

Excellence in Manufacturing
UNAFLEX[®] LLC.
ISO 9001:2008 CERTIFIED

METAL

Expansion Joints and Flexible Connectors



Toll Free: (800) 327-1286
www.unaflex.com | Email: sales@unaflex.com
Corporate HQ: 1350 S. Dixie Highway East | Pompano Beach, FL 33060
Factory Facilities in Anderson, SC | Warehouse Facilities in Houston TX
Mail: P.O. Box 5088 | Ft. Lauderdale, FL 33360

METAL Expansion Joints

A Leader in

METAL 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 wide range of flexible components and customer support. We offer an unparalleled array 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

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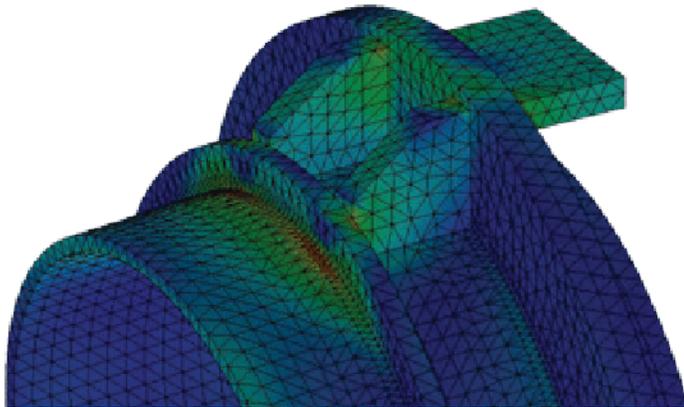
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METAL Expansion Joints

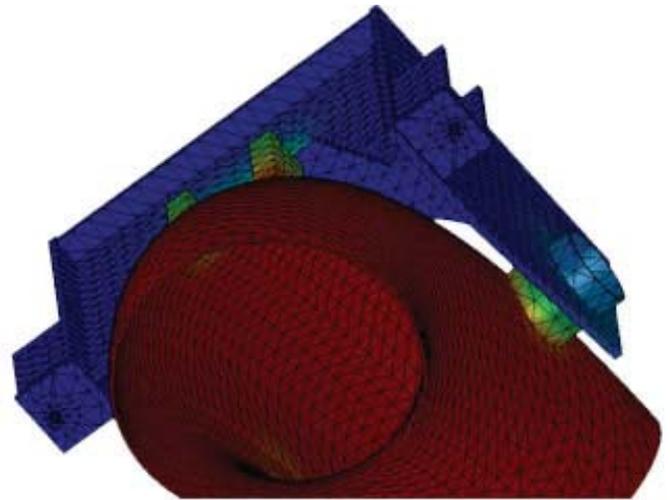
Overview

Engineering Capabilities

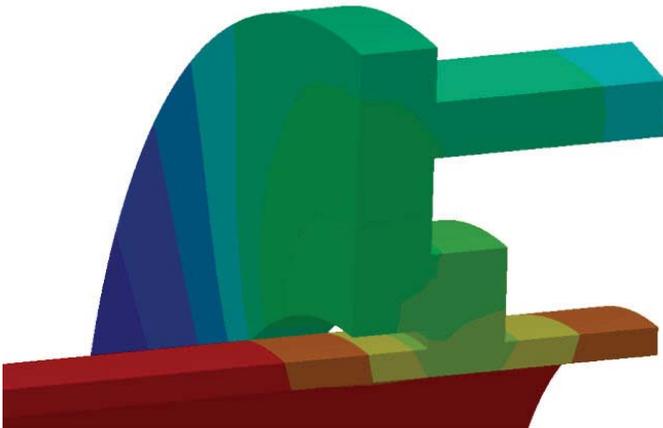
UNAFLEX® utilizes various engineering software programs to provide expansion joints in accordance with customer requirements for the utmost reliability. Some of these programs are industry-leading programs such as Finite Element Analysis (FEA) CAD/CAM and Expansion Joint Manufacturers Association (EJMA).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



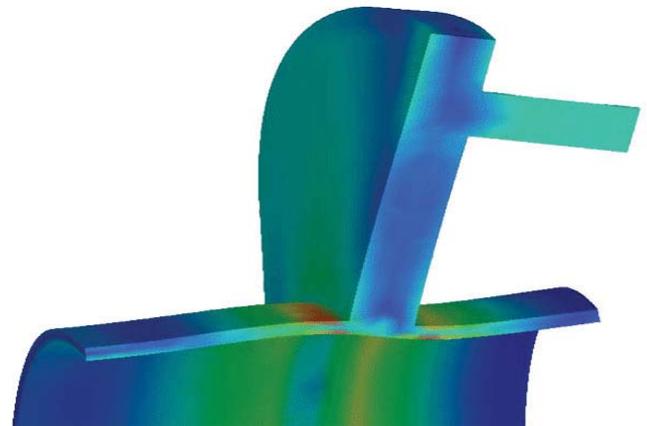
Stress distribution on a double ring with gussets hardware



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 310 S
- B/SB444 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 tests, hydro and pneumatic pressure tests, helium leak tests and PMI (Positive Material Identification) by fully qualified Quality Control Personnel.

METAL Expansion Joints

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# 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. The 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.

