Excellence in Manufacturing

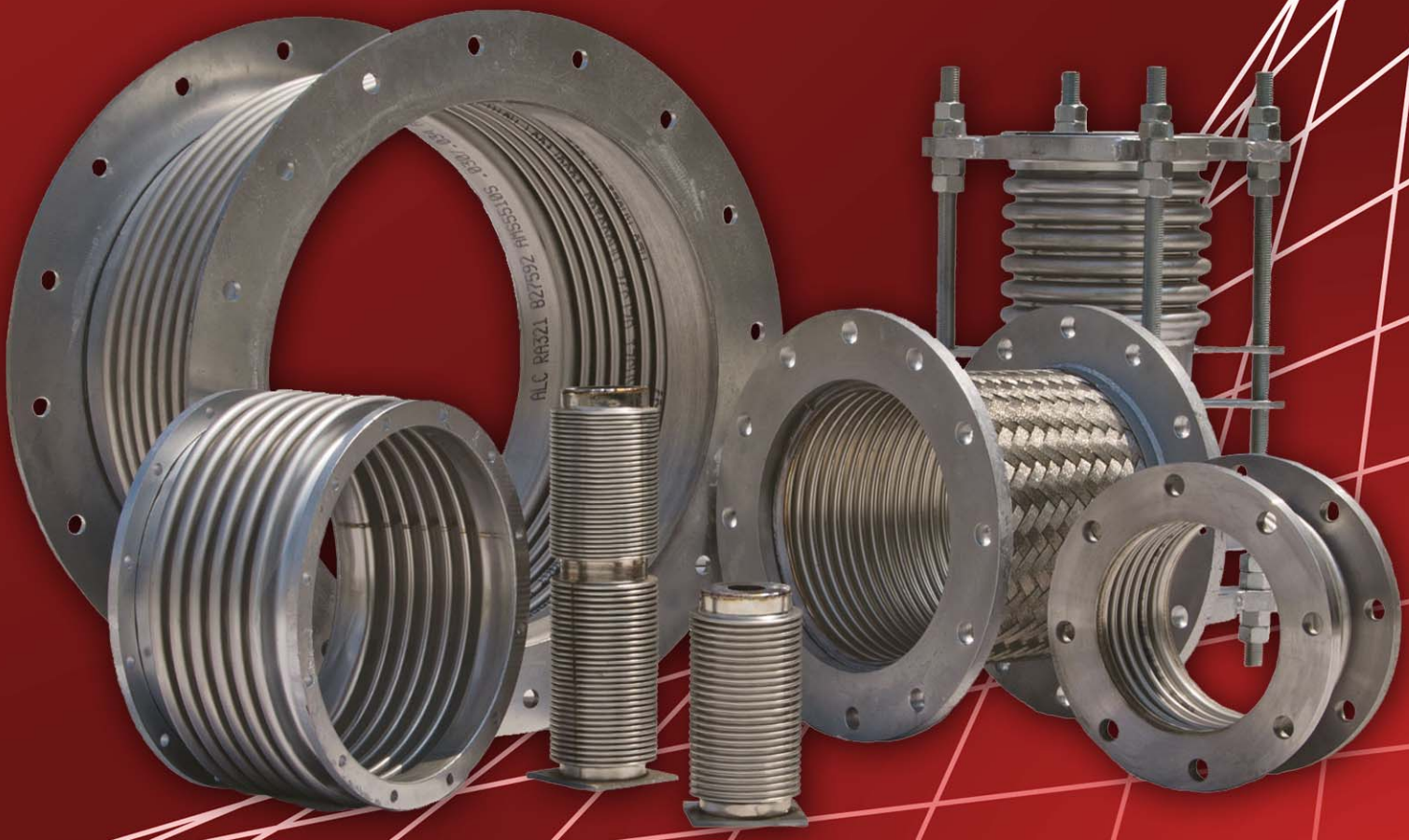
UNAFLEX® LLC.

ISO 9001:2008 CERTIFIED

MADE IN AMERICA

METAL Expansion Joints and Flexible Connectors

2011 Revision



Web: www. unaflex.com • Toll Free: 800.327.1286 • Email: sales@unaflex.com

A Leader in EXPANSION JOINT Manufacturing

No other manufacturer in the United States has the capabilities of Unaflex®. We are a full service expansion joint manufacturer offering a full range of flexible components and customer support. We offer a full range of products in the highest grades of stainless steel, as well as more exotic alloys including Monel®, Inconel® and Hastelloy®.

Unaflex® Quality control is rigorous and complies with requirements of MIL-I-45208 and MIL-Q-9858. Our Expansion Joints also comply with U.S. Coast Guard requirements. Certification is available.

Our expertise and manufacturing capabilities include Bellows-Type Metal Expansion Joints and Connectors, Rubber Expansion Joints, Teflon® Expansion Joints, Fabric Expansion Joints, Metal Hose and Pump Connectors. Unaflex® is one of the few companies in the world that can offer a complete expansion joint and hose product line.

This catalog outlines the selection and installation of our Metal Bellows Type Expansion Joints and Pump Connectors for use in piping/ducting systems along with process equipment to absorb thermal movement. Our products incorporate the latest recommendations of the Expansion Joint Manufacturers Association (EJMA).

A Leading Expansion Joint Manufacturer
Since 1972

Excellence in Manufacturing

UNAFLEX® LLC

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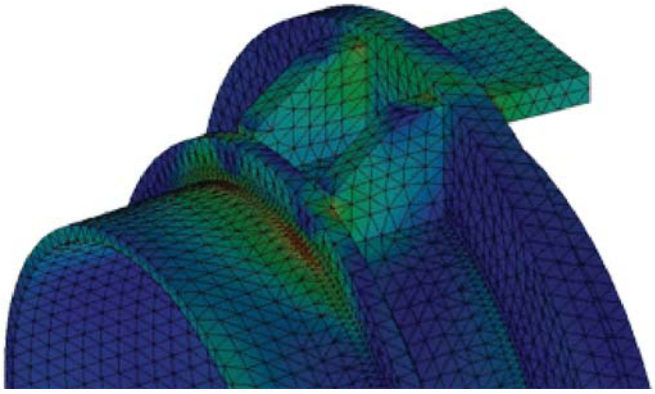
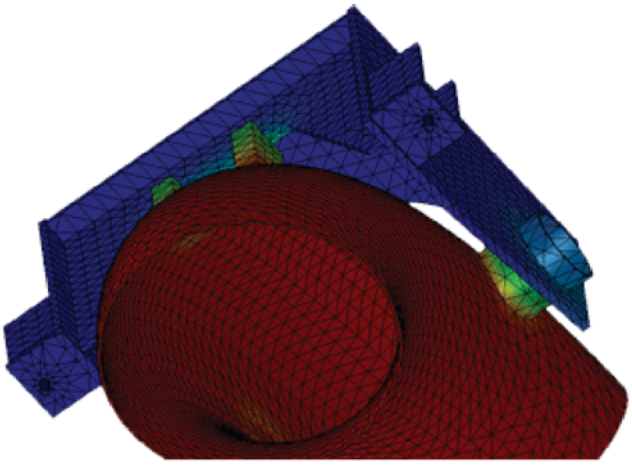
Overview

Engineering Capabilities

Unaflex® utilizes various engineering software programs to provide expansion joints in accordance with customer requirements for the utmost reliability. Some of these programs are industry-leading programs such as Finite Element Analysis (FEA) CAD/CAM and Expansion Joint Manufacturers Association (EJMA). Our products are fully engineered to industry accepted standards.

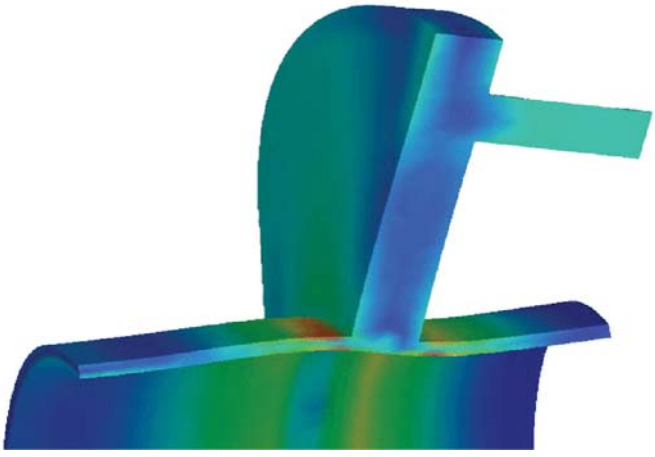


Stress distribution on a double ring with gussets hardware



Temperature distribution on a floating hardware assembly

Temperature distribution on a floating ring assembly



Stress Distribution on a ring to pipe attachment

Industry Codes

Unaflex® expansion joints are manufactured in accordance with EJMA's latest edition. Other Industry Standards that Unaflex® manufacturing can conform to but are not limited to, include:

- ASME B31.3
- ASME B31.1
- MIL-I-45208
- MIL-Q-9858
- U.S. Coast Guard Requirements

Bellows Material Specification

Unaflex® standard bellows material is A/SA240 321ss. Other materials available to Unaflex® to manufacture bellows are:

- A/SA240 304ss
- A/SA240 304Lss
- A/SA240 316ss
- A/SA240 316Lss
- A/SA240 310S
- B/SB443 Alloy 625 (Inconel® 625)
- B/SB168 Alloy 600 (Inconel® 600)
- B/SB575 Alloy C276 (Hastelloy®C276)
- B/SB575 Alloy C22 (Hastelloy®C22)
- B/SB127 ALLOY 400 (Monel® 400)
- B/SB409 ALLOY 800
- Duplex ALLOY 2205
- Hastelloy® X
- Nickel 200
- Alloy 20
- AL6XN

Unaflex® welders are qualified in accordance with ASME Section IX latest edition (procedures available for review upon request). We stock various types of bellows materials, flanges, plates, pipe and threaded rods for fast response and delivery times.

