



# Single Externally-Pressurized Expansion Joints

## PLATINUM SERIES – SEP

### Internal Guide Ring

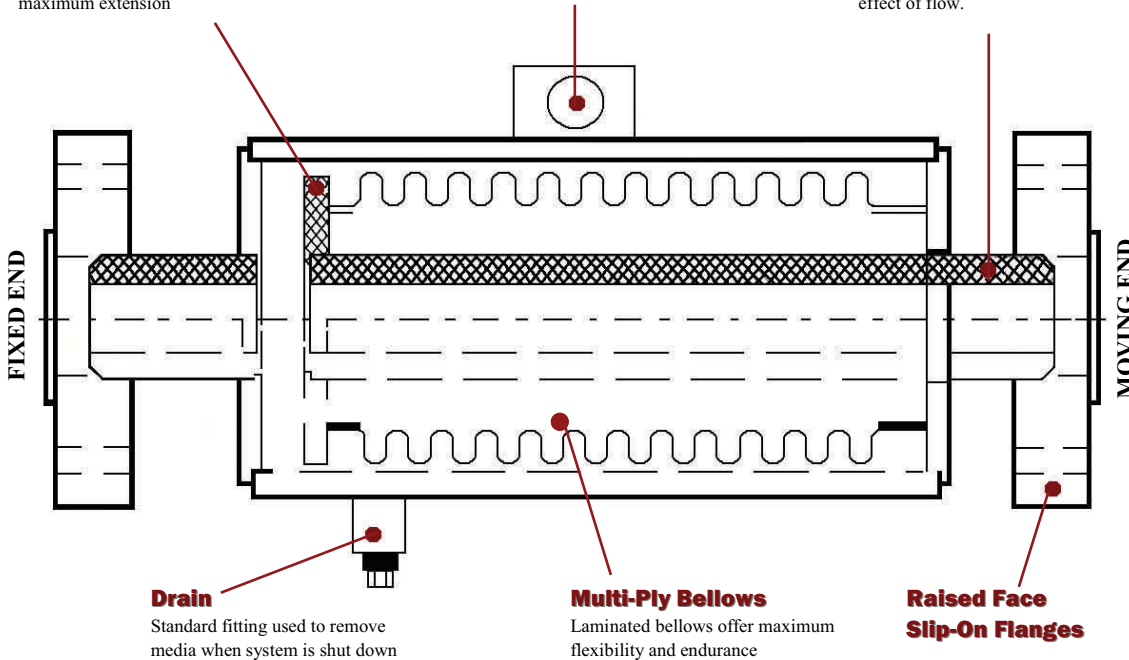
Maintains alignment of inner pipe and housing, prevents contact of bellows with housing, and provides stop for maximum extension

### Lifting Lug

Standard on all units, for ease of installation

### Liner

Equivalent to nominal ID size of expansion joint to manage effect of flow.



### FEATURES:

- ▶ **The First Choice In Steam Bearing Expansion Joints**
- ▶ **Variety Of Available End Fittings**
- ▶ **150 PSI Or 300 PSI**
- ▶ **Traverse Up To 8"**
- ▶ **Maintenance Free**
- ▶ **Ready For Direct Burial\***

**Externally-Pressurized Expansion Joints are Designed to Replace:**  
High Maintenance Packed Joints ♦ Space Confining Pipe Loops ♦ Costly Equalizing Expansion Joints

### OPTIONAL CONFIGURATIONS

END TYPE:	LINER:	PRESSURE:
Weld Ends	Schedule 40	150 Lbs
Grooved Ends	Schedule 80	300 Lbs
Plate Flanges		Consult Factory for Higher Pressure Applications

\* Consult Factory For Installation Details

### ADDITIONAL LITERATURE PERTAINING TO THIS PRODUCT SERIES:

- ♦ Installation Guide
- ♦ Submittal Drawings
- ♦ Engineering Specification
- ♦ Multi-Ply Expansion Joint Selection Guide
- ♦ Dual Externally-Pressurized Expansion Joint (DEP Series)