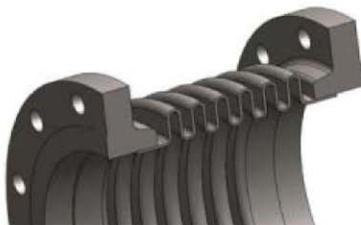


Raised Face Slip-On Flanges Type-55

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

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	50	6	2	0.64	0.16	0.1	681	945
	SMP	150		4				681	945
	SHP	300		4				681	945
2.5	SLP	50	7	3	0.64	0.16	0.1	664	1,304
	SMP	150		3				664	1,304
	SHP	300		3				1,253	2,469
3	SLP	50	9	4	0.64	0.16	0.1	703	1,962
	SMP	150		4				703	1,962
	SHP	300		4				1,343	3,760
3.5	SLP	50	9	4	0.64	0.16	0.1	728	2,132
	SMP	150		4				728	2,132
	SHP	300		4				1,342	3,938
4	SLP	50	9	5	0.64	0.16	0.1	756	2,740
	SMP	150		5				756	2,740
	SHP	300		5				1,410	5,118
5	SLP	50	10	7	1.04	0.26	0.1	564	3,088
	SMP	150		7				581	2,328
	SHP	300		8				2,150	10,931
6	SLP	50	10	9	1.04	0.26	0.2	337	1,973
	SMP	150		9				744	3,975
	SHP	300		10				2,846	14,368
8	SLP	50	10	9	1.28	0.32	0.2	250	1,307
	SMP	150		10				901	4,720
	SHP	300		12				2,833	14,893
10	SLP	50	10	12	1.28	0.32	0.1	397	3,273
	SMP	150		14				1,346	11,120
	SHP	300		15				4,119	34,129
12	SLP	50	10	15	1.28	0.32	0.1	309	3,075
	SMP	150		17				1,534	14,342
	SHP	300		22				7,148	62,597
14	SLP	50	12	18	1.28	0.32	0.1	356	4,181
	SMP	150		23				1,899	20,721
	SHP	300		31				3,797	41,651
16	SLP	50	12	22	1.28	0.32	0.1	651	9,449
	SMP	150		26				2,452	35,626
	SHP	300		34				4,887	59,981
18	SLP	50	12	25	1.44	0.36	0.1	559	10,229
	SMP	150		30				2,380	43,365
	SHP	300		40				4,721	72,641
20	SLP	50	14	41	1.44	0.36	0.1	753	17,181
	SMP	150		46				2,960	67,035
	SHP	300		61				5,818	132,337
22	SLP	50	14	41	1.44	0.36	0.1	599	16,035
	SMP	150		51				3,248	83,910
	SHP	300		68				6,380	139,960
24	SLP	50	14	50	1.44	0.36	0.1	898	28,938
	SMP	150		55				3,544	108,343
	SHP	300		74				6,958	180,225
30	DS	50	14	56	1.44	0.36	0.2	960	175,000
				67				1,100	248,000
				72				1,490	380,000
42	DS	50	14	84	1.60	0.40	0.2	1,680	410,000
				98				1,742	470,000
				170				3,600	500,000
50	DS	25	14	179	1.60	0.40	0.2	2,500	174,900
				210				3,215	318,000
				218				3,605	604,000
60	DS	25	14	242	1.60	0.40	0.1	4,200	780,000
				283				4,400	1,300,500
				309				4,750	2,800,300
84	DS	15	14	395	1.60	0.40	0.1	5,478	4,610,000
				460				6,300	12,100,000
				491				7,210	18,400,000
126	DS	15	14	565	1.60	0.40	0.08	8,008	19,500,000
				600				8,715	21,000,000
				660				9,430	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	50	6	10	0.64	0.16	0.1	681	945
	SMP	150		10				681	945
	SHP	300		10				681	945
2.5	SLP	50	6	13	0.64	0.16	0.1	664	1,304
	SMP	150		13				664	1,304
	SHP	300		13				1,253	2,469
3	SLP	50	6	13	0.64	0.16	0.1	703	1,962
	SMP	150		13				703	1,962
	SHP	300		13				1,343	3,760
3.5	SLP	50	6	20	0.64	0.16	0.1	728	2,132
	SMP	150		20				728	2,132
	SHP	300		20				1,342	3,938
4	SLP	50	7	18	0.64	0.16	0.1	756	2,740
	SMP	150		18				756	2,740
	SHP	300		18				1,410	5,118
5	SLP	50	8	21	1.04	0.26	0.1	564	3,088
	SMP	150		21				581	2,328
	SHP	300		22				2,150	10,931
6	SLP	50	8	26	1.04	0.26	0.2	337	1,973
	SMP	150		26				744	3,975
	SHP	300		27				2,846	14,368
8	SLP	50	8	46	1.28	0.32	0.2	250	1,307
	SMP	150		37				901	4,720
	SHP	300		40				2,833	14,893
10	SLP	50	8	46	1.28	0.32	0.1	397	3,273
	SMP	150		48				1,346	11,120
	SHP	300		50				4,119	34,129
12	SLP	50	9	76	1.28	0.32	0.1	309	3,075
	SMP	150		78				1,534	14,342
	SHP	300		84				7,148	62,597
14	SLP	50	9	107	1.28	0.32	0.1	356	4,181
	SMP	150		112				1,899	20,721
	SHP	300		121				3,797	41,651
16	SLP	50	9	138	1.28	0.32	0.1	651	9,449
	SMP	150		142				2,452	35,626
	SHP	300		152				4,887	59,981
18	SLP	50	10	149	1.44	0.36	0.1	559	10,229
	SMP	150		154				2,380	43,365
	SHP	300		166				4,721	72,641
20	SLP	50	10	191	1.44	0.36	0.1	753	17,181
	SMP	150		196				2,960	67,035
	SHP	300		214				5,818	132,337
22	SLP	50	10	219	1.44	0.36	0.1	599	16,035
	SMP	150		229				3,248	83,910
	SHP	300		249				6,380	139,960
24	SLP	50	11	265	1.44	0.36	0.1	898	28,938
	SMP	150		271				3,544	108,343
	SHP	300		292				6,958	180,225
30	DS	50	11	377	1.44	0.36	0.2	960	175,000
				497				1,100	248,000
				602				1,490	380,000
42	DS	50	11	641	1.60	0.40	0.2	1,680	410,000
				750				1,742	470,000
				810				3,600	500,000
50	DS	25	11	900	1.60	0.40	0.2	2,500	174,900
				1,008				3,215	318,000
				1,061				3,605	604,000
60	DS	25	11	1,347	1.60	0.40	0.1	4,200	780,000
				1,591				4,400	1,300,500
				1,799				4,750	2,800,300
84	DS	15	11	2,137	1.60	0.40	0.1	5,478	4,610,000
				3,916				6,300	12,100,000
				3,200				7,210	18,400,000
126	DS	15	11	4,400	1.60	0.40	0.08	8,008	19,500,000
				4,700				8,715	21,000,000
				5,200				9,430	25,000,100

