1-2-3 Selection Guide

MULTI-PLY EXPANSION JOINT

The **Original** Multi-ply Expansion Joint– Always Ask For Keflex™ !

Keflex™ Multi-Ply Expansion Joints are the premier expansion joints in the industry. They offer the ultimate solution to piping thermal expansion problems. A wide variety of end configurations are available and pressure ratings are in the range from vacuum to 600 PSI at room temperature. A variety of materials are also available for any type of media, including highly corrosive acids or gases. **Keflex™** Multi-Ply Expansion Joints have a softer spring rate compared to other expansion joints with the same dimensions, making them easier to install, and in service require less force to actuate. The inner section of this engineering brochure highlights the advantages of the multi-ply construction.

Additional Literature:

SEP—Single Externally Pressurized Expansion Joints
DEP– Dual Externally Pressurized Expansion Joints
Rubber Expansion Joints
Pipe Guides and Slides

FEATURES:

- **Longer Cycle Life**
- **Lower Thrust Forces**
- **Shorter Lengths**
- **Variety of End Configurations**
- **Range of Pressure Ratings**
- **Corrosion Resistant**
- **Standard Stainless Steel Liners**
- **Many Sizes In Stock**
- **Short Lead Times**
- **On-Site Engineering & Consultation**

100% American Made

FLEX-WELD, INC./KEFLEX ™ 1425 Lake Avenue Woodstock, IL 60098 (800) 323-6893 Fax: (815) 334-3689 www.flex-weld.com

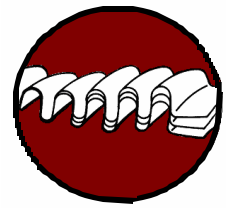
MULTI-PLY EXPANSION JOINTS

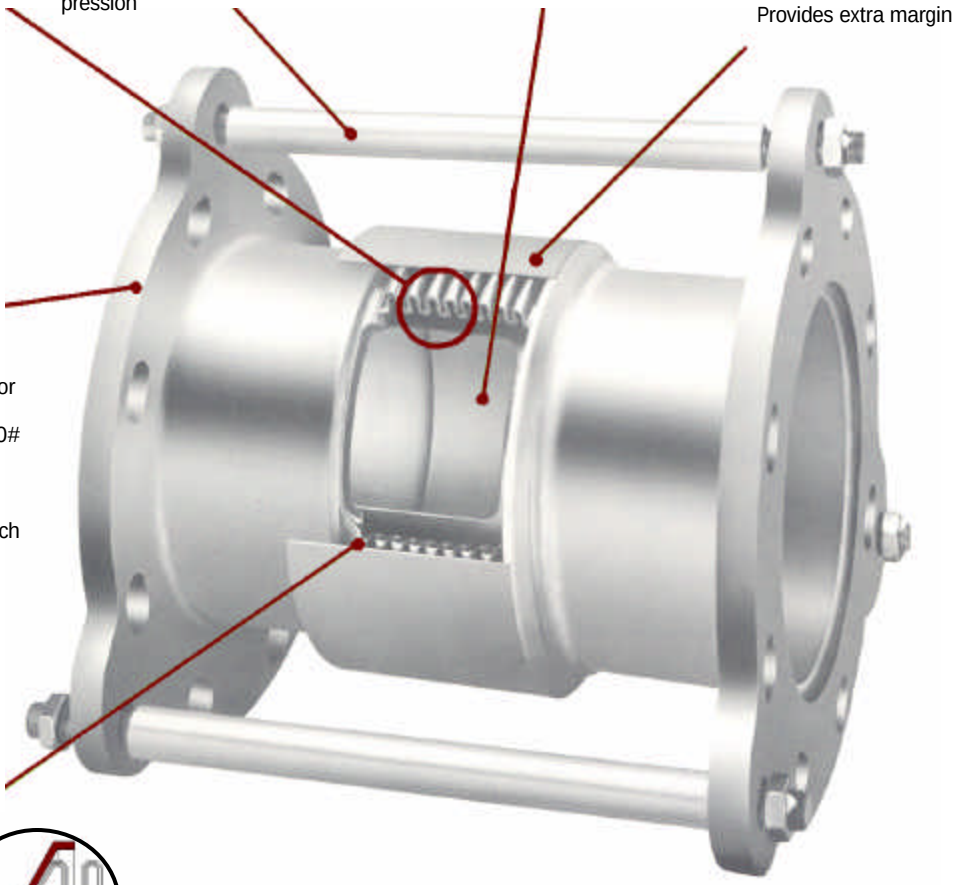
Multi-Ply Bellows Construction
Safer–Layered protection
Less end load
Stronger
Longer cycle life
Easier movement

