PisaFlex

Full Catalog

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PisaFlex

PROMOCIONES INDUSTRIALES S.A. DE C.V.

PisaFlex - Promociones Industries, S.A de C.V. was founded in 1954 as an Industrial Supply Company and Manufacturer's Representative headquartered in Monterrey, Mexico with four branches located throughout Mexico, to service basic industry while paying particular attention to the steel sector.

In 1994 it was decided to refocus the companies strategies towards value added products and manufacturing. We purchased our first welding machine in 1994 to manufacture metallic hose assemblies. In 1996 we acquired bellows forming machinery to produce metallic bellows and expansion joints. In 2002 we started up our modern hose and braid manufacturing facility. We currently have over 75 employees working for PisaFlex with 72,000 square feet of manufacturing floor space. Our welders are ASME Certified and highly trained experts.

PisaFlex today is Mexico's premier manufacturer of metallic expansion joints and braided hose assemblies. Our highly qualified team of sales associates, engineers, and technicians trained in Mexico and abroad are dedicated to the manufacture of high quality products required by our customers. Our expansion joints are all designed to EJMA and ASME standards. Our Metal Hose Assemblies have all been designed to meet or exceed ISO 10380 performance specification.

Our Production capabilities are:

1. **Round Metal Expansion Joints –** 3” Through 144” in Diameter with wall thickness from 11 Gauge down to as thin as 31 Gauge. We also make multi-ply bellow capsule for the severe vibration applications or pressure redundancy. For larger than standard diameter contact us.

2. **Rectangular/Square Metal Expansion** Joints – Any Length x Width dimensions as needed with wall thickness form 11 Gauge down to as thin as 31 Gauge.

3. **Metal Hose Assemblies -** We manufacture ¼” through 8” diameter hose and braid in house and we import the larger size bulk hose and braid and fabricate these assemblies at the factory.

Our product all ships FOB Laredo, TX; so you do not have to worry about customs or duty paperwork; PisaFlex will take care of all those issues, which make product delivery easier for you.

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Expansion Joint Design Basics

Design Basics
Metal bellows expansion joints consist of a flexible bellows element, appropriate end fittings such as flanges or butt-weld ends to allow connection to the adjacent piping or equipment, and other accessory items that may be required for a particular service application.

Bellows Design
Bellows are manufactured from relatively thin-walled tubing to form a corrugated cylinder. The corrugations commonly referred to as convolutions; add the structural reinforcement necessary for the thin-wall material to contain system pressure. The bellows designer/engineer selects the thickness and convolution geometry to produce a bellows design that approaches, and often exceeds the capacity of the adjoining pipe to contain system pressure at the specified design temperature.

Flexibility of the bellows is achieved through bending of the convolution sidewalls, as well as flexing within their crest and root radii. In most cases, multiple convolutions are required to provide sufficient flexibility to accommodate the expected expansion and contraction of the piping system.

Piping Flexibility
All materials expand and contract with thermal change. In the case of piping systems, the dimensional change can produce excessive stresses throughout the piping system and at fixed points such as vessels, rotating equipment, and as well as within the piping itself.

Pipe loops may add the required flexibility to a piping system if space permits, however the following factor should be considered before using pipe loops:

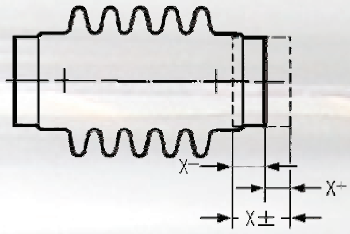
1. The initial cost of the additional pipe, elbows and supports must be considered.
2. In addition, increased continuous operating costs due to pressure drop may result from the frictional resistance of the flowing media through additional elbows and pipe.
3. In some cases, pipe diameter must be increased to compensate for losses due to pressure drop.

A practical and cost effective means of achieving piping system flexibility in a compact design is through the application of expansion joints. The most efficient piping system is the shortest and most directly routed system and expansion joints make this possible.
Expansion joints provide an excellent solution for settlement of structure or equipment, seismic deflection, isolation of mechanical vibration and sound attenuation transmission produced by rotating equipment.

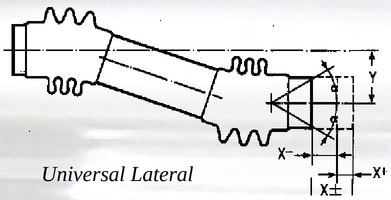
Movement Capabilities

<u>Axial Compression</u> Reduction of the bellows length due to piping expansion.

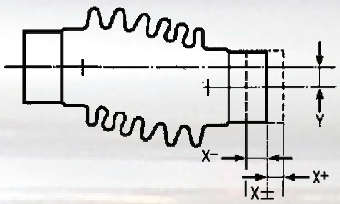
<u>Axial Extension</u> Increase of the bellows length due to pipe contraction.



<u>Lateral Offset</u> Transverse motion, which is perpendicular to the plane of the pipe with the expansion joint, ends remaining parallel.

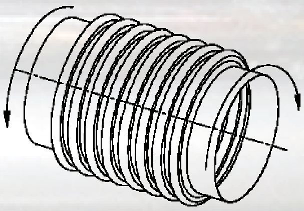


Universal Lateral

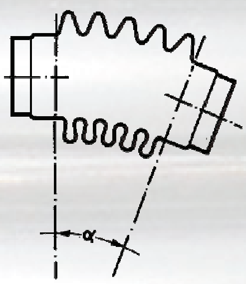


<u>Torsion</u> Twisting about the longitudinal axis of the expansion joint can reduce bellows life or cause expansion joint failure and should be avoided.