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	50	8	11	1.60	0.40	0.5	389	180
	LMP	150	8	11			0.3	483	219
	LHP	300	8	15	0.96	0.24	0.3	1,052	471
2.5	LLP	50	10	15	1.60	0.40	0.5	279	105
	LMP	150	10	15			0.3	688	253
	LHP	300	10.5	22	1.20	0.30	0.2	1,403	896
3	LLP	50	9.5	17	1.60	0.40	0.6	312	166
	LMP	150	9.5	18			0.4	721	379
	LHP	300	11	28	1.20	0.30	0.3	1,474	778
3.5	LLP	50	10	23	1.60	0.40	0.6	336	228
	LMP	150	8.5	24			0.4	589	686
	LHP	300	9.5	36	1.28	0.32	0.3	1,209	1,284
4	LLP	50	10	28	1.60	0.40	0.6	378	342
	LMP	150	10	28			0.4	743	671
	LHP	300	11	47	1.28	0.32	0.3	1,564	1,412
5	LLP	50	11	33	2.40	0.60	0.5	242	249
	LMP	150	11.5	34			0.5	922	862
	LHP	300	13	61	1.60	0.40	0.4	1,760	1,601
6	LLP	50	12	41	2.40	0.60	0.75	260	369
	LMP	150	12	43			0.6	762	1,003
	LHP	300	13	87	1.76	0.44	0.45	1,924	2,292
8	LLP	50	13	67	3.20	0.80	0.75	541	951
	LMP	150	13	69			0.55	1,014	1,788
	LHP	300	15	126	2.08	0.52	0.4	1,846	3,240
10	LLP	50	12.5	91	3.20	0.80	0.6	263	856
	LMP	150	12.5	97			0.45	984	3,344
	LHP	300	14	173	2.08	0.52	0.3	2,318	6,826
12	LLP	50	14.5	136	3.20	0.80	0.8	335	1,015
	LMP	150	15	141			0.5	1,144	3,311
	LHP	300	16.5	251	2.08	0.52	0.3	11,532	3,971
14	LLP	50	15	189	2.88	0.72	0.7	359	1,291
	LMP	150	15	195			0.5	1,055	3,850
	LHP	300	16	358			0.4	2,373	8,924
16	LLP	50	15.5	206	2.88	0.72	0.7	362	1,676
	LMP	150	15.5	213			0.4	1,362	6,318
	LHP	300	16.5	411			0.4	3,054	14,233
18	LLP	50	15.5	272	2.88	0.72	0.5	419	2,415
	LMP	150	16	279			0.35	1,588	9,163
	LHP	300	17	537			0.3	3,257	19,258
20	LLP	50	15	342	2.88	0.72	0.4	428	3,761
	LMP	150	15	349			0.3	1,721	14,290
	LHP	300	17	673			0.3	3,134	26,708
22	LLP	50	16.5	387	2.88	0.72	0.6	346	3,068
	LMP	150	17	399			0.25	2,430	24,241
	LHP	300	18.5	793			0.25	3,012	49,988
24	LLP	50	15	460	2.88	0.72	0.2	641	10,432
	LMP	150	15	468			0.2	2,531	38,408
	LHP	300	17.5	1,007			0.2	4,970	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	50	10	2	1.60	0.40	0.5	389	180
	LMP	150		6			0.3	483	219
	LHP	300		6	0.96	0.24	0.3	1,052	471
2.5	LLP	50	10	2	1.60	0.40	0.5	279	105
	LMP	150		2			0.3	688	253
	LHP	300		3	1.20	0.24	0.2	1,403	896
3	LLP	50	10	3	1.60	0.40	0.6	312	166
	LMP	150		4			0.4	721	379
	LHP	300		3	1.20	0.30	0.3	1,474	778
3.5	LLP	50	10	3	1.60	0.40	0.6	336	228
	LMP	150		5			0.4	589	686
	LHP	300		5	1.28	0.30	0.3	1,209	1,284
4	LLP	50	10	4	1.60	0.40	0.6	378	342
	LMP	150		4			0.4	743	671
	LHP	300		5	1.28	0.32	0.3	1,564	1,412
5	LLP	50	14	9	2.40	0.60	0.5	242	249
	LMP	150		9			0.5	922	862
	LHP	300		10	1.60	0.40	0.4	1,760	1,601
6	LLP	50	14	11	2.40	0.60	0.75	260	369
	LMP	150		12			0.6	762	1,003
	LHP	300		14	1.76	0.44	0.45	1,924	2,292
8	LLP	50	17	21	3.20	0.80	0.75	541	951
	LMP	150		23			0.55	1,014	1,788
	LHP	300		23	2.08	0.52	0.4	1,846	3,240
10	LLP	50	17	29	3.20	0.80	0.6	263	856
	LMP	150		34			0.45	984	3,344
	LHP	300		33	2.08	0.52	0.3	2,318	6,826
12	LLP	50	17	30	3.20	0.80	0.8	335	1,015
	LMP	150		34			0.5	1,144	3,311
	LHP	300		40	2.08	0.52	0.3	11,532	3,971
14	LLP	50	17	25	2.88	0.72	0.7	359	1,291
	LMP	150		31			0.5	1,055	3,850
	LHP	300		45			0.4	2,373	8,924
16	LLP	50	17	29	2.88	0.72	0.7	362	1,676
	LMP	150		35			0.4	1,362	6,318
	LHP	300		50			0.4	3,054	14,233
18	LLP	50	17	33	2.88	0.72	0.5	419	2,415
	LMP	150		39			0.35	1,588	9,163
	LHP	300		61			0.3	3,257	19,258
20	LLP	50	17	40	2.88	0.72	0.4	428	3,761
	LMP	150		46			0.3	1,721	14,290
	LHP	300		70			0.3	3,134	26,708
22	LLP	50	18	47	2.88	0.72	0.6	346	3,068
	LMP	150		57			0.25	2,730	24,241
	LHP	300		83			0.25	6,012	49,988
24	LLP	50	18	65	2.88	0.72	0.2	641	10,432
	LMP	150		71			0.2	2,531	38,408
	LHP	300		97			0.2	4,970	75,699
30	DL	50	18	130	3.20	0.80	0.2	960	64,500
36				157				1,160	132,000
40				173				1,300	158,000
42	DL	50	18	182	3.20	0.80	0.2	1,186	230,000
46				200				1,244	260,000
48				210				2,400	368,000
50	DL	25	18	220	3.20	0.80	0.3	1,440	45,500
52				250				2,200	80,100
54				265				2,290	90,900
60	DL	25	18	288	3.20	0.80	0.2	2,580	115,000
66				350				2,840	150,500
72				380				3,100	225,000
84	DL	15	18	490	3.20	0.80	0.15	3,610	1,500,000
86				640				4,150	1,900,000
108				660				4,670	2,300,000
126	DL	15	18	730	3.20	0.80	0.1	5,100	2,800,000
132				810				5,650	3,200,000
144				900				6,100	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