Manufacturing Capabilities

Unaflex® maintains an in-house machine shop complete with computer-controlled flame cutting capabilities, a high-speed laser machine and a water jet machine which enable us to provide a full range of metal working capabilities.

We are able to manufacture bellows from 2" ND to 144" ND as our standard with the capability to manufacture to 222" (18'-6"). We have both die forming and roll forming capabilities. We can perform in house dye-penetrant test, hydro and pneumatic pressure test, helium leak test and PMI (Positive Material Identification) by fully qualified Quality Control Personnel.

Matchless Expansion Joints

Unaflex® “MATCHLESS” bellows are manufactured from solution annealed A/SA240 321SS sheet rolled into a tube and seam welded. Multi-ply bellows can be designed and manufactured based on the application and design requirements. Unaflex® has a wide variety of materials available to design and manufacture bellows.

Unaflex® has the most commonly used bellows materials and thicknesses in stock to serve our customers faster. Unaflex® “MATCHLESS” bellows conform to the latest EJMA standards.

Overall lengths of standard assemblies are based on 150# drilling for both plate flange and raised face slip on thicknesses. Overall length may change if other types of flanges are requested. Overall lengths of the SHP and LHD series are based on 300# are raised face slip on flanges.

Fixed Plate Flanges–Type 44

Unaflex® Type 44 expansion joints are with 150# drill carbon steel flanges (AWWA Class D C207) fixed on each end of the expansion joint. Bellows necks are welded directly to the flanges.

Floating Plate Flanges–Type 66

Unaflex® Type 66 expansion joints are provided with 150# drill carbon steel flanges (AWWA class D C207) floating on each end of the expansion joint. Bellows necks are flared (Vanstone) to retain the flanges.

Floating flange arrangement allows use of carbon steel flanges when all wetted materials are required to be either Stainless Steel or an alloy material. Floating flanges also permit bolt hole alignment in the field.

Weld Ends–Type 22

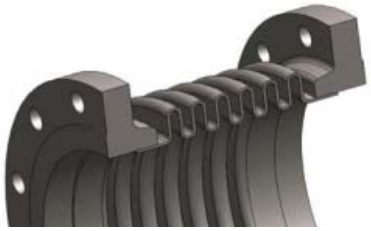
Unaflex® Type 22 expansion joints are provided with carbon steel weld ends on each end. Weld ends are beveled per ANSI standards. Schedule 40 (sch std.) pipe is used through 12” ND and 1/4” wall thickness for sizes over 12” unless otherwise specified.

Raised Face Slip On Flanges Type–55

Unaflex® Type 55 expansion joints are provided with 150# drill and 300# drill carbon steel raised face flanges.

Short Style Specification Chart Style 55

SLP-Short Style Low Pressure
SMP-Short Style Medium Pressure
SHP-Short Style High Pressure



Size (in.)	Series	Pressure (PSIG)	O.A.L.	Weight (lbs.)	Non-current Movements (in.)			Spring Rates (lbs./in.)	
					Comp.	Ext.	Lateral	Axial	Lateral
2	SLP SMP SHP	50 150 300	6 6 6	11 11 15	0.64	0.16	0.1	681 681 681	945 945 945
2.5	SLP SMP SHP	50 150 300	6 6 6.5	15 15 21	0.64	0.16	0.1	664 664 1,253	1,304 1,304 2,469
3	SLP SMP SHP	50 150 300	6 6 7	17 17 27	0.64	0.16	0.1	703 703 1,343	1,962 1,962 3,760
3.5	SLP SMP SHP	50 150 300	6 6 7	23 23 35	0.64	0.16	0.1	728 728 1,342	2,132 2,132 3,938
4	SLP SMP SHP	50 150 300	7 7 7.5	27 27 45	0.64	0.16	0.1	756 756 1,410	2,740 2,740 5,118
5	SLP SMP SHP	50 150 300	8 8 8	31 31 58	1.04	0.26	0.1	564 581 2,150	3,088 2,328 10,931
6	SLP SMP SHP	50 150 300	8 8 9	40 40 81	1.04	0.26	0.2 0.1 0.1	337 744 2,846	1,973 3,975 14,368
8	SLP SMP SHP	50 150 300	9 9.5 11	63 64 123	1.28	0.32	0.2 0.1 0.1	250 901 2,833	1,307 4,720 14,893
10	SLP SMP SHP	50 150 300	9.5 9.5 11	89 91 169	1.28	0.32	0.1	397 1,346 4,119	3,273 11,120 34,129
12	SLP SMP SHP	50 150 300	10 10 12	132 134 242	1.28	0.32	0.1	309 1,534 7,148	3,075 14,342 62,597
14	SLP SMP SHP	50 150 300	10.5 10.5 12.5	184 189 348	1.28	0.32	0.1	356 1,899 3,797	4,181 20,721 41,651
16	SLP SMP SHP	50 150 300	11 11 13	202 206 400	1.28	0.32	0.1	651 2,452 4,887	9,449 35,626 59,981
18	SLP SMP SHP	50 150 300	12 12 14	267 272 524	1.44	0.36	0.1	559 2,380 4,721	10,229 43,365 72,641
20	SLP SMP SHP	50 150 300	12 12 14	342 347 665	1.44	0.36	0.1	753 2,960 5,818	17,181 67,035 132,337
22	SLP SMP SHP	50 150 300	12 12.5 14.5	379 389 779	1.44	0.36	0.1	599 3,248 6,380	16,035 83,910 139,960
24	SLP SMP SHP	50 150 300	13 13 15	455 461 992	1.44	0.36	0.1	898 3,544 6,958	28,938 108,343 180,225

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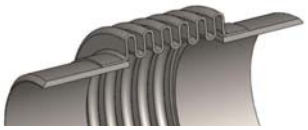
SLP-Short Style Low Pressure
SMP-Short Style Medium Pressure
SHP-Short Style High Pressure



Short Style Specification Chart Style 22

Size (in.)	Series	Pressure (PSIG)	O.A.L.	Weight (lbs.)	Non-concurrent Movements (in.)			Spring Rates (lbs./in.)	
					Comp.	Ext.	Lateral	Axial	Lateral
2	SLP SMP SHP	50 150 300	6	2 4 4	0.64	0.16	0.1	681 681 681	945 945 945
2.5	SLP SMP SHP	50 150 300	7	3 3 3	0.64	0.16	0.1	664 664 1,253	1,304 1,304 2,469
3	SLP SMP SHP	50 150 300	9	4 4 4	0.64	0.16	0.1	703 703 1,343	1,962 1,962 3,760
3.5	SLP SMP SHP	50 150 300	9	4 4 4	0.64	0.16	0.1	728 728 1,342	2,132 2,132 3,938
4	SLP SMP SHP	50 150 300	9	5 5 5	0.64	0.16	0.1	756 756 1,410	2,740 2,740 5,118
5	SLP SMP SHP	50 150 300	10	7 7 8	1.04	0.26	0.1	564 581 2,150	3,088 2,328 10,931
6	SLP SMP SHP	50 150 300	10	9 9 10	1.04	0.26	0.2 0.1 0.1	337 744 2,846	1,973 3,975 14,368
8	SLP SMP SHP	50 150 300	10	9 10 12	1.28	0.32	0.2 0.1 0.1	250 901 2,833	1,307 4,720 14,893
10	SLP SMP SHP	50 150 300	10	12 14 15	1.28	0.32	0.1	397 1,346 4,119	3,273 11,120 34,129
12	SLP SMP SHP	50 150 300	10	15 17 22	1.28	0.32	0.1	309 1,534 7,148	3,075 14,342 62,597
14	SLP SMP SHP	50 150 300	12	18 23 31	1.28	0.32	0.1	356 1,899 3,797	4,181 20,721 41,651
16	SLP SMP SHP	50 150 300	12	22 26 34	1.28	0.32	0.1	651 2,452 4,887	9,449 35,626 59,981
18	SLP SMP SHP	50 150 300	12	25 30 40	1.44	0.36	0.1	559 2,380 4,721	10,229 43,365 72,641
20	SLP SMP SHP	50 150 300	14	41 46 61	1.44	0.36	0.1	753 2,960 5,818	17,181 67,035 132,337
22	SLP SMP SHP	50 150 300	14	41 51 68	1.44	0.36	0.1	599 3,248 6,380	16,035 83,910 139,960
24	SLP SMP SHP	50 150 300	14	50 55 74	1.44	0.36	0.1	898 3,544 6,958	28,938 108,343 180,225
30 36 40	DS	50	14	56 67 72	1.44	0.36	0.2	960 1,100 1,490	175000 248000 380000
42 46 48	DS	50	14	84 98 170	1.60	0.40	0.2	1,680 1,742 3,600	410000 470000 500000
50 52 54	DS	25	14	179 210 218	1.60	0.40	0.2	2,500 3,215 3,605	174900 318000 604000
60 66 72	DS	25	14	242 283 309	1.60	0.40	0.1	4,200 4,400 4,750	780000 1,300,500 2,800,300
84 86 108	DS	15	14	395 460 491	1.60	0.40	0.1	5,478 6,300 7,210	4,610,000 12,100,000 18,400,000
126 132 144	DS	15	14	565 600 660	1.60	0.40	0.08	8,008 8,715 9,430	19,500,000 21,000,000 25,000,100