Stainless Steel Liner
Provides insulating effect to reduce the temperature on the bellows and increase service life
Insures smooth channel flow
Reduces the action of abrasive particles on the bellows
Adds stability
Reduces the detrimental effect of flow induced vibration

Tie Rods with Spacers (Optional)
Prevent overelongation and over- compression

Shroud (Optional)
Protects from external damage
Precludes pinching of external insulation
Provides extra margin of safety





End Fittings
Plate Flanges (150# or 300# drilling)
Tie Rod Flanges (150# or 300# drilling)
Forge Flanges (ANSI 150# or 300#)
Van Stone Flange-150# drilling
Weld Ends–Sch 40 or Sch 80 beveled
Specials–Upon request

Shoulders
Prevent bellows from inverting backwards during compression

KEFLEX™ STANDARD EXPANSION JOINT PARAMETERS:

Pressure–Vacuum to 600 PSI

Temperature–Minus 40°F to 2600°F

Sizes–2” thru 12”

Traverse (axial motion) - Up to 8”

Bellows Material and Construction–Laminated Stainless Steel Type 300 Series (other materials available upon request)

End Fittings–Carbon Steel

Internal Guide (liner) - Stainless Steel

Shroud (cover) - Carbon Steel

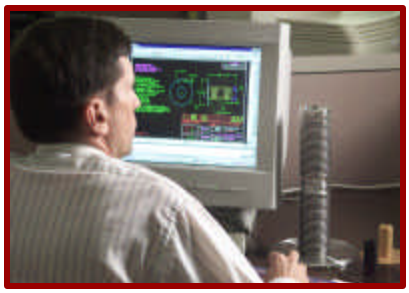
Expansion joints must be installed with proper placement and quantity of guides and anchors in accordance with EJMA standards. Please contact Flex-Weld engineers for system analysis and consultation.

SPOTLIGHT ON MULTI-PLY EXPANSION JOINTS

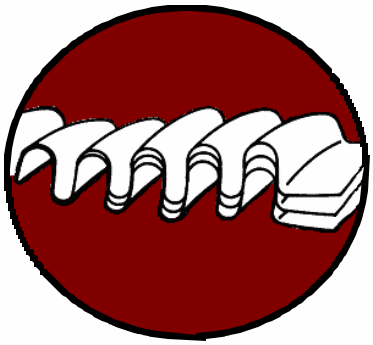
KEFLEX™ MULTI-PLY ADVANTAGES

Increased flexibility	Minimal installation length required
Higher pressures attainable	Fail safe design—shoulder, liners, multi-ply standard construction
Lower thrust forces	Elevated corrosion resistance

ADVANTAGES:



MULTI-PLY SAFETY FACTORS - In a critical application, a multi-ply expansion joint can in most cases preclude a catastrophic failure. If a failure occurs in one ply due to corrosion or fatigue, the intact plies will work as a protective barrier to contain the pressure and the medium until a replacement can be made. Flex-Weld Multi-ply expansion joints are designed to provide utmost safety in the event of system failure. The burst pressures are a multiplier of the operating pressure making the Flex-Weld multi-ply bellows the most reliable component in the system.



CYCLE LIFE OPTIMIZATION - The technical advantage of using multiple plies of thin wall thickness material is that less residual stresses are introduced at the time of bellows forming. Overall, Flex-Weld multi-ply expansion joints have lower built-in and induced stresses which ultimately results in longer cycle life. Also, the thinner gauge multiple plies have less localized induced stresses during operation compared to a single thicker ply. The configuration of the convolutions (pitch, depth, contour, number of plies, ply thickness) of FLEX-WELD multi-ply expansion joints are optimized to offer the highest fatigue life.