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

METAL Expansion Joints

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	0.188	2	4	10	0.6875	16	1572	0.128	2	6						
		22						22	518										
		28						18	249										
		40						10	94										
		52							48										
64		30																	
2.5	1.4 3.3 4.6	14	28	0.157	2	4	12	1.1875	22.5	805	0.110	2	8						
		22						28.5	386										
		28						40.5	147										
		40						52.5	76										
		52						64.5	47										
64	76.5	31																	
3	1.3 3.1 4.5	16	32	0.152	2	4	14	1.1875	22.5	818	0.102	4	8						
		22						28.5	395										
		28						40.5	149										
		40						52.5	78										
		52						64.5	47										
64	76.5	32																	
4	1.0 2.6 3.7	16	44	0.151	2	4	16	.9375	13	1435	0.100	4	8						
		22						29	689										
		28						41	262										
		40						53	136										
		52						65	83										
64	77	56																	
5	2.0 3.0 4.0	16	50	0.182	2	4	18	1.375	24	1460	0.098	4	8						
		22						30	757										
		28						42	308										
		40						54	165										
		52						66	103										
64	78	70																	
6	1.5 3.5 4.0	16	100	0.152	2	6	20	1.3125	24	1817	0.092	4	10						
		22						30	961										
		28						42	397										
		40						54	215										
		52						66	134										
64	78	92																	
8	1.5 3.5 4.0	16	120	0.138	2	6	24	.75	25	4205	0.079	4	10						
								1.1875	31	2056									
								2.125	43	795									
								3.0	55	417									
								3.9375	67	256									
		4.9375					79	173											
		30												.8125	26	4818	0.073	4	10
														1.1875	32	2696			
														1.9375	44	1187			
														2.625	56	663			
3.4375	68		423																
4.1875	80	293																	