Short Style Specification Chart Style 44 and 66

SLP-Short Style Low Pressure
SMP-Short Style Medium Pressure
SHP-Short Style High Pressure

Style 44

Style 66

Size (in.)	Series	Pressure (PSIG)	O.A.L.	Weight (lbs.)	Non-concurrent Movements (in.)			Spring Rates (lbs./in.)	
					Comp.	Ext.	Lateral	Axial	Lateral
2	SLP SMP SHP	50 150 300	6	10 10 10	0.64	0.16	0.1	681 681 681	945 945 945
2.5	SLP SMP SHP	50 150 300	6	13 13 13	0.64	0.16	0.1	664 664 1,253	1,304 1,304 2,469
3	SLP SMP SHP	50 150 300	6	13 13 13	0.64	0.16	0.1	703 703 1,343	1,962 1,962 3,760
3.5	SLP SMP SHP	50 150 300	6	20 20 20	0.64	0.16	0.1	728 728 1,342	2,132 2,132 3,938
4	SLP SMP SHP	50 150 300	7	18 18 18	0.64	0.16	0.1	756 756 1,410	2,740 2,740 5,118
5	SLP SMP SHP	50 150 300	8	21 21 22	1.04	0.26	0.1	564 581 2,150	3,088 2,328 10,931
6	SLP SMP SHP	50 150 300	8	26 26 27	1.04	0.26	0.2 0.1 0.1	337 744 2,846	1,973 3,975 14,368
8	SLP SMP SHP	50 150 300	8	46 37 40	1.28	0.32	0.2 0.1 0.1	250 901 2,833	1,307 4,720 14,893
10	SLP SMP SHP	50 150 300	8	46 48 50	1.28	0.32	0.1	397 1,346 4,119	3,273 11,120 34,129
12	SLP SMP SHP	50 150 300	9	76 78 84	1.28	0.32	0.1	309 1,534 7,148	3,075 14,342 62,597
14	SLP SMP SHP	50 150 300	9	107 112 121	1.28	0.32	0.1	356 1,899 3,797	4,181 20,721 41,651
16	SLP SMP SHP	50 150 300	9	138 142 152	1.28	0.32	0.1	651 2,452 4,887	9,449 35,626 59,981
18	SLP SMP SHP	50 150 300	10	149 154 166	1.44	0.36	0.1	559 2,380 4,721	10,229 43,365 72,641
20	SLP SMP SHP	50 150 300	10	191 196 214	1.44	0.36	0.1	753 2,960 5,818	17,181 67,035 132,337
22	SLP SMP SHP	50 150 300	10	219 229 249	1.44	0.36	0.1	599 3,248 6,380	16,035 83,910 139,960
24	SLP SMP SHP	50 150 300	11	265 271 292	1.44	0.36	0.1	898 3,544 6,958	28,938 108,343 180,225
30 36 40	DS	50	11	377 497 602	1.44	0.36	0.2	960 1,100 1,490	175,000 248,000 380,000
42 46 48	DS	50	11	641 750 810	1.60	0.40	0.2	1,680 1,742 3,600	410,000 470,000 500,000
50 52 54	DS	25	11	900 1,008 1,061	1.60	0.40	0.2	2,500 3,215 3,605	174,900 318,000 604,000
60 66 72	DS	25	11	1,347 1,591 1,799	1.60	0.40	0.1	4,200 4,400 4,750	780,000 1,300,500 2,800,300
84 86 108	DS	15	11	2,137 3,916 3,200	1.60	0.40	0.1	5,478 6,300 7,210	4,610,000 12,100,000 18,400,000
126 132 144	DS	15	11	4,400 4,700 5,200	1.60	0.40	0.08	8,008 8,715 9,430	19,500,000 21,000,000 25,000,100

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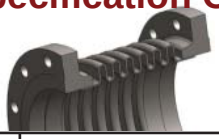
Long Style Specification Chart Style 55

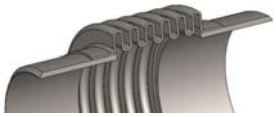
LLP-Long Style Low Pressure
LMP-Long Style Medium Pressure
LHP-Long Style High Pressure



Size (in.)	Series	Pressure (PSIG)	O.A.L.	Weight (lbs.)	Non-concurrent Movements (in.)			Spring Rates (lbs./in.)	
					Comp.	Ext.	Lateral	Axial	Lateral
2	LLP LMP LHP	50 150 300	8 8 8	11 11 15	1.60 0.96	0.40 0.24	0.5 0.3 0.3	389 483 1,052	180 219 471
2.5	LLP LMP LHP	50 150 300	10 10 10.5	15 15 22	1.60 1.20	0.40 0.30	0.5 0.3 0.2	279 688 1,403	105 253 896
3	LLP LMP LHP	50 150 300	9.5 9.5 11	17 18 28	1.60 1.20	0.40 0.30	0.6 0.4 0.3	312 721 1,474	166 379 778
3.5	LLP LMP LHP	50 150 300	10 8.5 9.5	23 24 36	1.60 1.28	0.40 0.32	0.6 0.4 0.3	336 589 1,209	228 686 1,284
4	LLP LMP LHP	50 150 300	10 10 11	28 28 47	1.60 1.28	0.40 0.32	0.6 0.4 0.3	378 743 1,564	342 671 1,412
5	LLP LMP LHP	50 150 300	11 11.5 13	33 34 61	2.40 1.60	0.60 0.40	0.5 0.5 0.4	242 922 1,760	249 862 1,601
6	LLP LMP LHP	50 150 300	12 12 13	41 43 87	2.40 1.76	0.60 0.44	0.75 0.6 0.45	260 762 1,924	369 1,003 2,292
8	LLP LMP LHP	50 150 300	13 13 15	67 69 126	3.20 2.08	0.80 0.52	0.75 0.55 0.4	541 1,014 1,846	951 1,788 3,240
10	LLP LMP LHP	50 150 300	12.5 12.5 14	91 97 173	3.20 2.08	0.80 0.52	0.6 0.45 0.3	263 984 2,318	856 3,344 6,826
12	LLP LMP LHP	50 150 300	14.5 15 16.5	136 141 251	3.20 2.08	0.80 0.52	0.8 0.5 0.3	335 1,144 11,532	1,015 3,311 3,971
14	LLP LMP LHP	50 150 300	15 15 16	189 195 358	2.88	0.72	0.7 0.5 0.4	359 1,055 2,373	1,291 3,850 8,924
16	LLP LMP LHP	50 150 300	15.5 15.5 16.5	206 213 411	2.88	0.72	0.7 0.4 0.4	362 1,362 3,054	1,676 6,318 14,233
18	LLP LMP LHP	50 150 300	15.5 16 17	272 279 537	2.88	0.72	0.5 0.35 0.3	419 1,588 3,257	2,415 9,163 19,258
20	LLP LMP LHP	50 150 300	15 15 17	342 349 673	2.88	0.72	0.4 0.3 0.3	428 1,721 3,134	3,761 14,290 26,708
22	LLP LMP LHP	50 150 300	16.5 17 18.5	387 399 793	2.88	0.72	0.6 0.25 0.25	346 2,430 3,012	3,068 24,241 49,988
24	LLP LMP LHP	50 150 300	15 15 17.5	460 468 1,007	2.88	0.72	0.2 0.2 0.2	641 2,531 4,970	10,432 38,408 75,699

Long Style Specification Chart Style 22

LLP-Long Style Low Pressure
LMP-Long Style Medium Pressure
LHP-Long Style High Pressure