COMPACT DESIGN - Multi-ply expansion joints have more flexibility than conventional single-ply expansion joints and thus require less live length to accommodate a given movement. The live length of the bellows can be minimized to absorb a given combination of axial, lateral and angular movements. This results in an economical compact assembly which can be installed in a minimal amount of space. An additional benefit is a small effective area resulting in lower thrust pressures on the anchors and mechanical equipment in the system.

LOWER THRUST FORCES - The multi-ply design results in lower spring rates. Also, the effective cross sectional area of multi-ply expansion joints is less, compared to single-ply bellows, to accommodate a given movement. These two reductions result in lower forces and moments on the anchors, equipment and guides. A side benefit is that less anchors and guides will be required in the overall bellows piping system.

TOLL FREE: 1-800-323-6893

SPOTLIGHT ON MULTI-PLY EXPANSION JOINTS

MANUFACTURING CAPABILITIES

Proprietary forming techniques produce metallic expansion joint bellows of consistent quality and close tolerances.
In-process testing & inspection result in the most reliable expansion joints.
Mechanically forming one convolution at a time minimizes material thinning.
High frequency pulse TIG welds minimize the heat –affected (HAZ) zone and results in superior bellows strength, ductility and dependability.
Diameters ranging from 2” I.D. to 12" I.D.
Pressures ranging from vacuum to 1,000 PSI depending on application.
Temperatures ranging from cryogenic to 2600°F
Axial movements up to 8" depending up on size.
Material handling from abrasive solids to corrosive gases and liquids.

EXPANSION JOINT BELLOWS MATERIALS

T-321 Stainless Steel	Brass	Inconel 625	Hastelloy C-276, C-22, C-2000
T-316 (L) Stainless Steel	Beryllium Copper	Inconel 625 LCF	Haynes 230
T-304 (L) Stainless Steel	Phosphor Bronze	Monel 400	Hastelloy B, B2
T-347 Stainless Steel	Carpenter Alloy 20	Titanium	Other alloys available upon request

SPECIAL CAPABILITIES

Mass Spec Leak Testing	Brazing
Teflon Coating	Material Selection
Heat Treating	Failure Analysis
Liquid Penetrant Testing / Radiography	Concurrent Engineering
Plating	Cleaning
Custom Flange Fitting Design	Electro-Polishing
Machining / Stamping	Special Testing
Welding	Prototyping/Modeling
Laser, MIG, TIG, RSEW	CAD / CAM
Soldering	System Engineering and Design (Complete take offs)

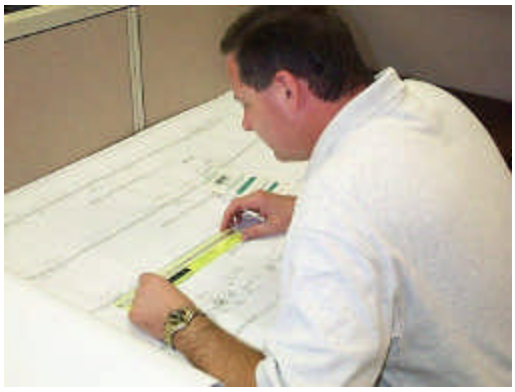
1, 2, 3 QUICK EASY SELECTION GUIDE

1 Determine the Operating Conditions

Use the Product Engineering Worksheet as a guide

2 Develop the Expansion Joint Requirements

3 Select the Proper Expansion Joint



1 DETERMINE THE OPERATING CONDITIONS & SYSTEM PARAMETERS

Determining the necessary information is the first step. Use the Keflex™ Product Engineering Worksheet (Form #EJWS4102) as a guide to proper selection of a standard expansion joint .

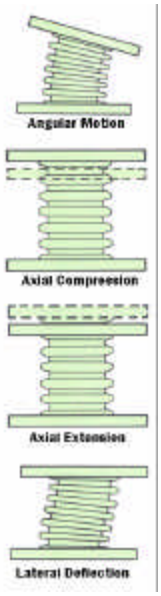
- ☑ Size
  - ID
  - OAL
- ☑ Pipe Detail
  - Material Type
  - Length of Run
- ☑ Media
  - External
  - Internal
- ☑ System Temp. (Min/Max)
- ☑ Ambient Temp. (°F)
- ☑ Design PSI
- ☑ Working PSI
- ☑ Axial Compression
- ☑ Axial Extension
- ☑ Lateral Deflection
- ☑ Angular Motion