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

METAL Expansion Joints

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	25	4	1	190	388
	300	34	6	2	130	260
		42	8	2	97	194
2.5	150	25	4	1	120	240
	300	34	6	2	80	160
		40	8	2	72	125
3	150	25	4	1	150	380
	300	34	6	2	90	230
		40	8	2	85	190
4	150	25	4	1	185	540
	300	34	6	2	116	340
		40	8	2	94	270
5	150	25	4	1	390	990
	300	34	6	2	270	670
		40	8	2	210	490
6	150	27	4	1	470	1,180
	300	35	6	2	315	800
		42	8	2	250	590
8	150	27	4	1	650	1,450
	300	35	6	2	410	850
		42	8	2	325	710
10	150	27	4	1	780	1,740
	300	35	6	2	490	1,015
		42	8	2	390	870
12	150	29	4	1	980	2,020
	300	37	6	2	610	1,213
		45	8	2	520	1,050
14	150	29	4	1	1,940	3,896
	300	37	6	2	1,220	2,370
		45	8	2	980	1,930
16	150	29	4	1	2,180	4,320
	300	37	6	2	1,370	2,630
		45	8	2	1,080	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	8	2	190	388
		60	12	4	130	260
		72	16	4	97	194
2.5	150 300	40	8	2	120	240
		60	12	4	80	160
		72	16	4	72	125
3	150 300	40	8	2	150	380
		60	12	4	90	230
		72	16	4	85	190
4	150 300	40	8	2	185	540
		60	12	4	116	340
		72	16	4	94	270
5	150 300	40	8	2	390	990
		60	12	4	270	670
		72	16	4	210	490
6	150 300	40	8	2	470	1,180
		60	12	4	315	800
		72	16	4	250	590
8	150 300	40	8	2	650	1,450
		60	12	4	410	850
		72	16	4	325	710
10	150 300	40	8	2	780	1,740
		60	12	4	490	1,015
		72	16	4	390	870
12	150 300	46	8	2	980	2,020
		64	12	4	610	1,213
		76	16	4	520	1,050
14	150 300	46	8	2	1,940	3,896
		64	12	4	1,220	2,370
		76	16	4	980	1,930
16	150 300	46	8	2	2,180	4,320
		64	12	4	1,370	2,630
		76	16	4	1,080	2,152

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

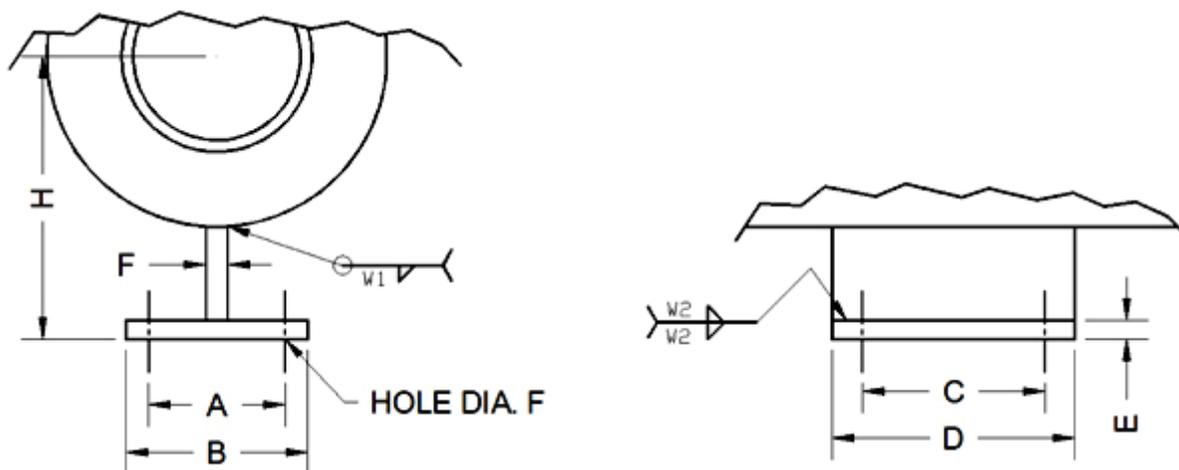
METAL Expansion Joints

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 are 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 Connector

Standard Operating Specifications

Max. Operating Pressure: 150 PSI

Max Operating Temperature: 500°F

Movements:

Axial Compression

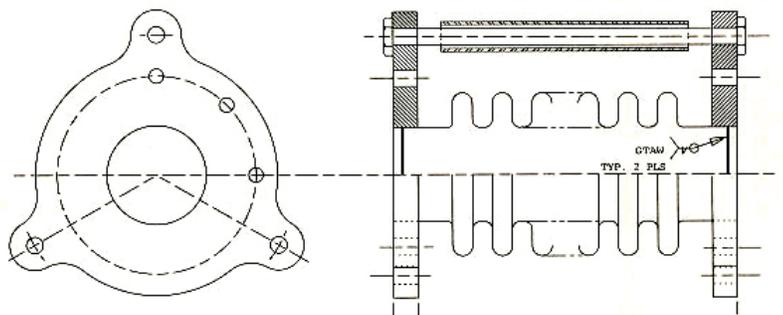
(2" ND to 8" ND): 0.5"

Axial Extension

(10" ND to 16" ND): 0.75"

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.

METAL Expansion Joints

Gimbal Expansion Joints

A gimbal expansion joint is designed to permit angular rotation in any plane by using two pairs of hinges attached to a common floating gimbal ring/box. Gimbal ring/box, hinge arms and pins are designed to restrain pressure thrust of the bellows and any extraneous forces where applicable.

Typical gimbal systems consist of “(2) gimbal expansion joints” or “(2) gimbal and (1) hinge expansion joints”.

Advantages of Gimbal Expansion Joints: Just as hinged expansion joints offer great advantages in single plane applications, gimbal expansion joints are designed to offer similar advantages in multi-plane systems. Since gimbal expansion joints are not restricted to single plane systems, they have greater flexibility of usage.



Gimbal Flanged Bellows



Gimbal Assembly Bellows

Hinged Expansion Joints

A hinged expansion joint is designed to permit angular rotation in only one plane by using a pair of pins through hinge plates attached to each end of the expansion joint. Hinge hardware and pins are designed to restrain pressure thrust of the bellows and any extraneous forces where applicable.

Hinged expansion joints must be used in sets of 2 or 3 to function properly and they do not need to be co-linear.