*Expansion joints should **not** be located at any point in a piping system that would impose torque to the expansion joint as a result of thermal change or settlement.*

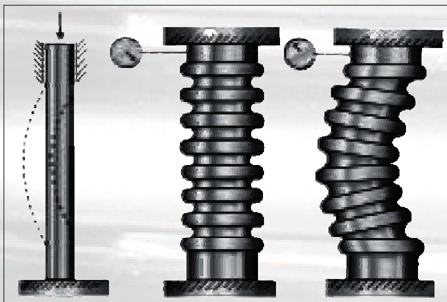


<u>Angular Rotation</u> Bending about the longitudinal centerline of the expansion joint.



Thermal Expansion Coefficients (in./100 Ft.)

Temperature F.	Carbon Steel Carbon-Moly Low-Chrome	Austenitic Stainless Steels	Copper
-25	-0.68	-0.98	-1.05
0	-0.49	-0.72	-0.79
25	-0.32	-0.46	-0.51
50	-0.14	-0.21	-0.22
70	0.00	0.00	0.00
100	0.23	0.34	0.34
125	0.42	0.62	0.62
150	0.61	0.90	0.90
175	0.80	1.18	1.18
200	0.99	1.46	1.48
225	1.21	1.75	1.77
250	1.40	2.03	2.05
275	1.61	2.32	2.34
300	1.82	2.61	2.62
325	2.04	2.90	2.91
350	2.26	3.20	3.19
375	2.48	3.50	3.48
400	2.70	3.80	3.88
425	2.93	4.10	4.17
450	3.16	4.41	4.47
475	3.39	4.71	4.76
500	3.62	5.01	5.06
525	3.86	5.31	5.35
550	4.11	5.62	5.64
575	4.35	5.93	-
600	4.60	6.24	-
625	4.86	6.55	-
650	5.11	6.87	-
675	5.37	7.18	-
700	5.63	7.50	-
725	5.90	7.82	-
750	6.16	8.15	-
775	6.43	8.47	-
800	6.70	8.80	-



Stable Bellows Squirmed Bellows

<u>Squirm</u>

An internally pressurized bellows, behaves in a manner similar to that of a slender column under compressive load. At some critical end load, the column will buckle, and in a similar manner, at a sufficient pressure, an internally pressurized bellows that is installed between fixed points will also buckle, or squirm.

Moment and Torsion Data

The information below is offered for the benefit of those designers/engineers who are modeling expansion joints in using computer stress programs.

Forces and Moments

When an expansion joint is offset laterally, the offset force can be assumed to act as a mode at the center of the bellows element if the expansion joint is a single bellows type. If the expansion joint is a universal type, the offset force can be assumed to act at a node at the center of the spool that separates the two bellows elements. The expansion joint can be considered as a node with stiffness values acting at the node point.

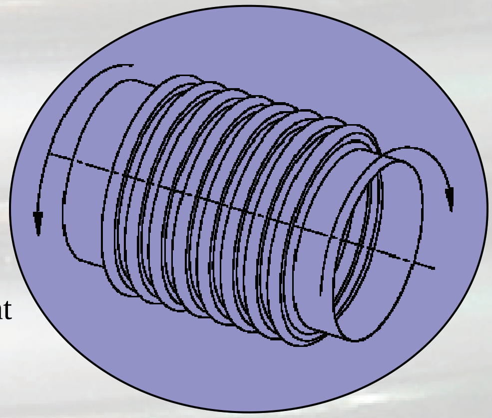
If the expansion joint is being evaluated as a component with offset loads acting at the ends of the assembly, there is a moment that must be considered to properly evaluate the effect of the expansion joint on the adjacent piping. The moment is equal to (the offset force) X (the distance from the end of the assembly to the center of the bellows element) if the expansion joint is a single bellows type. If the expansion joint is a universal, the moment is equal to (the offset force) X (the distance from the center of the center spool to the end of the assembly).

Torsion

Pipe stress programs require that expansion joints be modeled with 6 degrees of stiffness. One of these values is torsional stiffness. The Caesar II pipe stress program by COADE contains a database that includes all the spring rate values. When other software programs are used, that require the torsional spring rates and torsional limits, please contact us for those values.

Torsion is very damaging to an expansion joint. Torque causes a bellows to want to take a corkscrew shape, significantly reducing its pressure carrying capacity. When torsion is present in any amount, it is very important to specify the torsion loading in the inquiry so that the effects of torsion can be taken into account in the product design. If a significant amount of torsion is present, it may be necessary to add hardware to the expansion joint to isolate the bellows element from excessive torque. *Expansion joint design engineers assume there is no torsion load on an expansion joint unless a torsion value is specified.* Contact us for further information about torsion loading.

The torsion spring rates are based on torsional stiffness for single bellows elements with no lateral offset. Testing has indicated that lateral offset drastically reduces torsional stiffness and the pressure carrying capacity of the bellows.



The torsion data following is applicable to single bellows elements without hinge or gimbal hardware. A universal expansion joint without hardware to resist torque is made up of two single bellows elements. The universal expansion joints specified in this catalog use two 6 convolution bellows elements. Therefore, the torsion criteria for a standard universal expansion joints should be based on a 12-convolution single bellows element if the assembly is being evaluated in total. If each bellows of the universal is being evaluated, use the criteria for a 6 convolution bellows.

Applications Engineering

Design Considerations

The addition of expansion joints in a piping system introduces reaction forces produced by the expansion joint that must be taken into account when designing of the piping system.

