed resistance to virtually all chemicals except molten Alkali metals such as Potassium, Lithium, and radium, as well as Fluorochemicals.

Serpent PTFE lined hose is an excellent choice for transfer service of acids, ester, acetone, aromatic hydrocarbons, organic chemicals and alcohols. Unaflex® hose is steam cleanable for short durations and is excellent for food handling services.



PTFE/Flexible Rubber Pipe Connector Construction Features

Tube

Smooth, non-stick PTFE or FEP tube.

Carcass

Rubber, reinforced with spirals of yarn and double spiral helix wire for maximum flexibility.

Cover

Standard Neoprene or EPDM for abrasion, weather and ozone resistance. Also pin pricked to allow for slight permeation through the outer cover if it should occur.

Lengths

Standard in 50 or 60 foot lengths. Shorter lengths available with built-in integral duck and rubber flanges with beaded ends where all wetted surfaces are PTFE.

Temperature Resistance

Up to 350°F with EPDM, up to 400°F with Viton® and Kevlar® reinforcement. Pressure ratings must be reduced as temperatures increase over 212°F.

Sizes

Serpent PTFE lined Rubber Hose is available in a wide range of sizes including large bore capacity up through 48" ID contact factory with your requirements.

Fittings

Unaflex® has the capabilities to build a duck and rubber flange or beading end into the hose which allows the PTFE liner to extend up the face of the flange or beaded end. These are tough durable fittings which have unique properties. Stainless steel swaged fittings are also available.

Specifications for Una-Chem S-250 Series

Part Number	Size ID (in.)	Size Nominal (in.)	Working Pressure (psi)	Minimum Burst Pressure (psi)	Minimum Rec. Bend Radius (in.)	Approx. Weight per Foot (lbs.)	Vacuum Rating In. (hg)
S-250-50	1/2	1.04	200	2400	3	0.47	30
S-250-75	3/4	1.29	200	2400	6	0.60	30
S-250-100	1	1.54	200	2400	9	0.73	30
S-250-125	1-1/4	1.8	200	2000	11	0.90	30
S-250-150	1-1/2	2.05	200	1800	12	1.04	30
S-250-200	2	2.55	200	1500	16	1.32	30
S-250-300	3	3.64	200	900	30	2.00	30
S-250-400z	4	4.68	200	700	40	3.08	30

PTFE-FEP

2011 Revision

PTFE Lined Metal Pump Connectors

Unalon® Series 8000 PTFE combines the corrosion resistance of PTFE with the pressure and safety characteristics of stainless steel. corrugated hose and braid available with standard, metric or special flanges. Units can also be provided with floating flanges to facilitate installation.

For environmentally corrosive applications, these units can also be provided with vulcanized elastomeric coverings on the outer braid. Lengths up to 50' available.



Flanged Metal Pump Connector Specifications

Part Number TFE	Flange IPS and Nom. Hose I.D. (in.)	Overall Length (in.)	Max Working Press. @ Room Temp (psi)	Approx. Wt. (lbs.) Per Unit
8202	2-1/2	9	250	16
8003	3	9	250	19
8203	3-1/2	9	200	23
8004	4	9	200	19
8005	6	11	200	32
8006	6	11	200	40
8008	8	12	200	62
8010	10	13	150	101
8012	12	14	125	153
8014	14	14	100	200

Installation Recommendations

- | Do's | Don'ts |
|---|---|
| <ul style="list-style-type: none">• Inspect for damage during shipment, i.e. dents, broken hardware, water marks on carton, etc.• Store in clean dry area where it will not be exposed to heavy traffic or damaging environment.• Use only designated lifting lugs.• Make the piping system fit the expansion joint by stretching, compressing or offsetting the joint to fit the piping, it may be overstressed when the system is in service.• It is good practice to leave one flange loose until the expansion joint has been fitted into position. Make necessary adjustments of loose flanges before welding.• Install joint with arrow pointing in the direction of flow.• Install single Van Stone liners pointing in the direction of flow. Be sure to install a gasket between the metallic liner and Van Stone flange as well as between the mating flange and liner.• With telescoping Van Stone liners, install the smallest I.D. liner pointing in the direction of flow.• Remove all shipping devices after the installation is complete and before any pressure test of the fully installed system.• Remove any foreign material that may have become lodged between the convolution.• Refer to EJMA standards for proper guides. | <ul style="list-style-type: none">• Do not drop or strike carton• Do not remove shipping bars until installation.• Do not use hanger lugs as lifting lugs without approval of manufacturer.• Do not use chains or any lifting device directly on the bellows or bellow cover.• Protect with wet chloride-free asbestos.• Do not use cleaning agents that contain chlorides.• Do not allow weld spatter to hit unprotected bellows.• Do not use steel wool or wire brushes on bellows.• Do not force-rotate one end of an expansion joint alignment of bolt holes. Ordinary bellows are not capable of absorbing torque.• Do not hydrostatic pressure test or evacuate the system before proper installation not all guides and anchors.• Pipe hangers are not adequate guides.• Do not exceed a pressure of 1-1/2 times the rated working pressure of the expansion joint.• Do not use shipping bars to retain the pressure thrust if tested prior to installation. |