Advantages of Hinged Expansion Joints:

- Ability of hinged expansion joints to transmit loads helps to simplify supporting a hinged piping system. Such systems may be supported at virtually any point which does not interfere with the free movement of the system.
- Systems of hinged expansion joints may be used in other than 90 degree bends.
- A hinged expansion joint system may be used effectively in applications involving movement other than the pure thermal growth of piping.
- Hinged expansion joints are compact and they have high structural rigidity.
- It is usually possible to compensate for the thermal expansion of irregular and complex piping configurations which might preclude the use of other type of expansion joints.
- Since hinge structures have the ability to transmit loads, piping systems containing hinged expansion joints impose minimum forces on the pipe anchors.
- Hinge hardware can be designed to eliminate torsion or twisting about the expansion joint longitudinal axis.

Additional Types of Hinged Expansion Joints:

- Slotted Hinged Expansion Joint allows axial movement but it does not continuously restrain pressure thrust of bellows.
- Universal Hinge Expansion Joint.



Hinged Bellows



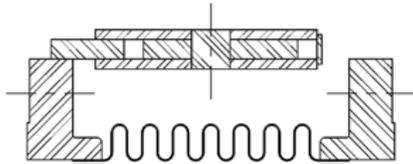
METAL Expansion Joints

UNAFLEX® Matchless Expansion Joint Bellows are produced from fully annealed stainless steel sheet rolled into a tube and seam welded.

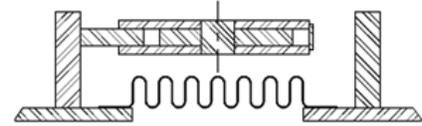
Gimbal Short Style Type 22, 55 Standard Sizes 2" through 24" diameter

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

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



Type 55
All SH units come with ANSI B16.5
300# flanges
Design Temperature 500 deg F.



Type 22
Actual gimbal hardware may look different
than shown Movements in two planes:
+/-7 degrees in each plane

Nominal Size (in.)	Series	Pressure (PSIG)	RFSO Flange Type 55 Overall Length (in.)	Welding Nipples Type 22 Overall Length (in.)	Movements (deg.)	Angular Spring Rate (in.-lbs./deg)
2	SL	50	5.25	14.75	+/-10	12
	SM	150	5.25	14.75	+/-10	12
	SH	300	5.75	14.75	+/-10	22
2.5	SL	50	5.50	14.75	+/-10	16
	SM	150	5.50	14.75	+/-10	16
	SH	300	6.25	14.75	+/-10	30
3	SL	50	5.75	14.75	+/-10	24
	SM	150	5.75	14.75	+/-10	24
	SH	300	6.75	14.75	+/-10	55
3.5	SL	50	6.00	15.00	+/-10	33
	SM	150	6.00	15.00	+/-10	33
	SH	300	7.50	15.25	+/-10	68
4	SL	50	6.25	15.00	+/-10	42
	SM	150	6.25	15.00	+/-10	42
	SH	300	7.75	15.25	+/-10	87
5	SL	50	6.50	15.00	+/-10	47
	SM	150	7.00	15.50	+/-10	49
	SH	300	7.75	15.13	+/-10	109
6	SL	50	7.25	15.50	+/-10	40
	SM	150	7.50	15.63	+/-10	89
	SH	300	8.50	15.75	+/-10	180
8	SL	50	9.00	16.75	+/-10	58
	SM	150	9.00	16.75	+/-10	175
	SH	300	11.00	17.50	+/-10	387
10	SL	50	9.50	16.88	+/-10	120
	SM	150	10.75	18.25	+/-10	373
12	SL	50	10.00	16.88	+/-10	140
	SM	150	10.25	17.00	+/-10	483
14	SL	50	10.25	16.88	+/-10	177
	SM	150	10.50	17.13	+/-10	657

**Gimbal Long Style Type 22, 55
Standard Sizes 2" through 24" diameter**

METAL Expansion Joints

Nominal Size (in.)	Series	Pressure (PSIG)	RFSO Flange Type 55 Overall Length (in.)	Welding Nipples Type 22 Overall Length (in.)	Movements (deg.)	Angular Spring Rate (in.-lbs./deg)
2	LL	50	7.50	16.88	+/-10	7
	LM	150	7.50	16.88	+/-10	15
	LH	300	8.00	16.88	+/-10	31
2.5	LL	50	9.25	18.50	+/-10	14
	LM	150	9.25	18.50	+/-10	29
	LH	300	10.50	19.00	+/-10	52
3	LL	50	9.25	18.38	+/-10	14
	LM	150	9.50	18.50	+/-10	42
	LH	300	10.50	18.50	+/-10	69
3.5	LL	50	9.50	18.50	+/-10	16
	LM	150	8.00	17.00	+/-10	45
	LH	300	9.50	17.25	+/-10	78
4	LL	50	9.50	18.25	+/-10	21
	LM	150	9.50	18.25	+/-10	69
	LH	300	10.50	18.00	+/-10	111
5	LL	50	10.75	19.25	+/-10	38
	LM	150	11.25	19.63	+/-10	101
	LH	300	13.00	20.25	+/-10	253
6	LL	50	11.00	19.25	+/-10	57
	LM	150	11.25	19.63	+/-10	174
	LH	300	13.00	20.13	+/-10	318
8	LL	50	13.00	20.50	+/-10	102
	LM	150	13.00	20.50	+/-10	270
	LH	300	13.75	20.00	+/-10	502
10	LL	50	12.00	19.50	+/-10	144
	LM	150	12.50	20.00	+/-10	377
	LH	300	14.00	20.00	+/-10	856
12	LL	50	14.50	21.25	+/-10	215
	LM	150	14.75	21.75	+/-10	810
	LH	300	15.50	20.00	+/-10	1,258
14	LL	50	14.50	21.25	+/-10	297
	LM	50	15.00	21.50	+/-10	897
	LH	300	15.00	21.00	+/-10	1,381
16	LL	50	15.00	21.25	+/-10	388
	LM	150	15.00	21.00	+/-10	1,326
18	LL	50	15.50	29.25	+/-10	561
	LM	150	16.00	29.00	+/-10	1,182
20	LL	50	15.00	28.25	+/-10	421
	LM	150	16.50	29.00	+/-10	1,413
22	LL	50	16.25	29.13	+/-10	665
	LM	150	18.50	30.00	+/-10	1,822
24	LL	50	15.75	28.25	+/-10	756
	LM	150	19.00	30.00	+/-10	2,323