How a Bellows Works

A bellows is a flexible seal. The convoluted portion of an expansion joint is designed to flex when thermal movements and/or vibrations occur in the piping system. The number of convolutions depends upon the amount of movement the bellows must accommodate or the force that must be used to accomplish this deflection. The convoluted element must be strong enough circumferentially to withstand the internal pressure of the system, yet responsive enough to flex. The longitudinal load (pressure thrust) must then be absorbed by some other type of device. These devices include pipe anchors, tie rods, hinges, or gimbal structures. Pressure thrust can be calculated by multiplying the effective area shown in the catalog by the working pressure.

Spring Force

Expansion joints behave in a manner that is similar to a spring; as movement occurs, expansion joints produce a resistive force. This resistance is stated as spring rate and measured as the force required deflecting the bellows 1” in the axial or lateral direction; or inch-lbs/degree for angular rotation. Spring force is the spring rate times the deflection.

Pressure Stresses

The ability of a bellows to carry pressure is limited by hoop stress or S2 as defined in the standards of the Expansion Joint Manufacturers Association (EJMA). This is a stress that runs circumferentially around the bellows due to the pressure difference between the inside and the outside of the bellows.

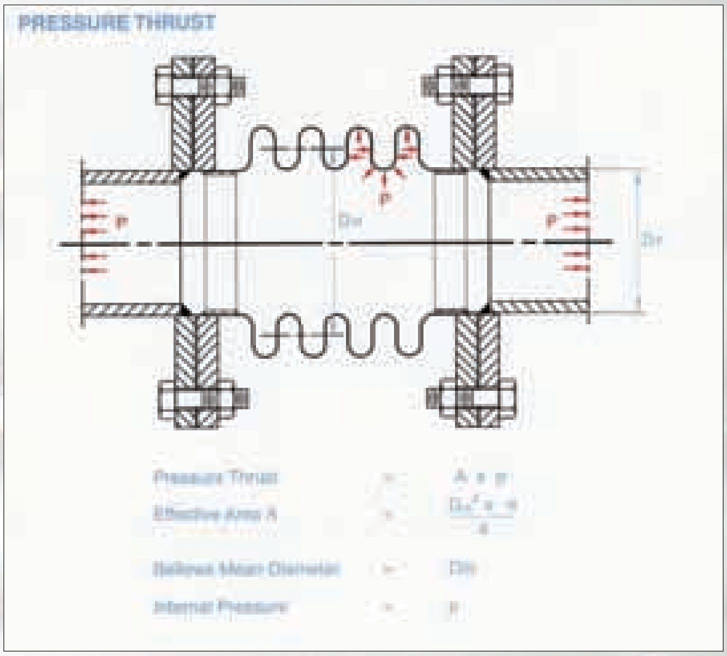
Hoop stress is what holds a bellows together like the hoops on a barrel. This stress must be held to a code stress level. The customer should specify the code to be used.

The bellow’s ability to carry pressure is also limited by bulge stress or EJMA stress S4. This is a stress that runs longitudinal to the bellows centerline. More specifically, it is located in the bellows sidewall and it is a measure of the tendency of the convolutions to become less U-shaped and more spherical.

For bellows that are not annealed after forming, S4 is allowed by EJMA to exceed the initial yield strength of the bellows material by a large margin because it is cold worked. If a bellows is annealed after forming, S4 must be severely limited because the bellows sidewall material is no longer cold worked.

Accommodating a requirement for annealing will often result in the addition of reinforcing rings or a much heavier bellows material and more convolutions. Pisa Flex’s standard policy is to provide bellows in the as-formed condition to take advantage of the added performance that is imparted to the bellows through cold work. We will accommodate annealing requirements on request.

Pressure Thrust



If we consider a pipe section with blind flanges attached at each end, it is obvious that internal pressure produces a thrust force against the flange surfaces in opposing direction, however the longitudinal rigidity of the pipe prevents elongation.
If we add an expansion joint in the center of the pipe, this rigidity is lost and the thrust force may overcome the spring resistance of the bellows, producing elongation and possibly un-corrugating the bellows.
The pressurized bellows behave much like a hydraulic cylinder. Internal pressure bears against the walls of the convolutions, just as pressure bears against the face of a piston. This pressure produces a force that is equal to the internal pressure multiplied by the effective area of the bellows mean diameter ([ID + OD]/2) and will cause the flexible bellows to extend outward unless it is restrained from doing so. In most pressure piping applications, pressure thrust is usually much greater than spring force.