Name of Person Submitting Data:	Part Description	Quantity Required
Size of Assembly: Nominal size or inside diameter of the connecting end fittings	Inches	
Installed Length (OAL): Space between connecting points	Inches	
Type of Media: Indicate if liquid, steam, gas, exhaust, slurry, solids, etc.		
Bellows Material Type:		
Temperature of Flowing Media: Indicate both operating and maximum temperatures of system	Operating °F	Maximum °F
Temperature of Surrounding Atmosphere: Indicate both min. & max. temperatures of atmosphere at the expansion joint	Min. Degrees °F	Max. Degrees °F
Velocity of Flowing Media: In feet/Sec or Gallons/Min	Feet/Sec	Gal/Min
Operating Pressure: Actual pressure which system works under normal conditions	Positive PSIG	Negative HG
Design Pressure of the System: Highest / Most severe pressure during operation	Positive PSIG	Negative HG
Test Method & Requirements: Test method used and testing levels required for system	Positive PSIG	Negative HG
Axial Movement (Compression/Extension): In inches as a result of system extension/expansion	Compression in Inches	Extension in Inches
Lateral Deflection / Offset: In inches	Inches	
Angular Movement: In degrees	Degrees	
Liner / Shroud Type:	Liner	Shroud
Lead Time / Target Pricing:	Required Lead Time	Target Price
End Fittings 1/E: Indicate end fitting requirements, thickness, material type & configuration		
End Fittings O/E: Indicate end fitting requirements, thickness, material type & configuration		
System Accessories: Indicate any accessories required including; Guides, Control Rods, Retaining Rings, Anchor Bases, Insulation, Etc.		
Special Notes / Shipping Instructions:		

KEFLEX 1, 2, 3 QUICK EASY SELECTION GUIDE

2 DEVELOP THE EXPANSION JOINT REQUIREMENTS

- **Size**—Measure pipe size (ID) of the system.
- **Type**—Determine piping material type.
- **Run of Pipe**—Length of pipe measured from anchor to anchor.
- **Media**—Identify what is going through the expansion joint (i.e. water, air, steam, etc.).
- **Design PSI**—Identify the pressure the system was designed to carry. Some systems carry a design pressure greater than the working pressure. If no design pressure is available, use the working pressure.
- **Working PSI**—Identify the maximum working or operating pressure of the system.
- **System Temp. (°F)** - Identify the max./min. temperature range of the system. This is necessary in order to determine maximum pipe growth and the expansion joint axial compression or extension required.
- **Ambient Temp. (°F)** - External temperature to the system should be considered if it falls outside of the max./min. media temperatures.
- **Axial Motion (in.)** also **Axial Extension (in.)** - Sometimes referred to as traverse, is defined as the amount of motion parallel to the longitudinal axis in a straight, guided pipe line which is absorbed by an expansion joint. **Compression:** As the pipe expands (lengthens) due to temperature increase, the expansion joint compresses (shortens). **Extension:** As the pipe contracts (shortens) due to temperature decrease (below installation temperature), the expansion joint will extend (lengthen).
- **Angular Motion (Degrees)** - Also referred to as radial-angular movement, is defined as movement in which the ends are displaced at an angle to each other rather than remaining parallel.
- **Lateral Deflection**—Lateral deflection, also referred to as shear or offset, is defined as single plane deflection from the center line of one end of an expansion joint, but with that end remaining parallel to the other end.



NOTE: Expansion joints are not designed to absorb torsional movement or stress. Subjecting an expansion joint to torsion of any amount may drastically affect operating life and will void the warranty. Consult factory if torsion is present.

How to Use the Thermal Expansion Table:

Example: Find the expansion of 105ft. Of any diameter carbon steel pipe carrying steam at 138 PSIG and at a lowest surrounding ambient temperature of 40°F.
Maximum temperature = 360°F (138 PSIG saturated steam)
Calculated traverse (from table)
Expansion per 100 ft. of carbon steel at 360°F = 2.88"
Less expansion per 100 ft. of carbon steel pipe at 40°F = 0.30"
Expected traverse per 100 ft. = 2.58"

Expansion of 105 ft. = $\frac{105}{100}$ X 2.58" = 2.71"

Conclusion: Since an expansion joint is normally set at 80% in compression and 20% in extension, an expansion joint with 4" total axial movement should be selected.