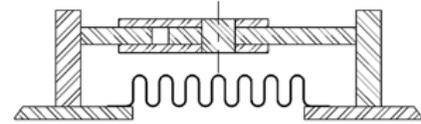
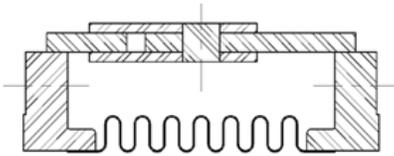
METAL Expansion Joints

UNAFLEX® Matchless Expansion Joint Bellows are produced from fully annealed stainless steel sheet rolled into a tube and seam welded.

Hinged Short Style Type 22, 55 Standard Sizes 2" through 24" diameter

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

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



Type 55

All SH units come with ANSI B16.5 300# flanges
Design Temperature 500 deg F.

Type 22

Actual hinge hardware may look different
than shown

Nominal Size (in.)	Series	Pressure (PSIG)	RFSO Flange Type 55 Overall Length (in.)	Welding Nipples Type 22 Overall Length (in.)	Movements (deg.)	Angular Spring Rate (in.-lbs./deg)
2	SL	50	5.25	14.75	+/-10	12
	SM	150	5.25	14.75	+/-10	12
	SH	300	5.75	14.75	+/-10	22
2.5	SL	50	5.50	14.75	+/-10	16
	SM	150	5.50	14.75	+/-10	16
	SH	300	6.25	14.75	+/-10	30
3	SL	50	5.75	14.75	+/-10	24
	SM	150	5.75	14.75	+/-10	24
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12	SL	50	10.00	16.88	+/-10	140
	SM	150	10.25	17.00	+/-10	483
14	SL	50	10.25	16.88	+/-10	177
	SM	150	10.50	17.13	+/-10	657

Hinged Long Style Type 22, 55
Standard Sizes 2" through 24" diameter

METAL Expansion Joints

Nominal Size (in.)	Series	Pressure (PSIG)	RFSO Flange Type 55 Overall Length (in.)	Welding Nipples Type 22 Overall Length (in.)	Movements (deg.)	Angular Spring Rate (in.-lbs./deg)
2	LL	50	7.50	16.88	+/-10	7
	LM	150	7.50	16.88	+/-10	15
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	LH	300	10.50	18.50	+/-10	69
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22	LL	50	16.25	29.13	+/-10	665
	LM	150	18.50	30.00	+/-10	1,822
24	LL	50	15.75	28.25	+/-10	756
	LM	150	19.00	30.00	+/-10	2,323

METAL Expansion Joints

Tube-Flex Engine Exhaust Expansion Joints

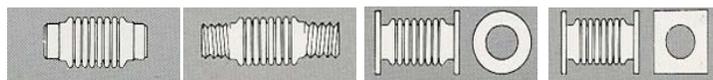
Style U-100 Expansion Joints

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 70F	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. UNAFLEX® U-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 Two-Ply Testable Bellows
- Jacketed Expansion Joints

METAL 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.

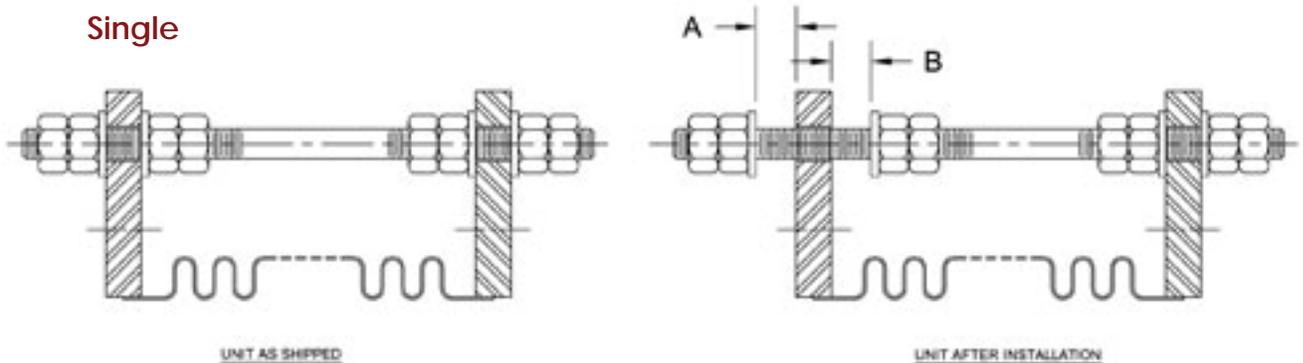
Installation Don'ts

- 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.