Size (in.)	Series	Pressure (PSIG)	O.A.L.	Weight (lbs.)	Non-concurrent Moments (in.)			Spring Rates (lbs.in.)	
					Comp.	Ext.	Lateral	Axial	Lateral
2	LLP LMP LHP	50 150 300	10	2 6 6	1.60 0.96	0.40 0.24	0.5 0.3 0.3	389 483 1,052	180 219 471
2.5	LLP LMP LHP	50 150 300	10	2 2 3	1.60 1.20	0.40 0.24	0.5 0.3 0.2	279 688 1,403	105 253 896
3	LLP LMP LHP	50 150 300	10	3 4 3	1.60 1.20	0.40 0.30	0.6 0.4 0.3	312 721 1,474	166 379 778
3.5	LLP LMP LHP	50 150 300	10	3 5 5	1.60 1.28	0.40 0.30	0.6 0.4 0.3	336 589 1,209	228 686 1,284
4	LLP LMP LHP	50 150 300	10	4 4 5	1.60 1.28	0.40 0.32	0.6 0.4 0.3	378 743 1,564	342 671 1,412
5	LLP LMP LHP	50 150 300	14	9 9 10	2.40 1.60	0.60 0.40	0.5 0.5 0.4	242 922 1,760	249 862 1,601
6	LLP LMP LHP	50 150 300	14	11 12 14	2.40 1.76	0.60 0.44	0.75 0.6 0.45	260 762 1,924	369 1,003 2,292
8	LLP LMP LHP	50 150 300	17	21 23 23	3.20 2.08	0.80 0.52	0.75 0.55 0.4	541 1,014 1,846	951 1,788 3,240
10	LLP LMP LHP	50 150 300	17	29 34 33	3.20 2.08	0.80 0.52	0.6 0.45 0.3	263 984 2,318	856 3,344 6,826
12	LLP LMP LHP	50 150 300	17	30 34 40	3.20 2.08	0.80 0.52	0.8 0.5 0.3	335 1,144 11,532	1,015 3,311 3,971
14	LLP LMP LHP	50 150 300	17	25 31 45	2.88	0.72	0.7 0.5 0.4	359 1,055 2,373	1,291 3,850 8,924
16	LLP LMP LHP	50 150 300	17	29 35 50	2.88	0.72	0.7 0.4 0.4	362 1,362 3,054	1,676 6,318 14,233
18	LLP LMP LHP	50 150 300	17	33 39 61	2.88	0.72	0.5 0.35 0.3	419 1,588 3,257	2,415 9,163 19,258
20	LLP LMP LHP	50 150 300	17	40 46 70	2.88	0.72	0.4 0.3 0.3	428 1,721 3,134	3,761 14,290 26,708
22	LLP LMP LHP	50 150 300	18	47 57 83	2.88	0.72	0.6 0.25 0.25	346 2,730 6,012	3,068 24,241 49,988
24	LLP LMP LHP	50 150 300	18	65 71 97	2.88	0.72	0.2 0.2 0.2	641 2,531 4,970	10,432 38,408 75,699
30 36 40	DL	50	18	130 157 173	3.20	0.80	0.2	960 1,160 1,300	64,500 132,000 158,000
42 46 48	DL	50	18	182 200 210	3.20	0.80	0.2	1,186 1,244 2,400	230,000 260,000 368,000
50 52 54	DL	25	18	220 250 265	3.20	0.80	0.3	1,440 2,200 2,290	45,500 80,100 90,900
60 66 72	DL	25	18	288 350 380	3.20	0.80	0.2	2,580 2,840 3,100	115,000 150,500 225,000
84 86 108	DL	15	18	490 640 660	3.20	0.80	0.15	3,610 4,150 4,670	1,500,000 1,900,000 2,300,000
126 132 144	DL	15	18	730 810 900	3.20	0.80	0.1	5,100 5,650 6,100	2,800,000 3,200,000 3,600,000

Long Style Specification Chart Styles 44 and 66

LLP-Long Style Low Pressure
LMP-Long Style Medium Pressure
LHP-Long Style High Pressure


Style 44


Style 66

Size (in.)	Series	Pressure (PSIG)	O.A.L.	Weight (lbs.)	Non-concurrent Movements (in.)			Spring Rates (lbs.in.)	
					Comp.	Ext.	Lateral	Axial	Lateral
2	LLP LMP LHP	50 150 300	8	10 10 10	1.60 0.96	0.40 0.24	0.5 0.3 0.3	389 483 1,052	180 219 471
2.5	LLP LMP LHP	50 150 300	8	13 13 14	1.60 1.20	0.40 0.30	0.5 0.3 0.2	279 688 1,403	105 253 896
3	LLP LMP LHP	50 150 300	8	13 14 14	1.60 1.20	0.40 0.30	0.6 0.4 0.3	312 721 1,474	166 379 778
3.5	LLP LMP LHP	50 150 300	8	20 21 21	1.60 1.28	0.40 0.32	0.6 0.4 0.3	336 589 1,209	228 686 1,284
4	LLP LMP LHP	50 150 300	8	19 19 20	1.60 1.28	0.40 0.32	0.6 0.4 0.3	378 743 1,564	342 671 1,412
5	LLP LMP LHP	50 150 300	11	23 24 25	2.40 1.60	0.60 0.40	0.5 0.5 0.4	242 922 1,760	249 862 1,601
6	LLP LMP LHP	50 150 300	12	27 29 33	2.40 1.76	0.60 0.44	0.75 0.6 0.45	260 762 1,924	369 1,003 2,292
8	LLP LMP LHP	50 150 300	12	50 42 43	3.20 2.08	0.80 0.52	0.75 0.55 0.4	541 1,014 1,846	951 1,788 3,240
10	LLP LMP LHP	50 150 300	12	48 54 54	3.20 2.08	0.80 0.52	0.6 0.45 0.3	263 984 2,318	856 3,344 6,826
12	LLP LMP LHP	50 150 300	12	80 85 93	3.20 2.08	0.80 0.52	0.8 0.5 0.3	335 1,144 11,532	1,015 3,311 3,971
14	LLP LMP LHP	50 150 300	12	112 118 131	2.88	0.72	0.7 0.5 0.4	359 1,055 2,373	1,291 3,850 8,924
16	LLP LMP LHP	50 150 300	12	142 149 163	2.88	0.72	0.7 0.4 0.4	362 1,362 3,054	1,676 6,318 14,233
18	LLP LMP LHP	50 150 300	12	154 161 179	2.88	0.72	0.5 0.35 0.3	419 1,588 3,257	2,415 9,163 19,258
20	LLP LMP LHP	50 150 300	12	191 198 222	2.88	0.72	0.4 0.3 0.3	428 1,721 3,134	3,761 14,290 26,708
22	LLP LMP LHP	50 150 300	13	227 239 263	2.88	0.72	0.6 0.25 0.25	346 2,730 6,012	3,068 24,241 49,988
24	LLP LMP LHP	50 150 300	13	270 278 307	2.88	0.72	0.2 0.2 0.2	641 2,531 4,970	10,432 38,408 75,699
30 36 40	DL	50	13	350 530 626	3.20	0.80	0.2	960 1,160 1,300	64,500 132,000 158,000
42 46 48	DL	50	13	730 806 930	3.20	0.80	0.2	1,186 1,244 2,400	230,000 260,000 368,000
50 52 54	DL	25	13	980 1,100 1,150	3.20	0.80	0.3	1,440 2,200 2,290	45,500 80,100 90,900
60 66 72	DL	25	13	1,433 1,650 1,850	3.20	0.80	0.2	2,580 2,840 3,100	115,000 150,500 225,000
84 86 108	DL	15	13	2,240 4,100 4,600	3.20	0.80	0.15	3,610 4,150 4,670	1,500,000 1,900,000 2,300,000
126 132 144	DL	15	13	5,050 5,400 6,600	3.20	0.80	0.1	5,100 5,650 6,100	2,800,000 3,200,000 3,600,000

METAL Expansion Joints

2011 Revision

Unaflex® Universal Tied Expansion Joints are capable of absorbing greater lateral movements than standard bellows type expansion joints. Bellows manufactured of 321 Stainless steel. Assembly designed in accordance with EJMA standards. Available with optional liners or covers. Working temperature 500°F Working pressure up to 150 PSI.

- Standard bellows material: A/SA240 321ss
- Design Temperature: 500°F
- Design Pressure: Up to 150 psig
- Standard end connections are 150# drill plate flanges (AWWA Class D C207)
- Overall lengths are based on 150# drilling standard plate flange thicknesses.
- Overall length may change if other type of flanges are requested.

Optional liners and covers are available upon request.