Additional Suggestions

- Clean all foreign matter and remove burrs or sharp edges from flanges
- All pipelines should be properly supported so that the expansion joints do not carry the pipe load
- Remove burrs or sharp edges from flanges
- Do not install joints on raised face flanges of more than 1/16"
- All pipes are to be lined up accurately before installing expansion joints. Offset joints should be installed where misalignment is greater than the lateral movement allowed by the joint construction
- Bolts should be on the inside of the joint flange. Metal washer must be placed at the facing of the split retaining ring
- Bolts should be tightened by alternating around the flange and all tightened equally
- Slight gouges or abraded areas caused by tools or bolts during installation should be sealed with rubber cement and painted to prevent deterioration of the carcass
- Bolt tightness should be checked one week after going on stream and periodically thereafter
- If system is not anchored to insure against movement beyond maximum stated limits, a control unit must be used

Technical Information

Flange Bolt Torquing for Unaflex® PTFE-lined piping products

General techniques utilized to install flanged carbon steel piping systems may also be applied to Unaflex® PTFE-lined piping systems.

When assembling flange connections, it is recommended that a full complement of clean, new and high-strength A193-B7 bolting is consistently utilized. When stainless steel bolting is used, consist of A 320/A320M Class 2 B8 (304 SS) or Class 2 B8M (316 SS) with A 194/A194M Grade 8 or 8A Nuts (for 304 SS) or Grade 8M or 8MA (for 316 SS). When other bolting materials are employed, user should ensure new bolting material strength properties exceed the calculated bolt stress values generated in establishing the piping connection.

The following practices are strongly recommended:

- Always utilized flat washers on both sides of the connection
- Ensure that the flange bolts are tightened with a calibrated torque wrench expressly for the specified bolt torques. Note: For anti-seize compounds, the torque values may vary. Please contact Unaflex® for more information
- Firmly secure the flange bolts with a torque wrench utilizing a “crisscross” pattern that alternately tightens the bolts located 180 degrees apart
- Employing the above mentioned pattern, tighten the bolts in 20% increments of the final bolt torque until 80% of the final bolt torque has been accomplished
- To tighten the final torque values, firmly tighten bolts sequentially clockwise one time around the flange. This procedure ensures the bolts have been evenly stressed
- Extreme caution should be taken to avoid over-torquing which can result in damage to plastic sealing surfaces

NOTE: When bolting dissimilar materials, always tighten to the lowest recommended torque of the components in the joint. Employing higher torques may cause excessive deformation of the “softer” material contained in the joint. Position a ½” thick spacer between Unaflex PTFE-lined pipe or fittings and other plastic-lined components, particularly valves, should differences in the diameters of the raised plastic faces occur. *Belleville washers are not recommended for use with PTFE-lined products.

Retorquing

A retorque should be applied a minimum of 24 hours after the initial torque or after the first thermal cycle. Retorquing enables seating of the plastic and allows for the relaxation of the bolts. In the event that the system is intended to perform at elevated temperatures, hot water should be circulated at the maximum operating temperature of the process (if possible) for at least 24 hours. This process will allow the pipe system to experience one full thermal cycle.

After cool-down, retorquing of the system should be completed. Torquing need only be completed on the system in the ambient, cooled state and never while the process is at an elevated temperature. This could cause excessive force to be exerted to the plastic faces. Never attempt to disassemble a flange joint in a hot system. Wait until the system has cooled to ambient temperature.

Technical Information

Hydrotesting

Typically after initial torque and retorque, a hydrotest should be carried out utilizing ANSI requirements. Experience has demonstrated that if the aforementioned procedure is adhered to, very few, if any flange joints will fail the hydrotest. If a flange joint leaks, first re-check the torque values and tighten in 10% increments over the specified bolt torques until completely sealed. If, however, 150% of the specified torque value has been reached and the flange joint continues to leak, stop the process and disassemble the flange joint. It is likely that something else is wrong, i.e, a scratched plastic face.

The hydrotest must be successfully completed, and any existing leaks corrected before the pipeline can be approved and commissioned.

Annual Retorquing

Retorquing should be completed a minimum of annually thereafter. This is particularly crucial if the process line experiences elevated temperatures or extreme ambient temperature exposure. Torquing should only be completed on the system in the ambient, cooled state. Never attempt this process at an elevated temperature as damaging excessive force may be applied to the plastic faces.

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