Thermal Expansion Table

Thermal Expansion of Pipe in Inches per 100 Feet							
Saturated Steam Vacuum in HG below 212°F, Pressure, PSIG above 212°F	Temp. °F	Cast Iron	Carbon Steel or Steel	Wrought Iron	4-6% Cr. Alloy Steel	18 Cr.8Ni Stainless Steel	Copper
	-200	-1.058	-1.282	-1.289	-1.250	-2.030	-1.955
	-180	-0.982	-1.176	-1.183	-1.150	-1.850	-1.782
	-160	-0.891	-1.066	-1.073	-1.030	-1.670	-1.612
	-140	-0.797	-0.948	-0.955	-0.970	-1.480	-1.428
	-120	-0.697	-0.826	-0.833	-0.800	-1.300	-1.235
	-100	-0.593	-0.698	-0.705	-0.700	-0.900	-1.040
	-80	-0.481	-0.563	-0.570	-0.500	-0.880	-0.835
	-60	-0.368	-0.428	-0.435	-0.430	-0.670	-0.630
	-40	-0.248	-0.288	-0.295	-0.920	-0.450	-0.421
	-20	-0.127	-0.145	-0.152	-0.145	-0.225	-0.210
	0	0	0	0	0	0	0
	20	0.128	1.148	0.180	0.140	0.223	0.238
	32	0.209	0.230	0.280	0.234	0.356	0.366
	40	0.270	0.300	0.350	0.280	0.446	0.451
29.39	60	0.410	0.448	0.540	0.430	0.669	0.684
28.89	80	0.550	0.580	0.710	0.500	0.892	0.896
27.99	100	0.680	0.753	0.887	0.650	1.115	1.134
26.48	120	0.830	0.910	1.058	0.800	1.338	1.366
24.04	140	0.970	1.064	1.240	0.950	1.545	1.590
20.27	160	1.110	1.200	1.420	1.100	1.784	1.804
14.63	180	1.240	1.360	1.580	1.250	2.000	2.051
6.45	200	1.390	1.520	1.750	1.400	2.230	2.296
0	212	1.480	1.610	1.870	1.500	2.361	2.428
2.50	220	1.530	1.680	1.940	1.550	2.460	2.516
10.30	240	1.670	1.840	2.120	1.720	2.680	2.756
20.70	260	1.820	2.020	2.300	1.880	2.920	2.985
34.50	280	1.970	2.180	2.470	2.050	3.150	3.218
52.30	300	2.130	2.350	2.670	2.200	3.390	3.461
74.90	320	2.268	2.530	2.850	2.370	3.615	3.696
103.30	340	2.430	2.700	3.040	2.530	3.840	3.941
138.30	360	2.590	2.880	3.230	2.700	4.100	4.176
180.90	380	2.750	3.060	3.425	2.860	4.346	4.424
232.40	400	2.910	3.230	3.620	3.010	4.580	4.666
293.70	420	3.090	3.421	3.820	3.180	4.800	4.914
366.10	440	3.250	3.595	4.020	3.350	5.050	5.154
451.30	460	3.410	3.784	4.200	3.530	5.300	5.408
550.30	480	3.570	3.955	4.400	3.700	5.540	5.651
664.30	500	3.730	4.151	4.600	3.860	5.800	5.906
795.30	520	3.900	4.342	4.810	4.040	6.050	6.148
945.30	540	4.080	4.525	5.020	4.200	6.280	6.410
1115.00	560	4.250	4.730	5.220	4.400	6.520	6.646
1308.00	580	4.430	4.930	5.430	4.560	6.780	6.919
1525.00	600	4.600	5.130	5.620	4.750	7.020	7.184
1768.00	620	4.790	5.330	5.840	4.920	7.270	7.432
2041.00	640	4.970	5.530	6.050	5.100	7.520	7.689
2346.00	660	5.150	5.750	6.250	5.300	7.770	7.949
2705.00	680	5.330	5.950	6.470	5.480	8.020	8.196
3080.00	700	5.520	6.160	6.670	5.650	8.280	8.472
	720	5.710	6.360	6.880	5.850	8.520	8.708
	740	5.900	6.570	7.100	6.030	8.780	8.999
	760	6.090	6.790	7.320	6.220	9.050	9.256
	780	6.280	7.000	7.530	6.410	9.300	9.532
	800	6.470	7.230	7.730	6.610	9.580	9.788
	820	6.660	7.450	7.960	6.800	9.820	10.068
	840	6.850	7.660	7.180	7.000	10.100	10.308