METAL Expansion Joints

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Single



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 ROCS.
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.

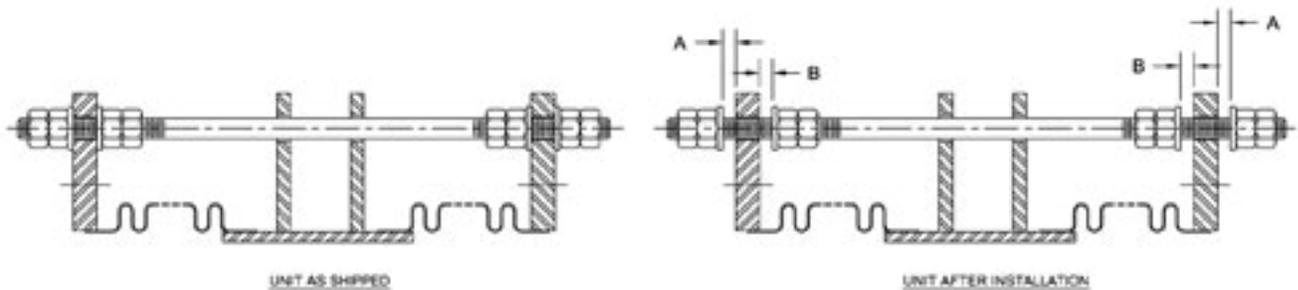
INSTRUCTIONS FOR SPACING NUTS FOR SINGLE EXPANSION JOINTS WITH CONTROL OR LIMIT ROCS

SIZE	REV
B	A



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Double



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 ROCS.
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 ROCS

SIZE	REV
B	A



METAL Expansion Joints

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.

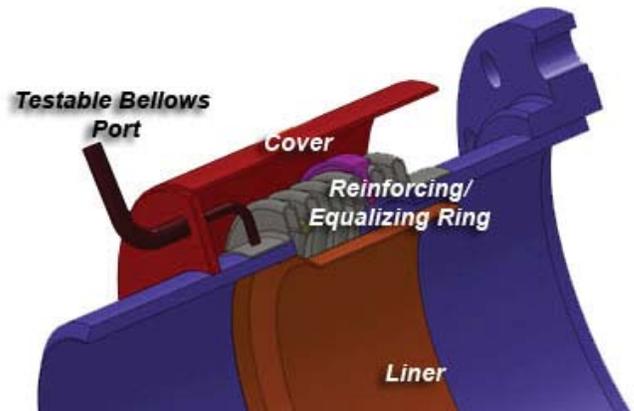
Gimbal Expansion Joint: A gimbal expansion joint is designed to permit angular rotation in any plane by the used of two pairs of hinges affixed to a common floating gimbal ring. The gimbal ring, hinges and pins must be designed to restrain the thrust of the Expansion Joint due to internal pressure and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

METAL Expansion Joints

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.

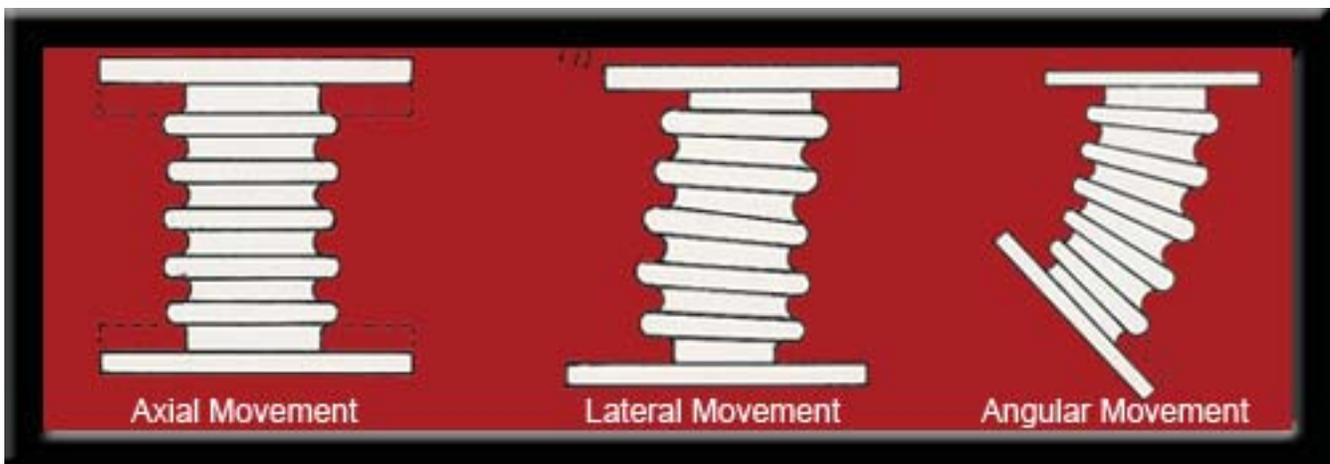
Movements, Cycle Life, Anchoring and Guiding Axial Movement

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 is 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	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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Toll Free: (800) 327-1286 | In FL: (954) 943-5002 | Fax: (954) 941-7968
www.unaflex.com | Email: sales@unaflex.com
Corporate HQ: 1350 S. Dixie Highway East | Pompano Beach, FL 33060
Factory Facilities in Anderson, SC | Warehouse Facilities in Houston TX
Mail: P.O. Box 5088 | Ft. Lauderdale, FL 33360