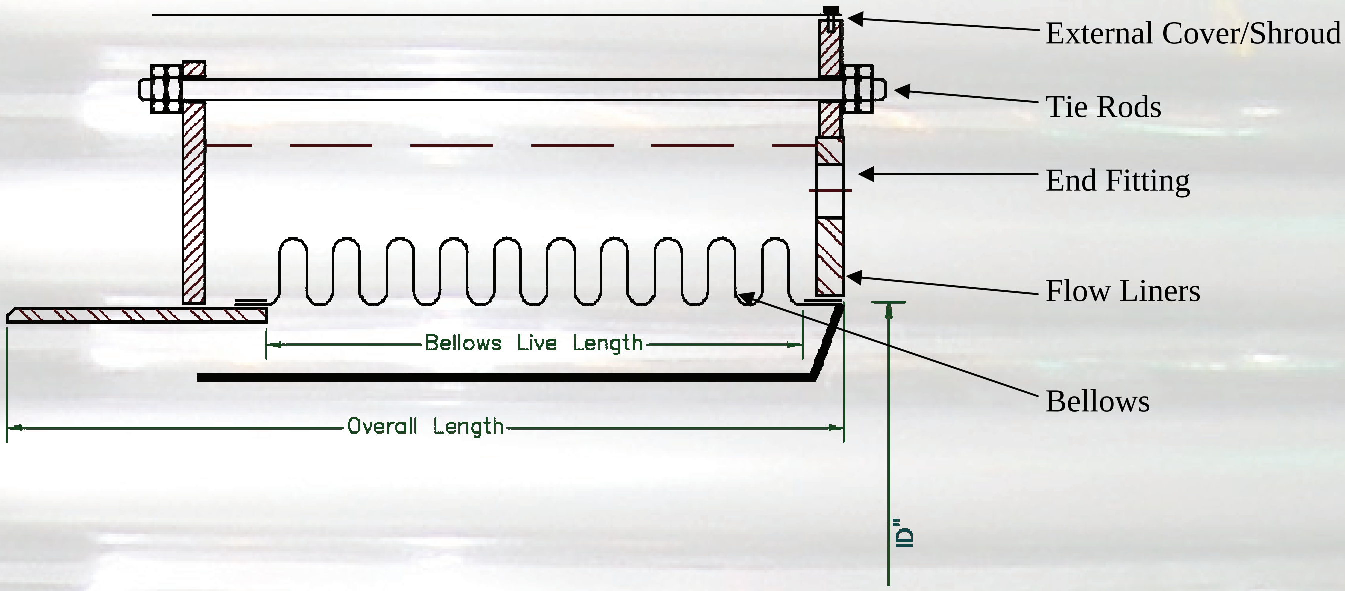
For the purpose of understanding pressure thrust, a single bellows designed for pure axial motion can be modeled as hydraulic cylinder with a spring inside.
Force on equipment or adjacent piping anchors “F” = (the effective area of the bellows) x (the working pressure) + (the spring rate of the bellows) x (the stroke of the bellows).

The spring represents the axial spring rate of the bellows. The hydraulic piston represents the effect of the pressure thrust which the expansion joint can exert on the piping anchors or pressure thrust restraints (hinges, gimbals, tie rods) which may be part of the expansion joint assembly. The area of the hydraulic cylinder would be the effective area of the bellows. For a 20”, 150 psig catalog standard expansion joint with 20 convolutions, the spring force for 1” of axial stroke would be (the axial motion) x (the bellows effective area) or (150 lbs./in.2) x (359 in.2) = 53, 850 pounds.
The pressure thrust force is typically much higher than the spring force.
Expansion joints designed for lateral offset or angular motion are more complicated to model accurately. However, the effect of pressure thrust is the same.

Corrosion

PisaFlex does not publish corrosion resistance data because of the many variables present in expansion joints. Reference materials are available and will provide accurate corrosion data. The Corrosion Data Survey published by the National Association of Corrosion Engineers (NACE) is one of many sources of reference for corrosion resistance information.

Applications Engineering: Accessories



External Covers (Letter Code C) are mounted at one end of the expansion joints, providing a protective shield that spans the length of the bellows. Covers prevent direct contact with the bellows, offering personnel protection, as well as protection to the bellows from physical damage such as falling objects, weld splatter or arc strikes. Covers also provide a suitable base for external insulation to be added over an expansion joint; some insulating materials, if wet, can leech chlorides or other substances which will could damage a bellows.

Covers should be specified when:

- Protection from falling objects or protection from traffic is needed.
- Protection of personnel is needed.
- Insulation will be applied over the expansion joint.
- When high flow velocities may exist around the outside of the expansion join, such as in the exhaust of a steam turbine.

PisaFlex always recommends a cover. The small cost for the cover is insurance against costly downtime due to damage. The standard cover is a removable design.

Tie Rods or Limit Rods (Letter Code T)
This part number designation adds threaded rods that are designed to contain pressure thrust. The rods will have nuts or stops on the ends of the assembly to limit the overall length. *When an expansion joint is designed for pure lateral offset the rods are defined as Tie Rods*. If the expansion joint is intended to absorb axial motion as well as lateral offset, the rods will have outboard stops to limit the expansion joint to the installed length plus any specified axial extension. This is defined as a Limit Rod. The designation "T" applies to either purpose. The required movements determine if the rods are Tie Rods or Limit Rods. Limit Rods are generally used to limit expansion joint movement in the event of main anchor failure. During normal operation Limit Rods do not contain pressure thrust.

Ordering with Accessories: See *Thermal Expansion Coefficients (in/100Ft)* Table on page 3.

Applications Engineering: Accessories, cont.

End Fittings
Expansion joints will include appropriate end fittings such as flanges or butt-weld ends that should match the dimensional requirements and materials of the adjoining pipe, or equipment. Small diameter compensators are available with threaded male ends, butt weld ends or copper sweat ends. Threaded flanges may be added to the threaded end compensators if a flanged connection is preferred.

Bellows
The corrugations commonly referred to as convolutions; add the structural reinforcement necessary for the thin-wall material to contain system pressure. The bellows designer/engineer selects the thickness and convolution geometry to produce a bellows design that approaches, and often exceeds the capacity of the adjoining pipe to contain system pressure at the specified design temperature.

Standard Liners (Letter Code L)
Liners can be installed the expansion joint to protect the bellows from damage. Liners should be specified by adding the letter L to the part number when the following conditions exist:

- Smooth flow or low pressure drop is required.
- Velocities which may produce flow induced vibrations described below.