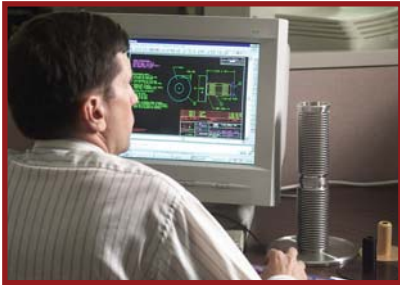


**100% American Made**

## KEFLEX™ MULTI-PLY ADVANTAGES

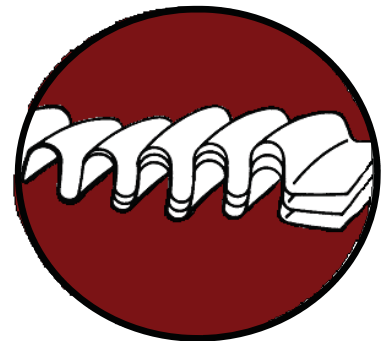
- ◆ Increased flexibility
- ◆ Higher pressures attainable
- ◆ Lower thrust forces
- ◆ Lower spring rates & higher elasticity
- ◆ Minimal installation length required
- ◆ Fail safe design--shoulder, liners, multi-ply standard construction
- ◆ Elevated corrosion resistance
- ◆ Low cost

## 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.



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

## SPECIAL CAPABILITIES



- ◆ Mass Spec Leak Testing
- ◆ Teflon Coating
- ◆ Heat Treating
- ◆ Liquid Penetrant Testing / Radiography
- ◆ Plating
- ◆ Custom Flange Fitting Design
- ◆ Machining / Stamping
- ◆ Welding
  - Laser, MIG, TIG, RSEW
- ◆ Soldering
- ◆ Brazing
- ◆ Material Selection
- ◆ Failure Analysis
- ◆ Concurrent Engineering
- ◆ Cleaning
- ◆ Electro-Polishing
- ◆ Special Testing
- ◆ Prototyping/Modeling
- ◆ CAD / CAM
- ◆ 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
<b>Size of Assembly:</b> Nominal size or inside diameter of the connecting end fittings	Inches	
<b>Installed Length (OAL):</b> Space between connecting points	Inches	
<b>Type of Media:</b> Indicate if liquid, steam, gas, exhaust, slurry, solids, etc.		
<b>Bellows Material Type:</b>		
<b>Temperature of Flowing Media:</b> Indicate both operating and maximum temperatures of system	Operating °F	Maximum °F
<b>Temperature of Surrounding Atmosphere:</b> Indicate both min. & max. temperatures of atmosphere at the expansion joint	Min. Degrees °F	Max. Degrees °F
<b>Velocity of Flowing Media:</b> In feet/Sec or Gallons/Min	Feet/Sec	Gal/Min
<b>Operating Pressure:</b> Actual pressure which system works under normal conditions	Positive PSIG	Negative HG
<b>Design Pressure of the System:</b> Highest / Most severe pressure during operation	Positive PSIG	Negative HG
<b>Test Method &amp; Requirements:</b> Test method used and testing levels required for system	Positive PSIG	Negative HG
<b>Axial Movement (Compression/Extension):</b> In inches as a result of system extension/expansion	Compression in Inches	Extension in Inches
<b>Lateral Deflection / Offset:</b> In inches	Inches	
<b>Angular Movement:</b> In degrees	Degrees	
<b>Liner / Shroud Type:</b>	Liner	Shroud
<b>Lead Time / Target Pricing:</b>	Required Lead Time	Target Price
<b>End Fittings 1/E:</b> Indicate end fitting requirements, thickness, material type & configuration		
<b>End Fittings O/E:</b> Indicate end fitting requirements, thickness, material type & configuration		
<b>System Accessories:</b> Indicate any accessories required including: Guides, Control Rods, Retaining Rings, Anchor Bases, Insulation, Etc.		
<b>Special Notes / Shipping Instructions:</b>		



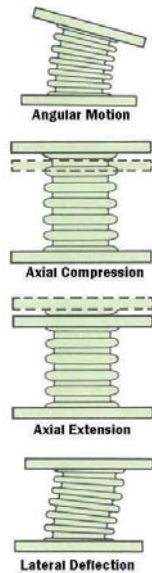
# 1, 2, 3 QUICK & EASY SELECTION GUIDE

## 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. **DOES NOT APPLY TO SEP SERIES.**
- 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. **DOES NOT APPLY TO SEP SERIES.**

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
29.39	40	0.270	0.300	0.350	0.280	0.446	0.451
	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	8.180	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.