Fixed 150# Plate Flanges

Nominal Size (in.)	Lateral Mvmt. (in.)	O.A.L. (in.)	Lateral Spring Rt (lbs./in.)	Added Mvmt. per 1" add'l length	Number of Rods	For Nipple Ends Add to Flange Unit O.A.L.	Nominal Size (in.)	Lateral Mvmt. (in.)	O.A.L. (in.)	Lateral Spring Rt (lbs./in.)	Added Mvmt. per 1" add'l length	Number of Rods	For Nipple Ends Add to Flange Unit O.A.L.
2	1.5 3.8 5.4	16 22 28 40 52 64	22 18 10	0.188	2	4	10	0.6875 1.375 2.1875 3.875 5.625 7.375	16 22 28 40 52 64	1572 518 249 94 48 30	0.128	2	6
2.5	1.4 3.3 4.6	14 22 28 40 52 64	28 20 10	0.157	2	4	12	1.1875 1.875 3.250 4.750 6.1875 7.750	22.5 28.5 40.5 52.5 64.5 76.5	805 386 147 76 47 31	0.110	2	8
3	1.3 3.1 4.5	16 22 28 40 52 64	32 12 10	0.152	2	4	14	1.1875 1.875 3.375 4.875 6.375 7.875	22.5 28.5 40.5 52.5 64.5 76.5	818 395 149 78 47 32	0.102	4	8
4	1.0 2.6 3.7	16 22 28 40 52 64	44 17 11	0.151	2	4	16	.9375 1.4375 2.5625 3.75 4.9375 6.125	13 29 41 53 65 77	1435 689 262 136 83 56	0.100	4	8
5	2.0 3.0 4.0	16 22 28 40 52 64	50 22 12	0.182	2	4	18	1.375 2.0 3.3125 4.75 6.125 7.5625	24 30 42 54 66 78	1460 757 308 165 103 70	0.098	4	8
6	1.5 3.5 4.0	16 22 28 40 52 64	100 60 15	0.152	2	6	20	1.3125 1.875 3.125 4.4375 5.75 7.0625	24 30 42 54 66 78	1817 961 397 215 134 92	0.092	4	10
8	1.5 3.5 4.0	16 22 28 40 52 64	120 80 30	0.138	2	6	24	.75 1.1875 2.125 3.0 3.9375 4.9375	25 31 43 55 67 79	4205 2056 795 417 256 173	0.079	4	10
							30	.8125 1.1875 1.9375 2.625 3.4375 4.1875	26 32 44 56 68 80	4818 2696 1187 663 423 293	0.073	4	10

All data is for reference. Specific requirements should be sent to the factory for engineering review

Externally Pressurized-Type EXS Single

Nominal Size (in.)	Pressure (PSIG) at 600 deg F	O.A.L. (in.)	Axial Movements		Axial Spring Rates (lbs./in.)	
			Compression	Extension	150 PSIG Style	300 PSIG Style
2	150 300	25 34 42	4 6 8	1 2 2	190 130 97	388 260 194
2.5	150 300	25 34 40	4 6 8	1 2 2	120 80 72	240 160 125
3	150 300	25 34 40	4 6 8	1 2 2	150 90 85	380 230 190
4	150 300	25 34 40	4 6 8	1 2 2	185 116 94	540 340 270
5	150 300	25 34 40	4 6 8	1 2 2	390 270 210	990 670 490
6	150 300	27 35 42	4 6 8	1 2 2	470 315 250	1,180 800 590
8	150 300	27 35 42	4 6 8	1 2 2	650 410 325	1,450 850 710
10	150 300	27 35 42	4 6 8	1 2 2	780 490 390	1,740 1,015 870
12	150 300	29 37 45	4 6 8	1 2 2	980 610 520	2,020 1,213 1,050
14	150 300	29 37 45	4 6 8	1 2 2	1,940 1,220 980	3,896 2,370 1,930
16	150 300	29 37 45	4 6 8	1 2 2	2,180 1,370 1,080	4,320 2,630 2,152

All technical data subject to change without notice
Please see use, installation, precautions and technical pages

Externally Pressurized-Type EXD Double

Nominal Size (in.)	Pressure (PSIG) at 600 deg F	O.A.L.	Axial Movements (in.)		Axial Spring Rates (lbs./in.)	
			Compression	Extension	150 PSIG Style	300 PSIG Style
2	150 300	40 60 72	8 12 16	2 4 4	190 130 97	388 260 194
2.5	150 300	40 60 72	8 12 16	2 4 4	120 80 72	240 160 125
3	150 300	40 60 72	8 12 16	2 4 4	150 90 85	380 230 190
4	150 300	40 60 72	8 12 16	2 4 4	185 116 94	540 340 270
5	150 300	40 60 72	8 12 16	2 4 4	390 270 210	990 670 490
6	150 300	40 60 72	8 12 16	2 4 4	470 315 250	1,180 800 590
8	150 300	40 60 72	8 12 16	2 4 4	650 410 325	1,450 850 710
10	150 300	40 60 72	8 12 16	2 4 4	780 490 390	1,740 1,015 870
12	150 300	46 64 76	8 12 16	2 4 4	980 610 520	2,020 1,213 1,050
14	150 300	46 64 76	8 12 16	2 4 4	1,940 1,220 980	3,896 2,370 1,930
16	150 300	46 64 76	8 12 16	2 4 4	2,180 1,370 1,080	4,320 2,630 2,152

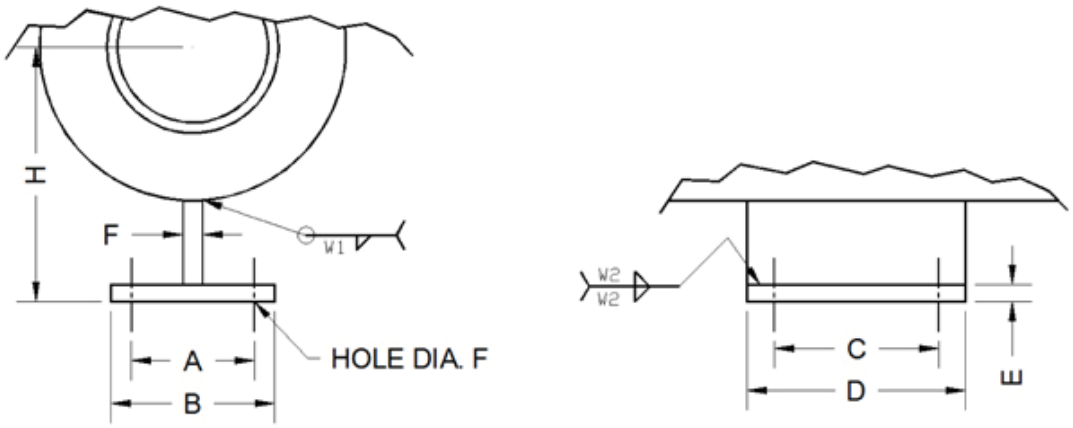
All technical data subject to change without notice
Please see use, installation, precautions and technical pages

Externally Pressurized-Anchor Dimensions

Externally pressurized expansion joints are capable of absorbing large axial movements at higher pressures due to their bellows being pressurized externally. Absorbing large axial movements require high number of convolutions and this in turn increases the bellows instability. By pressurizing the bellows externally, while keeping the unit pressurized internally, bellows column instability problem is eliminated. This type of design also protects the bellows from outside medium, any possible damage during shipping, handling and installation, and from high flow velocities.

Standard end connections are 150# drilling plate flanges (AWWA Class D C207).

Overall lengths are based on 150# drilling standard plate flange thicknesses. Overall length may change if other type of flanges is requested.



Nom. Dia	A	B	C	D	E	F	H	Hole Dia.	W1	W2
1.5”	1.5”	2.5”	7”	8”	3/8”	3/8”	5.25”	1/2”	3/16”	3/16”
2”-3.5”	2.75”	4”	6.75”	8”	3/8”	3/8”	7.31”	5/8”	3/16”	3/16”
4”-6”	4.5”	6.25”	6”	8”	1/2”	1/2”	9.38”	7/8”	1/4”	1/4”
8”-10”	5.25”	8”	9.25”	12”	1/2”	1/2”	12”	1 3/8”	1/4”	1/4”
12”-14”	5.25”	8”	9.25”	12”	3/4”	3/4”	13”	1 3/8”	3/8”	3/8”
16”	5.5”	10”	11.5”	16”	1”	1”	16”	2 1/4”	1/2”	1/2”

All technical data subject to change without notice
Please see use, installation, precautions and technical pages

For sizes 18” and larger consult factory with application details. Units can be provided with pipe nipples, other types of flanges, anchor bases and other accessories. Anchors are not designed for pressure forces.

Specific requirements should be sent to the factory for engineering review. Spring rates shown are for **EACH** bellows.

Units come with 3/8” diameter 3000# threaded coupling drains as a standard.