For air, steam, and other gases

a) Up to 6” Dia. flow greater than 4 ft/sec per inch of Dia.
(Up to 150 mm Dia. flow greater than 0.05 M/sec per mm of Dia.)
b) Over 6” Dia. flow greater than 24 ft/sec
(over 150 mm Dia. flow greater than 7.5 M/sec)

For water and other liquids

Up to 6” Dia. flow greater than 1.67 ft/sec per inch of Dia.
(up to150 mm Dia. flow greater than 0.02 M/sec per mm of Dia.)
Over 6” Dia. flow greater than 10 ft/sec (over 150 mm Dia. flow greater than 3.0 M.sec)

Heavy-Duty Liners (Letter Code HL)
Heavy-duty liners should be used in the following conditions:

- When high velocity, extremely turbulent or damaging two-phase flow exists upstream of the bellows.
- When extremely high temperatures are present, the liners can create an insulating barrier which would permit the bellows to operate at lower temperatures ensuring longer life and resisting oxidation. Steam purging and/or insulation can be added to enhance protection.
- When the media is erosive such as in catalyst carrying services.
- When an expansion joint is located within 10 pipe diameters downstream of an elbow, tee or value.

When liners are specified, PisaFlex should be provided with the following:

- Axial, lateral and angular movement expected.
- Pipe wall thickness.

This information is required so that the diameter of the liner can be properly determined to avoid interference with the downstream pipe or flange.

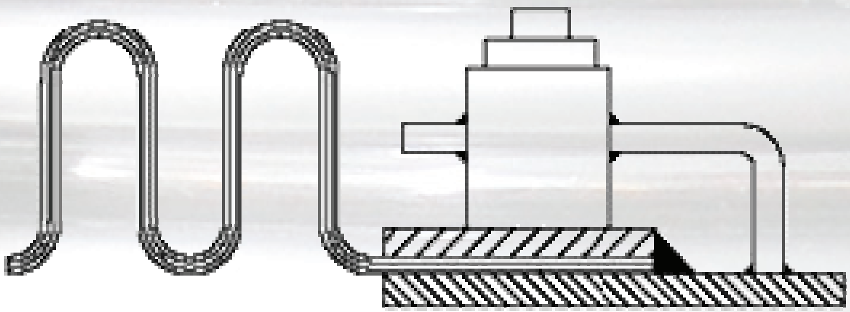
Pipe Anchors (Letter Code P)
By adding fixed points in the piping system, referred to as main anchors, the expansion joint is prevented from extending. Pressure thrust force is directed into the immovable main anchor. Now the joint is forced to compress or extent axially solely in response to dimensional changes in the pipe segment located between these main anchors.

Anchor design requires the consideration of forces due to pressure thrust at system test pressure, which is customarily 1 ½ times the design pressure. In addition, bellows spring forces produces by deflection, friction force due to pipe movement across contact surfaces, forces and moments resulting from wind loading, bending, and other influences must be considered in the design of anchors.

Main anchors are intended to anchor the pipe from motion in any direction.

Directional main anchors are, as the name implies, intended to anchor the piping system in one direction, while allowing movement to occur from a transverse direction. Bellows squirm is characterized by a gross lateral shift of the convolutions off of the longitudinal centerline. Bellows squirm can reduce cycle life, or in extreme cases, produce a catastrophic failure. To avoid squirm, the bellows designer must limit movement capacity and flexibility to a level that insures that the bellows retains a conservation margin of column stability beyond the required design pressure.

Two ply testable bellows, (Letter Code PT), redundant ply designs are used when it is necessary to monitor the integrity of the bellows inner or outer ply. Not to be confused with the multi-ply design, both bellows plies are designed for the full pressure and temperature cycles. If one ply fails, the second one will take its place until a scheduled repair can be made. The first style, referred to as "passive", only monitors the pressure between the bellows plies. If the inner ply is breached, then the incident is detected as an increase in pressure on the measuring device. Pressure transducers and/or pressure gauges are the most common types of measuring devices. The second style, referred to as "active", requires vacuum between the plies. Depending on the pressure reading, an inner or outer ply failure can be detected.



Cycle Life
In most applications, design movements cause the individual convolutions to deflect beyond their elastic limits, producing fatigue due to plastic deformation, or yielding. One movement cycle occurs each time the expansion joint deflects from the installed length, to the operating temperature length, and then back again to the original installation length.
In the majority of applications, total shutdowns are infrequent; therefore a bellows with a predicted cycle life of one or two thousand cycles is usually sufficient to provide reliable fatigue life for decades of normal service. High cycle life designs may be desirable for service applications that include frequent start up/shut down cycles. The bellows designer/engineer considers such design variables as material type, wall thickness, the number of convolutions and their geometry to produce a reliable design for the intended service with a suitable cycle life expectancy.

Applications

Single Expansion Joints "SEJ"

has one bellows. Axial compression & extension lateral and angular movement can be accommodated. These expansion joints do not restrain the internal pressure thrust. The piping designer/engineer must provide the system with separate anchoring and guiding to resist the pressure thrust. Where small thermal movements are involved and proper anchoring and guiding is feasible, a single expansion joint is the most economical installation.

Single Tied "STJ"

Expansion Joints also have one bellows, except the overall length is restrained by tie rods designed to contain pressure thrust. A single tied EJ is usually designed for lateral offset so that the tie rods can remain fully engaged and loaded with the pressure thrust force. A two tie rod design can accept angular deflection in a single plane.

Dual or Universal Expansion Joint "DEJ"

Consists of two bellows separated by a pipe spool. This configuration can accommodate large lateral movements. In addition it can also handle axial compression and extension and angular deflection. These expansion joints have no restraints to resist pressure thrust and like the single EJ, the piping designer/engineer must provide separate anchoring to handle pressure thrust.