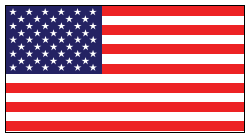
**NOTE:** Expansion joints are not designed to absorb torsional movement or stress. Subjecting an expansion joint to torsion of any amount may drastically affect operating life and will void the warranty. Consult factory if torsion is present.



# Single Externally-Pressurized Expansion Joints

## 3

### SELECT THE PROPER EXPANSION JOINT



**100%  
American Made**

Working Pressure @ 650 ° F												
Size (in)	Axial Compression (in)	150 PSI					300 PSI					Effective Area
		Flanged Ends		Weld Ends		Spring Rate	Flanged Ends		Weld Ends		Spring Rate	
		OAL (in)	LBS	OAL (in)	LBS		OAL (in)	LBS	OAL (in)	LBS		
1"	4	22-1/2	23	22	19	40	23-1/2	25	23	20	60	7.8"
	6	29-3/4	30	29-1/4	26	25	30-3/4	32	30-1/4	28	40	
	8	36-5/8	35	36-1/8	31	20	37-5/8	37	37-1/8	33	30	
1-1/4"	4	23	26	22-1/2	20	40	24	33	23-1/2	22	60	
	6	30	34	29-1/2	29	25	31	41	30-1/2	31	40	
	8	36-7/8	39	36-1/8	33	20	37-7/8	44	37-3/8	35	30	
1-1/2"	4	23	26	22-1/2	20	40	24	33	23-1/2	22	60	
	6	30	35	29-1/2	29	25	31	38	30-1/2	31	40	
	8	36-7/8	39	36-3/8	33	20	37-7/8	41	37-3/8	35	30	
2"	4	23-1/2	44	23	33	40	24-1/2	44	24	35	60	
	6	30-1/2	56	30	46	25	31-1/2	60	31	48	40	
	8	37-3/8	65	36-7/8	55	20	38-3/8	70	37-7/8	58	30	
2-1/2"	4	26-3/8	51	25-7/8	35	160	27-3/8	54	26-7/8	37	230	19.8
	6	33-3/8	65	32-7/8	50	100	34-3/8	68	33-7/8	52	150	
	8	43-3/8	75	42-7/8	60	80	44-3/8	79	43-7/8	63	120	
3"	4	26-3/8	63	25-7/8	46	160	27-3/8	68	26-7/8	48	230	
	6	33-3/8	74	32-7/8	57	100	34-3/8	79	33-7/8	60	150	
	8	43-3/8	91	42-7/8	74	80	44-3/8	96	43-7/8	78	120	
3-1/2"	4	26-3/8	93	25-7/8	69	160	27-3/8	98	26-7/8	72	230	
	6	33-3/8	109	32-7/8	86	100	34-3/8	115	33-7/8	90	150	
	8	43-3/8	175	42-7/8	152	80	44-3/8	180	43-7/8	163	120	
4"	4	25-3/4	99	25-1/4	72	165	26-3/4	121	26-1/4	74	230	29.5"
	6	33-5/8	117	33-1/8	89	105	34-5/8	127	34-1/8	94	150	
	8	39-5/8	144	39-1/8	116	85	40-5/8	156	40-1/8	124	120	
5"	4	26-7/8	128	26-3/8	95	320	27-7/8	150	27-3/8	97	500	66.8"
	6	34-7/8	149	34-3/8	116	225	35-7/8	175	35-3/8	120	350	
	8	44-3/8	171	43-7/8	138	160	45-3/8	195	44-7/8	143	250	
6"	4	26-7/8	144	26-3/8	102	320	27-7/8	164	27-3/8	106	500	
	6	34-7/8	167	34-3/8	125	225	35-7/8	187	35-3/8	130	350	
	8	44-3/8	191	43-7/8	149	160	45-3/8	213	44-7/8	155	250	
8"	4	25-1/4	228	24-3/4	161	440	26-1/4	236	25-3/4	168	600	81"
	6	31-3/4	265	31-1/4	198	320	32-3/4	285	32-1/4	209	450	
	8	40-7/8	302	40-3/8	236	220	41-7/8	314	41-3/8	250	300	
10"	4	25-1/4	306	24-3/4	209	490	26-1/4	336	25-3/4	216	900	121"
	6	31-3/4	358	31-1/4	261	350	32-3/4	388	32-1/4	272	670	
	8	40-7/8	434	40-3/8	337	240	41-7/8	483	41-3/8	354	450	