Series 5000 BPC Bellows Pump Connector Assemblies
Metal Bellows Pump Connector Dimensions

Dash Number	Nominal I.D. (in.)	Overall Length (in.)	Flange Thickness (in.)
-032	2	3-1/2	5/8
-040	2-1/2	3-1/2	5/8
-048	3	4	5/8
-056	3-1/2	4	5/8
-064	4	4-1/2	5/8
-080	5	4-1/2	5/8
-096	6	5	5/8
-128	8	5	5/8
-160	10	6	3/4
-192	12	6	3/4
-224	14	8	1
-256	16	8	1

All technical data subject to change without notice
Please see use, installation, precautions and technical pages

Series 5000 BPC Pump Connectors

Standard Operating Specifications
Max. Operating Pressure: 150 PSI

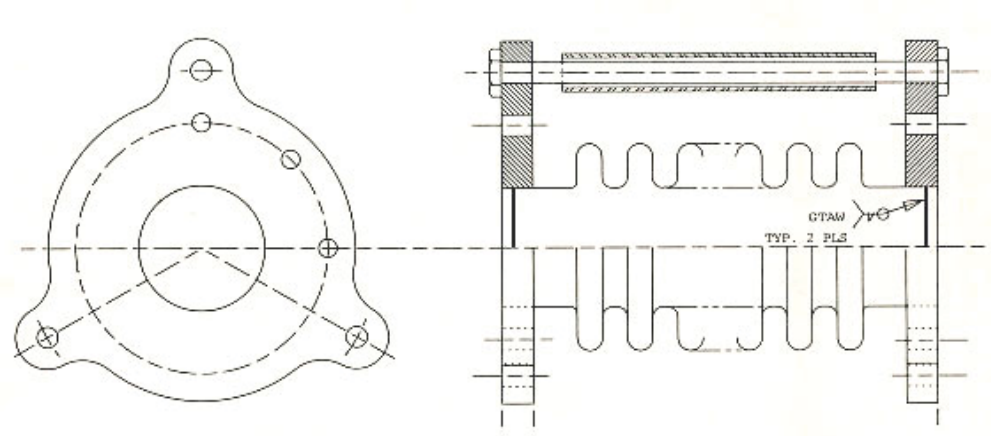
Max. Operating Temperature: 500°F

Movements:
Axial Compression
(2”ND to 8”ND): 0.5”

Axial Compression
(10”ND to 16”ND):0.75”

Axial Extension
(All Sizes):0.25”

Lateral Offset
(All Sizes):0.13”



Flanges to mate with
ANSI B16.5 150# Flange Drilling.

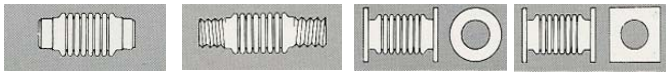
If flow velocity exceeds 25 feet per second, Unaflex® recommends adding a liner.

Tube-Flex Engine Exhaust Expansion Joints
Style U-100 Expansion Joints

Unaflex® “Tube-Flex” Series 7000 Stainless Steel Engine exhaust Expansion Joints are manufactured from a thin-gauge stainless steel tube. This tubular body is formed into corrugations forming a bellows providing a highly flexible and durable connector for the extremes of exhausting engine gases.

End Connections

Type W Welding Nipples
Type T IPT Threaded Nipples
Type FP 1/2” Thick plate flange (specify O.D. Bolt Circle, number of Bolt Holes and Bolt Hole diameter).
Type SFP Square plate flange (specify outside dimension, Bolt pattern and Bolt hole diameter).



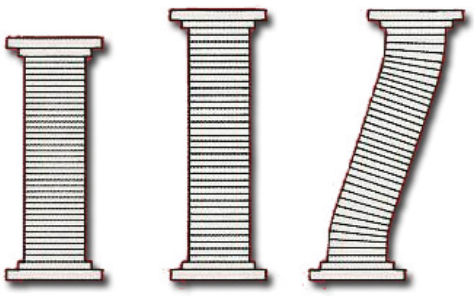
Type W Pipe Size	Type T Max. Operating Pressure at 70°F	Type FP Standard Length (in.)	Type SFP Part Number
1”	40	18	7001
1-1/4”	24	18	7101
1-1/2”	20	18	7201
2”	15	18	7002
3”	8	18	7003
4”	5	18	7004
5”	3	18	7005
6”	3	18	7006
8”	3	18	7008
10”	2	18	7010
12”	2	18	7012

U-100 Style Expansion Joints

Unaflex® “Tube-Flex” Style U-100 Expansion Joints can absorb longitudinal and lateral movement in one cycle. Opposite ends of the joint can move laterally in opposite directions to complete an expansion cycle. UNAFLEXU-100 joints can be lagged with fire-proofing insulation for fire protection without affecting flexibility.

Features

- Can be ordered packed (A) or special packed (S)
- Equipped with rigid or floating flanges (optional)
- Sizes 4” to 26” I.D.



Applications

- Diesel exhaust steam lines
- Water and oil lines; *air intakes
- Air service for boilers
- Conveying hot liquids

“Matchless” Dual Unit Expansion Joints

Unaflex® can custom design and manufacture various types of expansion joints based on your needs and requirements of the system. Some commonly used non-standard expansion joint types are:

Dual Expansion Joints

Dual expansion joints are used where axial movement is larger than can be absorbed by a single expansion joint. The dual assembly consists of two single bellows connected by an interconnecting weld end. In some cases, this interconnecting weld end has an integral anchor base. The anchor base is designed to withstand the forces required to move either bellows but not for pressure forces. When no anchor base is used, interconnecting weld end must be anchored with standard pipe anchors.

Dual expansion joints can also be used where large amount of movement in any combination (i.e. axial, lateral and angular rotation) is required which cannot be absorbed by a single expansion joint. In this type of application, the interconnecting weld end is not anchored but the remaining system must be properly anchored and guided.

Elbow Pressure Balanced Unit

“MATCHLESS” elbow pressure balanced expansion joints are designed to absorb axial and/or lateral deflection while continuously restraining pressure force. Balance (out of line) bellows creates an equal and opposite force to the working (in line) bellows.

The typical arrangement (as shown) is to have a balance side and a working side separated by an elbowed mid-section. Tie-rods are used to balance and restrain pressure forces.

Additional Types of Expansion Joints Available

- Gimbal Expansion Joint
- Hinge Expansion Joint
- In-line Pressure Balanced Expansion Joint
- Expansion Joints with Pantograph Linkage
- Expansion Joints with Testable Bellows
  Two Ply Testable Bellows
- Jacketed Expansion Joints

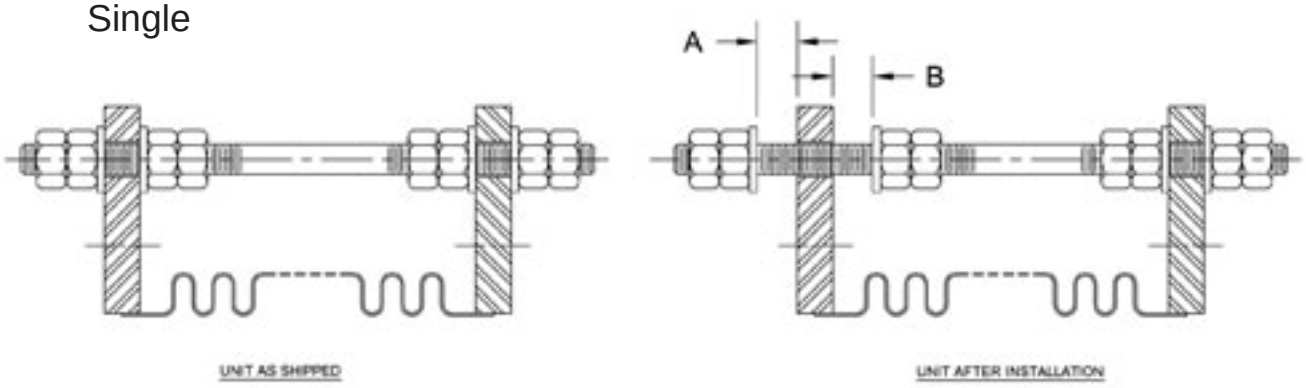
Installation Do's

- 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 over stressed 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 adjustment of loose flange 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 liner and Van Stone flange as well as between the matting flange and liner.
- With telescoping Van Stone line, 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 convolutions.
- Refer to EJMA Standards for proper guide spacing and anchor recommendations.

Installation Don'ts

- Do not drop or strike carton.
- Do not remove shipping bars until installation is complete.
- 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 Bellows cover.
- Do not allow weld splatter to hit unprotected bellows. Protect with wet chloride-free asbestos.
- Do not use cleaning agents that contain chlorides.
- 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 of all guides and anchors.
- Pipe hangers are not adequate guides.
- Do not exceed a pressure test 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.

Single



UNIT AS SHIPPED

UNIT AFTER INSTALLATION

TO ALLOW FOR AXIAL MOVEMENT OF
THE EXPANSION JOINT,BACK OFF NUTS
AS SPECIFIED BELOW:

DISTANCE "A": MAXIMUM EXTENSION
THE UNIT IS DESIGNED FOR OR EXTENSION
IMPOSED ON THE UNIT BY THE PIPING SYSTEM.