Dual Universal Tied Expansion Joints "DTE"

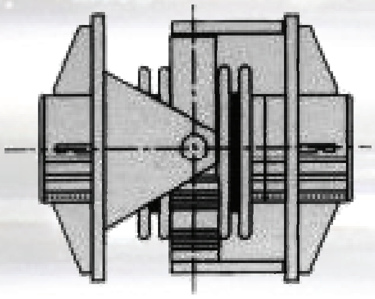
Contain two bellows separated by a pipe spool and tie rods designed to contain the pressure thrust force. These expansion joints are generally designed to accommodate lateral movement only. A dual expansion joint can be designed to have a very low lateral spring force to minimize forces on adjacent equipment. A two tie rod design can also accept angular deflection in a single plane. Tie rods are usually at or near ambient temperatures of the media within the pipe. As a result, the thermal expansion of the length of pipe between the tie rod end plates is forced into the bellows as an axial movement. The bellows design must accommodate this axial thermal expansion as well as the specified lateral movement. Sometimes a dual expansion joint has a very heavy center spool that can exert excessive weight on the bellows elements. To protect the bellows elements from excessive lateral loads, a support system such as a slotted hinge can be installed across the individual bellows elements to support the dead weight of the center spool.

Hinged Expansion Joints "HEJ"

have a single bellows with overall length restrained by hinge hardware designed to accommodate pressure thrust.

Universal Hinged Expansion Joints "UHE"

have two bellows separated by a pipe spool with overall length restrained by hinge hardware designed to contain pressure thrust. A hinged universal expansion joint accepts large lateral movements in a single plane with very low spring forces. A three-hinge system can accommodate very large movements with very low reaction loads on the adjacent equipment. This is a very attractive application for large diameter hot piping systems if the movements are in the same plane.



Gimbal Expansion Joints “GEJ”

have a single bellows and gimbal hardware designed to resist pressure thrust. The gimbal expansion joint hardware operates like the universal joint on a drive shaft to accommodate angular movements in any plane.

Universal Gimbaled Expansion Joints “UGE”

are similar to the hinged universals except that the two expansion joint are gimbal type. The advantage of this arrangement is the ability of the expansion joint to accept large lateral movements and independent angular movements in any plane.
A system consisting of two gimbals and a hinge can accommodate very large movements with very low reaction loads on the adjacent equipment. This is a very attractive application for large diameter hot piping systems even if the movements are couples and not in a single plane.

Pressure Balanced Expansion Joint “PBJ”

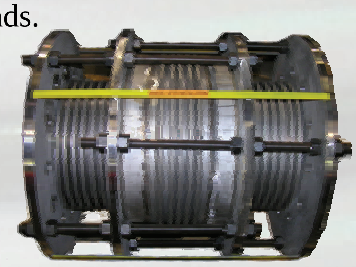
are devices which produce no pressure thrust forces in the piping system on the main anchors. In addition to elimination the pressure thrust, the expansion joint can accept axial compression, axial extension, lateral and angular movements. The balancing thrust is created by using a balancing bellows.

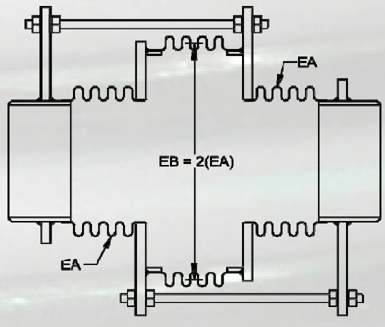
Pressure Balance Elbow “PBE”

are expansion joints which can consist of a single or double bellows in the flow section, and a balancing bellows or equal are on the back side of the elbow. Tie rods attach the outboard end of the balancing bellows to the outboard end of the flow bellows. Under pressure the tie rods are loaded with the pressure thrust force. If the flow bellows compresses in service, the balancing bellows extends the same amount without exposing the adjacent anchors to pressure thrust forces. However, the spring forces associated with bellows movements are imposed on the adjacent equipment. A pressure balanced elbow expansion joint can accept axial compression axial extension lateral movements and very limited angular motion.

In-Line Pressure Balanced Expansion Joints “IPB”

consists of single or double (universal) bellows to accept the piping induced axial compression, extension and lateral movements. An oversize bellows with approximately two times the area of the flow bellows is used to create an annular pressure chamber that produces a balancing pressure thrust force. The rods are used to link the bellows elements and contain the pressure thrust force. In-Line pressure balanced expansion joints are typically used in straight pipe runs between intermediate anchors (non pressure thrust resistant) or adjacent to rotating equipment that cannot operate with large externally applied loads.





EA=Small Bellows Effective Area
EB=Large Bellows Effective Area

Cycle Life Calculations

From the Expansion Joint Design Data Tables select the number of convolutions based on movement capability and/or spring rate. This is a simple iterative process. Utilizing the movement data for the size and pressure class required, compare the movements required with the movements available for a given convolution count. An acceptable design satisfies the following equation:

$$\frac{\text{Required Axial Movement}}{\text{Catalog Rated Axial}} + \frac{\text{Required Lateral Movement}}{\text{Catalog Rated Lateral}} + \frac{\text{Required Angular Movement}}{\text{Catalog Rated Angular}} < 1$$

Modify Cycle Life

The catalog movements are based on a cycle life of 2000 using the Expansion Joint Manufacturer Association's calculation method. If a higher cycle life is required, the available catalog movements should be reduced by the following amount before the above calculation is preformed.