Note: The shaded area indicates the maximum and minimum recommended temperature for each material. For applications requiring lower or higher temperatures, consult the factory. From the Piping Handbook by Sabin Crocker, McGraw-Hill Publishing Co. & Acme Paper No. 53-A-52, 1954.

Temperature Derating Table

Maximum Rated Pressures (PSIG)							
Pressure Class		L Series, 50 PSI		M Series, 150 PSI		H Series, 300 PSI	
Temp °F	Temp °C	Working (Design)	Proof (Test)	Working (Design)	Proof (Test)	Working (Design)	Proof (Test)
100°	38°	50.0	75	150.0	225	300.0	450
150°	66°	45.9		137.7		275.4	
200°	93°	41.8		125.4		250.8	
250°	121°	39.6		118.8		237.6	
300°	149°	37.4		112.2		224.4	
350°	177°	36.0		108.0		216.0	
400°	204°	34.6		103.8		207.6	
450°	232°	33.5		100.5		201.0	
500°	260°	32.4		97.2		194.4	
600°	316°	30.5		91.5		183.0	
700°	371°	29.6		88.7		177.3	
800°	427°	28.0		84.0		168.0	

PRODUCT TESTED AT ROOM TEMP

KEFLEX 1, 2, 3 QUICK EASY SELECTION GUIDE

3 SELECT THE PROPER EXPANSION JOINT

2” - 12”