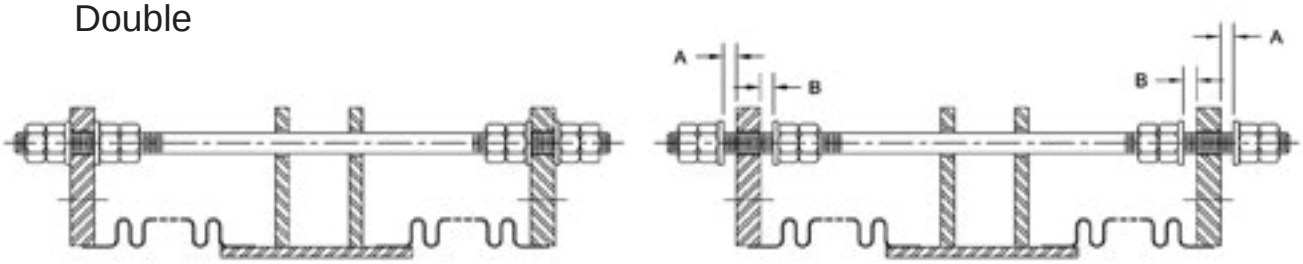
DISTANCE "B": MAXIMUM COMPRESSION
THE UNIT DESIGNED IS FOR OR COMPRESSION
IMPOSED ON THE UNIT BY THE PIPING SYSTEM.

NOTES:
1. WHEN IN DOUBT PLEASE CALL UNAFLEX.
2. IF THE UNIT SEES ANGULAR MOVEMENT,CONTACT UNAFLEX FOR SPACING
3. ATTENTION MUST BE GIVEN NOT TO DAMAGE THE BELLOWS WHILE SETTING THE NUTS.
4. DO NOT BACK OFF NUTS FOR AXIAL MOVEMENTS FOR PRESSURE BALANCED EXPANSION JOINTS
5. DO NOT BACK OFF NUTS IF AXIAL MOVEMENT ABSORBED WITHIN RODS.
6. EXTENSION OR COMPRESSION IMPOSED ON THE UNIT BY THE PIPING SYSTEM MUST BE LESS THAN MAXIMUM EXTENSION OR COMPRESSION THE UNIT IS DESIGNED FOR.

INSTRUCTIONS FOR SPACING NUTS FOR SINGLE EXPANSION JOINTS WITH CONTROL OR LIMIT RODS	SIZE	REV.
	B	A

UNAFLEX

Double



UNIT AS SHIPPED

UNIT AFTER INSTALLATION

TO ALLOW FOR AXIAL MOVEMENT OF
THE EXPANSION JOINT,BACK OFF NUTS
AS SPECIFIED BELOW:

DISTANCE "A": MAXIMUM EXTENSION
THE UNIT DESIGNED FOR OR EXTENSION
IMPOSED ON THE UNIT BY THE PIPING
SYSTEM DIVIDED BY 2.

DISTANCE "B": MAXIMUM COMPRESSION
THE UNIT DESIGNED FOR OR COMPRESSION
IMPOSED ON THE UNIT BY THE PIPING
SYSTEM DIVIDED BY 2.

NOTES:
1. WHEN IN DOUBT PLEASE CALL UNAFLEX.
2. IF THE UNIT SEES ANGULAR MOVEMENT,CONTACT UNAFLEX FOR SPACING.
3. ATTENTION MUST BE GIVEN NOT TO DAMAGE THE BELLOWS WHILE SETTING THE NUTS.
4. DO NOT BACK OFF NUTS FOR AXIAL MOVEMENTS FOR PRESSURE BALANCED EXPANSION JOINTS.
5. DO NOT BACK OFF NUTS IF AXIAL MOVEMENT ABSORBED WITHIN RODS.
6. 6. EXTENSION OR COMPRESSION IMPOSED ON THE UNIT BY THE PIPING SYSTEM MUST BE LESS THAN MAXIMUM EXTENSION OR COMPRESSION THE UNIT IS DESIGNED FOR.

INSTRUCTIONS FOR SPACING NUTS FOR DOUBLE EXPANSION JOINTS WITH CONTROL OR LIMIT RODS	SIZE	REV.
	B	A

UNAFLEX

Technical Information

Metal Bellows Expansion Joints are designed to absorb a specified amount of movement by the flexing of the thin-gauge convolutions. If proper care is not taken during installation, it may reduce the cycle life and the pressure capacity of the expansion joints which could result in a premature failure of the bellows element or damage to the piping system. The following recommendations are included to avoid the most common errors that occur during installation. When in doubt about an installation procedure, contact the manufacturer for clarification before attempting to install the Expansion Joints.

Metal Expansion Joint Types

Single Expansion Joint: The simplest form of Expansion Joint, of single bellows construction, for the purpose of absorbing any combination of the three basic movements of the pipe section in which it is installed.

Universal Expansion Joint: A Universal Expansion Joint is one containing two bellows joined by a common connector for the purpose of absorbing any combination of the three basic movements: Axial movement, lateral deflection and angular rotation. Universal Expansion Joints are usually furnished with control rods to distribute the movement between the two bellows of the Expansion Joint and stabilize the common connector. This definition does not imply that only a Universal Expansion Joint can absorb combined movement..

Double (Dual) Expansion Joint: A double Expansion Joint consists of two bellows joined by a common connector which is anchored to some rigid part of the installation by means of an anchor base. The anchor base may be attached to the common connector either at installation or at time of manufacture. Each bellows acts as a single Expansion Joint and absorbs the movement of the pipe section in which it is installed independently of the other bellows. Double Expansion Joints should not be confused with Universal Expansion Joints.

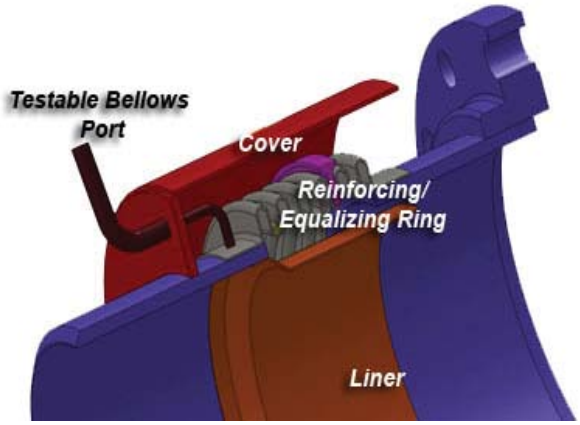
Hinged Expansion Joint: A hinged Expansion Joint contains one bellows and is designed to permit angular rotation in one plane only by the use of a pair of pins through hinge plates attached to the Expansion Joint ends. The hinges and hinge pins must be designed to restrain the thrust of the Expansion Joint due to internal pressure and extraneous forces, where applicable. Hinged Expansion Joints should be used in sets of two or three to function properly.

Gimbal Expansion Joint: A gimbal expansion joint is designed to permit angular rotation in any plane by the used of two pairs of hinges affixed to a common floating gimbal ring. The gimbal ring, hinges and pins must be designed to restrain the thrust of the Expansion Joint due to internal pressure and extraneous forces, where applicable.

In-Line Pressure Balanced Expansion Joint: An in-line pressure balanced Expansion Joint is designed to absorb axial and/or lateral movement while restraining the pressure thrust by means of tie devices interconnecting the line bellows with outboard compensating bellows also subjected to line pressure. Each bellows set is designed to absorb the axial movement and usually the line bellows will absorb the lateral deflection. This type of Expansion Joint is used in a straight run of piping.

Metal Expansion Joint Accessories

Internal Sleeve (Liner): A device which minimizes contact between the inner surface of the bellows of an Expansion Joint and the fluid flowing through it. These devices have also been referred to as liners or baffles.



Cover (Shroud): A device used to provide limited protection of the exterior surface of the bellows of an expansion joint from foreign objects or mechanical damage. A cover is sometimes referred to as a shroud.

Testable Bellows Elements: In a two-ply testable bellows, outer ply is a redundant ply that is designed to contain the pressure if the inner ply fails. If the inner ply fails, pressure flows to the test port indicating a failure on customer's instrumentation.

Equalizing Rings/Reinforcing Rings: Devices used on some expansion joints fitting snugly in the roots of the convolutions. The primary purpose of these devices is to reinforce the bellows against internal pressure. Equalizing rings are made of cast iron, steel, stainless steel or other suitable alloys and are approximately "T" shaped in cross section. Reinforcing or root rings are fabricated from tubing or solid round bars of carbon steel, stainless steel or other suitable alloys.

Control Rods: Devices, usually in the form of rods or bars, attached to the Expansion Joint assembly whose primary function is to distribute the movement between the two bellows of a Universal Expansion Joint. Control rods are not designed to restrain bellows pressure thrust.

Limit Rods: Devices, usually in the form of rods or bars, attached to the expansion joint assembly whose primary function is to restrict the bellows movement range (axial, lateral, and angular) during normal operation. In the event of a main anchor failure, they are designed to prevent bellows over-extension or over-compression while restraining the full pressure loading and dynamic forces generated by the anchor failure.

Tie Rods: Devices, usually in the form of rods or bars attached to the Expansion Joint assembly whose primary function is to continuously restrain the full bellows pressure thrust during normal operation while permitting only lateral deflection. Angular rotation can be accommodated only if two tie rods are used and 90 degrees opposed to the direction of rotation.