Desired Cycle Life	2000	3000	5000	7000	10000
Catalog Movement Reduction Factor	1	.905	.801	.741	.683

Modify Cycle Life Example:

20 convolutions would be required if the required cycle life were 5000. The catalog movements for a 12" – 150 PSIG expansion joint with 20 convolutions is 3.39" available axial compression, 1.42" available lateral offset. The calculation for 5000 cycles using the above example would be: 1/(.801*3.39) + .5/(.801*1.42) + .37 + .44 + .81 or 81% of the available movement. Twenty convolutions would work for a required cycle life of 5000.

Modify Spring Rate

If spring rate is the limiting design factor, select the convolution count that results in a total force that is less than the required amount for lateral and axial movements. Keep in mind that pressure thrust must be added to the axial spring force for a single expansion joint that has axial compression even if limit rods are specified. To calculate the pressure thrust force, multiply the area of the bellows times the operating pressure. The affective are for any design is located under the pressure class on each page of design data.

Modify Spring Rate Example:

For the above example assuming 16 convolutions,

- The pressure thrust is 150 x 153 = 22,950 pounds.
- The axial spring force is 1 x 1861 = 1861 pounds.
- The lateral offset force is 0.5 x 2766 = 1383 pounds.

How to Order

An example part number is done for you in the table below. Follow the instructions given to find the required part number used when ordering.

See table pages 14-35 that show the Nominal size required. Must be three digits.

Identify the style (SEJ for Single, HEJ for Hinged, GEJ for Gimbal) See *Applications* on page 10-11.

Select the number of convolutions based on movement capability and /or spring rate. See *Cycle Life Calculations* on page 12. Must be two digits. (Enter '0' in front of single digits.)

Review the material information to understand the standard flange rating, weld end thickness, and materials of construction that will be applied. See page 14 or 23 for more information. Use the material table below to select a letter code.

Select the letter code for accessories and options (L for Liner, HL for heavy liner, C for Cover, and PT for ply testable). See pages 7-9. If more than one letter code is needed, enter alphabetically.

SIZE	STYLE	STYLE MATERIAL	# OF CONS	CONS MATERIAL	#1 END FITTINGS	#1 MATERIAL	#2 END FITTINGS	#2 MATERIAL	ALTERNATE MATERIAL
025	SEJ	AA	04	AA	W4	AH	VS	YZ	CLPT

Identify Style Material using table below.

Identify Convolutions Material using table below.

Choose the type of end fitting required (W4 or W8 for weld end, FF for forge flange, PF for plate flange, VS for van stone flange).

LETTER CODE	ASTM MATERIAL	LETTER CODE	ASTM MATERIAL
AA	**A240-304H**	**KK**	**B435-230**
AB	**A240-304**	**LL**	**B162-200**
AC	**A240-304L**	**MM**	**B162-201**
AD	**A240-309S**	**NN**	**B127-Alloy 400**
AE	**A240-316**	**OO**	**B168-600**
AF	**A240-316L**	**PP**	**B443-617**
AG	**A240-317**	**QQ**	**B443-625 LCF**
AH	**A240-317L**	**RR**	**B409-800**
AJ	**A240-321**	**SS**	**B409-800H**
BB	**A240-347**	**TT**	**B424-825**
CC	**AL6XN 7Mo Plus**	**UU**	**INCO 60D**
DD	**A240-2205**	**VV**	**INCO 625**
EE	**A625-904L**	**WW**	**INCO 800**
FF	**B463-20Cb**	**XX**	**INCO 800W**
GG	**A240-255**	**YX**	**INCOHT**
HH	**B536-330**	**YY**	**HASTALLY C-276**
JJ	**A240-253MA**	**YZ**	**20 (Alloy)**
Additional Materials for End Fitting #1 Material and End Fitting #2 Material			
ZA	**A-36**	**ZC**	**A 53 GR B**
ZB	**A516**	**ZD**	**A 106 GR B**

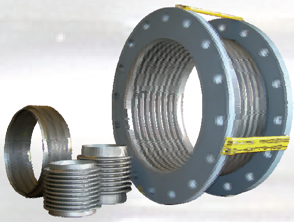
EXAMPLE INFORMATION

A 12" - 150 PSIG expansion joint is required to accept 1" of axial compression and .5" of lateral offset. The 12 convolution 150 PSIG catalog part has an allowable lateral offset of .51". The example would use up .5/.51 or 98% of the available catalog lateral movement, leaving almost nothing for the required axial movement. The 16 convolution 150 PSIG catalog part lists 2.71" of available axial compression and .91" of available lateral offset. The example expansion joint would use up 1/2.71 or 36% of the catalog axial movement + .5/.91 or 55% of the catalog lateral movement or 36% + 55% = 91% of the total available catalog movement. The 16-convolution profile works. Therefore, the number 16 goes in the part number.

SPECIAL NOTE

If a non-standard flange rating is required or a non-standard weld end thickness is required or if the fittings are non-standard materials, those preferences must be stated along with the part number.

Contact the factory for additional options and specifications.



Single Expansion Joints – Metal

Standard Materials of Construction

Bellows: ASTM A240 T304
To specify alternate bellows material, add to part number.

Pipe: ASTM A53/A106
50 lb. Series: Sch. 40
150 lb. Series: Sch. 40

Flanges: ASTM A105/A36/A516-70
50 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
150 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
300 lb. Series: 300 lb. ANSI B16.5 R.F.S.O.