For larger sizes, please contact the factory

311 Shrouded Series with 150# Flanges

311 Shrouded Series with Tie Rods and 150# Flanges

311 Shrouded Series with Sch 40 Weld Ends

311 Shrouded Series with Tie Rods and Sch 40 Weld Ends

Nom. Pipe Size (in.)	Total † Axial Move. (in.)		Axial Force to Compress	Pressure Class PSI @ 70°F 50	150	300	308 Series Un-shrouded OAL	311 Series-Shrouded OAL	308 Series Approximate Weight (lbs.) Sch 40 Weld Ends	150# Flange	300# Flange	150# Flange Tie Rods	300# Flange Tie Rods	311 Series Added Weight (lbs.)
2	S	1	100	L	M	H	13	15	4	12	15	26	41	1
		2	175	L	M	H	15	17	5	13	16	28	44	1
		3	200	L	M	–	17	20	7	15	18	31	48	1
	D	2*	100	L	M	H	19	25	16	24	27	42	61	1
		4*	175	L	M	H	24	31	19	27	30	47	68	1
		6*	200	L	M	–	30	36	24	32	35	54	77	3
2½	S	1	200	L	M	H	13	15	6	16	21	31	47	1
		2	350	L	M	H	15	17	8	17	22	33	51	2
		3	400	L	M	–	17	20	9	19	24	36	54	2
	D	2*	200	L	M	H	19	25	16	24	29	43	64	2
		4*	350	L	M	H	24	31	19	27	32	48	71	3
		6*	400	L	M	–	30	36	24	30	35	53	78	5
3	S	1	150	L	M	H	13	15	8	19	26	35	52	2
		2	225	L	M	H	15	17	10	21	28	38	57	2
		3	300	L	M	–	17	20	12	23	30	41	60	3
	D	2*	150	L	M	H	19	25	32	44	51	64	85	2
		4*	225	L	M	H	24	31	37	49	56	71	94	4
		6*	300	L	M	–	30	36	43	55	62	79	104	8
4	S	1	400	L	M	H	13	15	12	26	41	43	63	4
		2	575	L	M	H	15	17	14	28	43	46	67	5
		3	700	L	M	–	17	20	17	31	46	50	72	6
		4	625	L	–	–	21	24	21	35	50	56	80	10
	D	2*	400	L	M	H	19	25	47	61	76	82	106	2
		4*	575	L	M	H	24	31	52	66	81	89	115	6
		6*	700	L	M	–	30	36	58	72	87	97	125	12
		8*	625	L	–	–	40	46	67	76	91	105	137	14
5	S	1	225	L	M	H	13	15	19	39	56	57	79	5
		2	350	L	M	H	15	17	21	41	58	60	83	5
		3	425	L	M	–	17	20	25	45	62	65	89	8
		4	425	L	–	–	21	24	32	52	69	74	100	10
	D	2*	225	L	M	H	19	25	56	76	93	98	124	5
		4*	350	L	M	H	24	31	61	81	98	105	133	10
		6*	425	L	M	–	30	36	67	87	104	113	143	19
		8*	425	L	–	–	40	46	71	91	108	121	155	23
6	S	1	250	L	M	H	13	15	27	50	69	70	96	6
		2	400	L	M	H	15	17	30	53	72	74	101	6
		3	500	L	M	–	17	20	33	56	75	78	106	8
		4	500	L	M	–	21	24	48	66	85	90	120	11
	D	2*	250	L	M	H	19	25	67	90	109	114	144	6
		4*	400	L	M	H	24	31	72	95	114	121	153	11
		6*	500	L	M	–	30	36	78	101	120	129	163	22
		8*	500	L	M	–	40	46	84	107	126	139	177	26
8	S	1	400	L	M	H	13	15	43	85	104	106	140	6
		2	575	L	M	H	15	17	48	89	108	111	146	6
		3	750	L	M	H	17	20	57	97	116	120	156	8
		4	650	L	M	–	21	24	66	106	125	131	169	12
	D	2*	400	L	M	H	19	25	88	130	149	155	193	6
		4*	575	L	M	H	24	31	91	133	152	165	205	12
		6*	750	L	M	H	30	36	97	139	158	168	210	30
		8*	650	L	M	–	40	46	101	143	162	176	222	35
10	S	1	600	L	M	H	13	15	60	110	135	138	173	6
		2	850	L	M	H	15	17	68	118	143	147	182	7
		3	1000	L	M	H	17	20	78	128	153	158	193	12
		4	900	L	M	–	21	24	90	140	165	173	208	15
	D	2*	600	L	M	H	19	25	115	165	190	198	233	5
		4*	850	L	M	H	24	31	120	170	195	206	241	15
		6*	1000	L	M	H	30	36	126	176	201	215	250	31
		8*	900	L	M	–	40	46	130	180	205	224	259	37
12	S	1	350	L	M	H	13	15	79	159	189	192	242	6
		2	475	L	M	H	15	17	85	165	195	199	249	10
		3	600	L	M	H	17	20	96	176	206	211	261	16
		4	550	L	M	–	21	24	116	196	226	234	284	24
	D	2*	350	L	M	H	19	25	149	229	259	267	317	10
		4*	475	L	M	H	24	31	154	234	264	276	326	24
		6*	600	L	M	H	30	36	160	240	270	284	334	48
		8*	550	L	M	–	40	46	165	245	275	294	344	58

†Total Axial Movement rated at 80% compression (pipe expansion) and 20% extension (pipe compression).
*Movement each side of base is 1/2 of total—All Dual units will be provided with center Anchor Base or universally tied.
Note: Lateral movement is limited to 1/16” either side of center line. Angular movement is limited to 2-1/2 degrees.

KEFLEX MULTI-PLY EXPANSION JOINTS

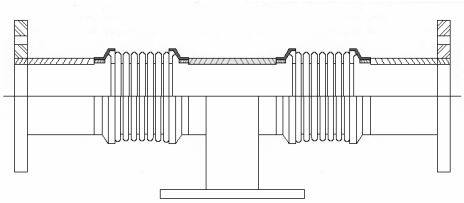
THRUST FORCE TABLE

To determine the end load on an anchor when a bellows type expansion joint is installed, us the Thrust Force Table below and add the "Axial Force to Compress" (see page 7, column 3).