Purge Connections: Purge connections, where required, are usually installed at the sealed end of each internal sleeve of an Expansion Joint for the purpose of injecting a liquid or gas between the bellows and the internal sleeve to keep the area clear of erosive and corrosive media and/or solids that could pack the convolutions. Purging may be continuous, intermittent or just on start-up or shut down, as required. These are sometimes called aeration connections..

Pantograph Linkages: A scissors-like device. A special form of control rod attached to the Expansion Joint assembly whose primary function is to positively distribute the movement equally between the two bellows of the universal joint throughout its full range of movement. Pantograph linkages, like control rods, are not designed to restrain pressure thrust.

Key Concepts

Bellows: Flexible element of an expansion joint consisting of one or more convolutions and the end tangents.

Convolution: Smallest flexible unit of a bellows. Total movement capacity and flexibility of a bellows is proportional to the number of convolutions.

Pressure Thrust: Pressure thrust is created by the installation of a flexible unit, such as an expansion joint, into a rigid piping system which is under pressure. Pressure thrust force is a function of the system pressure and mean diameter of the bellows. In cases of internal or positive pressure, bellows are forced to extend in length while the opposite is observed in cases of external or negative pressure. This force is transmitted from the ends of the expansion joint along the pipe.

Shipping Bars: Rigid support devices installed on expansion joint to maintain the overall length of the assembly for shipment and installation. These devices may also be used to pre-compress, pre-extend or laterally offset the bellows. They should not be used to resist pressure thrust during testing.

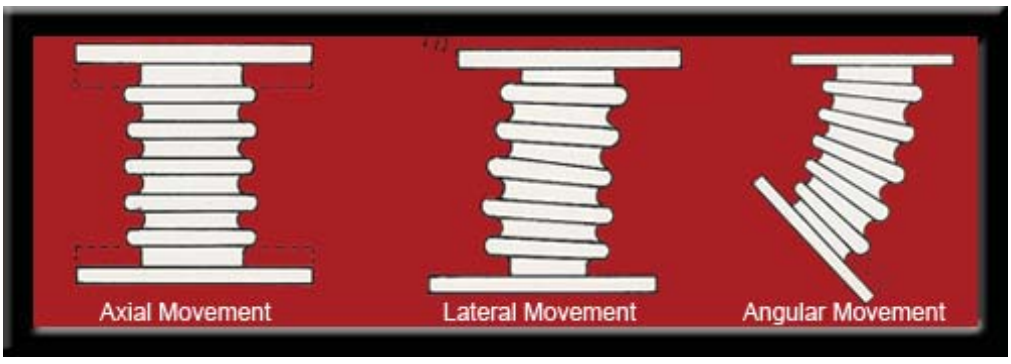
Movements, Cycle Life, Anchoring and Guiding Axial Movement

Axial Compression: The dimensional shortening of an Expansion Joint along its longitudinal axis. Axial compression has been referred to as axial movement, traverse or compression.

Lateral Movement: This relative displacement of the two ends of an Expansion Joint perpendicular to its longitudinal axis. This has been referred to as lateral offset, lateral movement, parallel misalignment, direct shear or transverse movement.

Angular Movement: This displacement of the longitudinal axis of the Expansion Joint from its initial straight line position into a circular arc. Angular rotation is occasionally referred to as “rotational movement.” This is not torsional rotation.

Angular Extension: The dimensional lengthening of an Expansion Joint along its longitudinal axis. Axial extension has been referred to as axial movement, traverse, elongation or extension.



Cycle Life

The cycle life of an expansion joint is the number of stress cycles endured at operating conditions. A stress cycle if defined as one complete movement of the expansion joint from initial to extreme position and return.

Main Anchor: A main anchor is one which must withstand the full bellows thrust due to pressure, flow, spring forces and all other piping loads.

A main anchor base for connection to the anchor structure can be furnished as an integral part of a single or double Expansion Joint, if desired. The Expansion Joint manufacturer must be advised of the magnitude and direction of all forces and moments which will be imposed upon the anchor base, so that it can be adequately designed to suit the specific application.

Intermediate Anchors: An intermediate anchor is one which must withstand the bellows thrust due to flow, spring forces, and all other piping loads, but not the thrust due to pressure.

An intermediate anchor base for connection to the anchor structure can be furnished as an integral part of a single or double Expansion Joint, if desired. The Expansion Joint manufacturer must be advised of the magnitude and direction of all forces and moments which will be imposed upon the anchor base, so that it can be adequately designed to suit the specific application.

Pipe Guides and Supports: Correct alignment of the pipe adjoining an expansion joint is important to its proper function. Maximum service from expansion joints will be obtained only when the pipeline has recommended number of guides and is anchored and supported in accordance with good piping practice. When locating pipe guides for applications involving axial movement only, it is generally recommended that the expansion joint be located near an anchor and that the first guide be located a maximum of 4 pipe diameters away from the expansion joint. For more information please see EJMA guidelines.

Pressure Thrust

When a bellows is pressurized, it reacts causing a load equal to its effective area X working pressure along its longitudinal axis. These loads must be considered when designing the system arrangement and appropriate anchors.

Size	Eff. Area sq. in.	Size	Eff. Area sq. in.	Size	Eff. Area sq. in.
2	6.3	18	290	52	2,290
2-1/2	9.6	20	354	54	2,460
3	12.0	22	426	60	3,025
4	20	24	500	66	3,635
5	30.0	30	775	72	4,300
6	43.0	36	1,090	84	5,800
8	72.0	40	1,350	96	7,550
10	110	42	1,470	108	9,510
12	150	46	1,775	126	13,200
14	180	48	1,940	132	14,110
16	234	50	2,125	144	16,750

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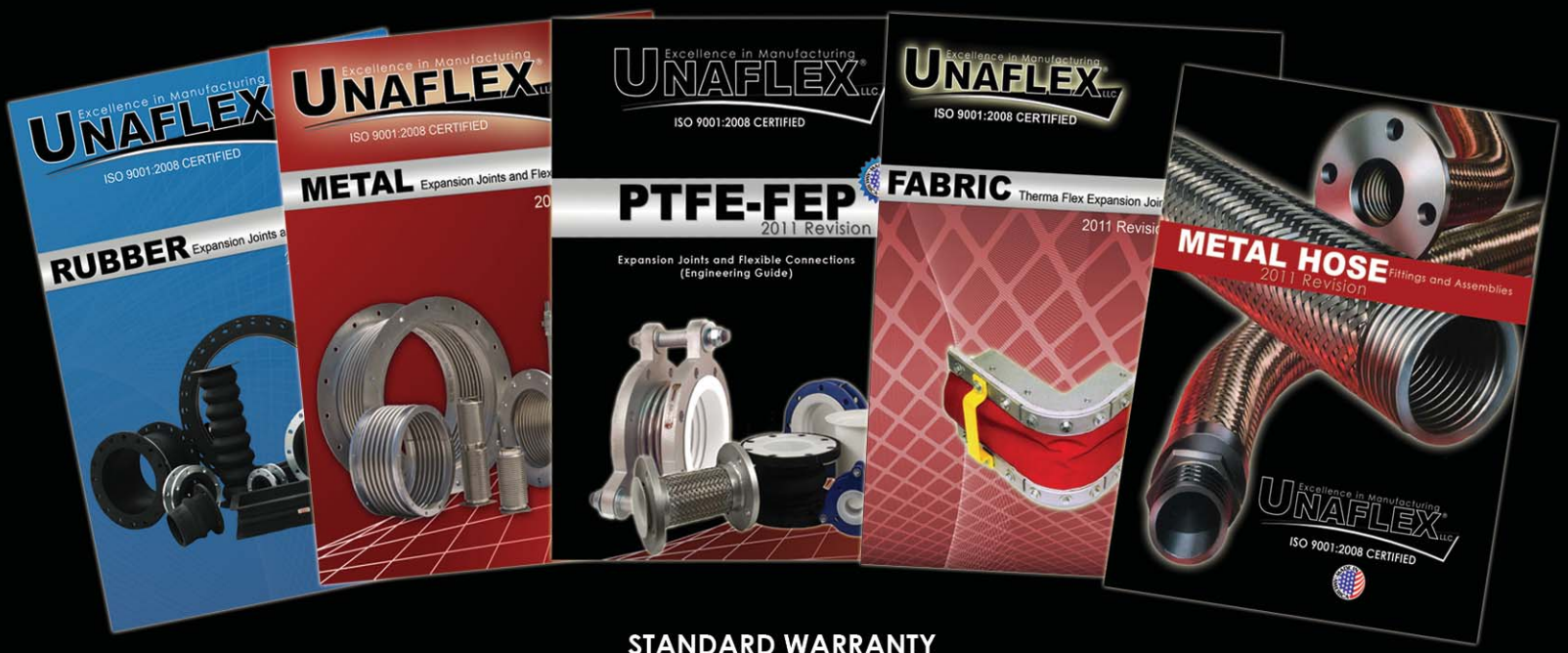

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3901 N.E. 12th Avenue • Pompano Beach, FL 33064
Mail: P.O. Box 5088 • Ft. Lauderdale, FL 33310
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