Expansion Joint Nominal Pipe Size	2"	2-1/2"	3"	4"	5"	6"	8"	10"	12"
Nominal I.D. Bellows Element	2.375"	2.875"	3.5"	4.5"	5.563"	6.625"	8.625"	10.75"	12.75"
Nominal O.D. Bellows Element	3.02	3.32	4.11	5.12	6.41	7.41	9.42	11.60	13.80
Effective Area in Square Inches	6.02	8.32	11.05	17.81	27.80	38.75	64.67	96.64	137.19
Pressure PSI	THRUST FORCE LBS @ SPECIFIED PRESSURES								
10	60	83	111	178	278	388	647	566	1372
20	120	166	222	356	556	776	1293	1933	2744
30	181	250	332	534	834	1163	1940	2899	4116
40	214	333	442	712	1112	1550	2587	3866	5488
50	301	416	553	891	1390	1938	3234	4832	6860
60	361	499	663	1069	1668	2325	3880	5798	8231
75	451	624	829	1336	2085	2906	4850	7248	10289
100	602	832	1105	1781	2780	3875	6467	9664	13719
125	752	1040	1381	2226	3475	4844	8084	12080	17149
150	903	1248	1658	2672	4170	5813	9700	14496	20579
175	1053	1456	1934	3117	4865	6781	11317	16912	24008
200	1204	1664	2210	3562	5560	7750	12934	19328	27438
225	1354	1872	2486	4407	6255	8719	14550	21744	30868
250	1505	2081	2763	4453	6950	9688	16168	24160	34298
275	1655	2289	3039	4898	7645	10656	17784	26576	37727
300	1805	2497	3315	5343	8340	11625	19401	28992	41157

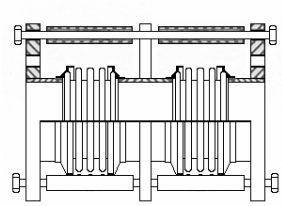
STANDARD AND SPECIAL OPTIONS

DUAL UNITS (Standard Option)



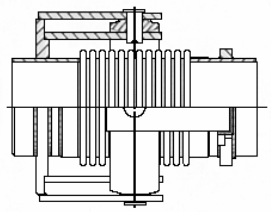
A dual expansion joint is specified when axial movement caused by thermal expansion is longer than can be absorbed by a single bellows unit. Dual units are supplied with a center base which serves as an intermediate anchor when the unit is installed in a section of pipe between two main anchors. (The center base should not replace or be used instead of a main anchor.)

Universally Tied (Standard Option)



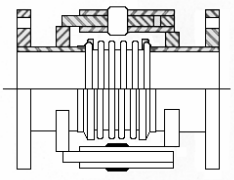
This assembly uses two or more bellows elements to permit combinations of lateral, angular and axial movements. Tie rods and/or limit stops are generally furnished to control the action of the assembly and also to support longer assemblies.

Gimbal Joints (Special Option)



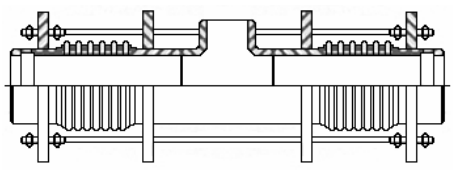
Gimbal joints provide up to 5-1/2° angular deflection in any direction from the pipe axis. They protect the bellows from any torsional displacement or stress. Made with two sets of hinged plates attached to a central floating box, they function in a manner similar to a universal joint. Gimbal joints are used for complex piping systems where proper anchoring and guiding may not be feasible. Gimbal joints usually in pairs, will permit piping to float in relation to the terminal points. They negate any and all end thrust loads due to the media pressure.

Hinged (Special Option)

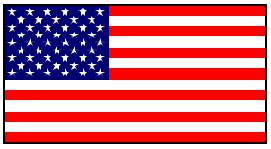


When angular motion in one plane only is desired, hinged assemblies are available. Hinges (forks) placed 180° apart are designed to restrain inter-thrust forces and to support the unit.

Balanced Joints (Special Option)



These are dual bellows units with a central offset or elbow take-off and are made with tie rods. They are designed for full media pressure end thrust restraint as one of the dual bellows is a dead end type. They are used at or near a piping system terminal point to compensate for the axial expansion and contraction without imposing any of the media pressure end thrust load on the terminal point. The mechanical force required to compress or extend both of theses bellows is the only force load on the terminal point.



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