1. Rated cycle life is 2000 cycles per EJMA 9th edition for any non-concurrent movement tabulated.
2. For torque values contact factory. See page 4 for more information.
3. Maximum axial extension movement is 50% of tabulated axial value.
4. To obtain greater movements or cycle life, contact the factory.
5. Catalog pressure ratings are based upon a maximum bellows temperature of 800F. Actual operating temperature should always be specified.
6. To Combine axial, lateral movements, see page 3.
7. Maximum test pressure: 1 ½ x maximum working pressure.
8. To obtain greater movements or cycle life, contact the factory.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
2” Effective Area 5.7 in.^{2}	50	4	0.32	0.05	10.0	598	4148	9	7¼	2	3¼	10	5¼	6
		8	0.64	0.20	10.0	599	518	5	8½	2	4½	11	6½	6
		12	0.96	0.45	10.0	199	154	3	9¾	2	5¾	12	7¾	7
		16	1.28	0.79	*	150	65	2	11	4	7	14	9	8
2” Effective Area 5.7 in.^{2}	150	4	0.23	0.04	10.0	1168	8101	18	7¼	2	3¼	10	5¼	6
		8	0.47	0.15	10.0	584	1013	9	8½	2	4½	11	6½	7
		12	0.70	0.33	10.0	389	300	6	9¾	2	5¾	12	7¾	8
		16	0.97	0.61	*	413	175	6	11	4	7	16	9	10
2” Effective Area 5.7 in.^{2}	300	4	0.18	0.03	7.7	2019	13999	32	7¼	2	8 7/8	14	5½	8
		8	0.36	0.11	10.0	1009	1750	16	8½	2	5 1/8	17	6¾	8
		12	0.54	0.25	10.0	673	518	11	9¾	2	6 3/8	16	8	11
		16	0.72	0.45	*	806	341	12	11	4	7 5/8	19	9¼	11
2.5” Effective Area 8.3in. ^{2}	50	4	0.42	0.05	10.0	419	4252	10	7¼	3	3½	14	5 3/8	9
		8	0.84	0.21	10.0	210	531	5	8½	3	4¾	15	6 5/8	9
		12	1.26	0.48	*	140	157	3	9¾	5	6	17	7 7/8	11
		16	1.63	0.83	*	210	133	5	11	4	7¼	19	9 1/8	12
2.5” Effective Area 8.3 in. ^{2}	150	4	0.30	0.04	10.0	819	8304	19	7¼	3	3½	14	5 3/8	9
		8	0.60	0.15	10.0	409	1038	9	8½	3	4¾	15	6 5/8	9
		12	0.89	0.34	10.0	546	615	13	9¾	4	6	20	7 7/8	11
		16	1.18	0.61	*	409	259	9	11	6	7¼	21	9 1/8	14
2.5” Effective Area 8.2 in. ^{2}	300	4	0.21	0.03	7.6	1612	16186	37	7¼	3	4¼	20	5¾	12
		8	0.43	0.11	10.0	806	2023	18	8½	3	5½	21	7	12
		12	0.63	0.25	10.0	1074	1199	25	9¾	4	6¾	24	8¼	14
		16	0.85	0.44	*	806	506	18	11	4	8	28	9½	16
3” Effective Area 12.4 in. ^{2}	50	4	0.46	0.07	10.0	881	6794	30	7¾	4	5 7/8	16	6¾	12
		8	0.92	0.27	10.0	440	849	15	9½	4	7 5/8	19	8½	11
		12	1.38	0.61	10.0	294	252	10	11¼	5	9 3/8	19	10¼	12
		16	1.85	1.09	*	220	106	8	13	7	11 1/8	21	12	13
		20	2.40	1.78	*	252	76	9	14¾	6	12 7/8	29	13¾	17
3” Effective Area 12.4 in. ^{2}	150	4	0.24	0.04	6.9	4077	31455	140	7¾	4	5 7/8	17	6¾	12
		8	0.48	0.14	10.0	2039	3932	70	9½	7	7 5/8	20	8½	11
		12	0.72	0.32	10.0	1359	1165	47	11¼	5	9 3/8	21	10¼	13
		16	0.96	0.56	10.0	1019	491	35	13	6	11 1/8	24	12	15
		20	1.20	0.88	*	815	252	28	14¾	6	12 7/8	29	13¾	18

*For available angular rotation torsion, contact factory.

Single Expansion Joints – Metal, cont.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
3” Effective Area 12.2 in. ^{2}	**300**	4	0.21	0.03	6.0	5035	38232	170	7¾	4	5 1/8	27	6 3/8	15
		8	0.41	0.12	10.0	2517	4779	85	9½	5	6 7/8	28	8 1/8	16
		12	0.62	0.28	10.0	1678	1416	57	11¼	5	8 5/8	31	9 7/8	18
		16	0.83	0.49	10.0	1259	597	43	13	8	10 3/8	34	11 5/8	22
		20	1.11	0.83	*	1293	387	43	14¾	7	12 1/8	45	13 3/8	26
3.5” Effective Area 15.9 in. ^{2}	**50**	4	0.50	0.06	10.0	833	8258	37	7¾	4	4¼	22	6	13
		8	1.00	0.26	10.0	416	1032	18	9½	4	6	23	7¾	14
		12	1.50	0.58	*	278	306	12	11¼	5	7¾	25	9½	15
		16	2.00	1.04	*	208	129	9	13	7	9½	29	11¼	16
		20	2.69	1.76	*	235	92	10	14¾	6	11¾	35	13	21
3.5” Effective Area 15.9 in. ^{2}	**150**	4	0.26	0.03	6.7	3855	38232	170	7¾	4	4¾	23	6	13
		8	0.53	0.14	10.0	1927	4779	85	9½	5	6	24	7¾	15
		12	0.79	0.31	10.0	1285	1416	57	11¼	5	7¾	27	9½	18
		16	1.06	0.55	*	964	597	43	13	6	9½	33	11¼	18
		20	1.32	0.86	*	771	306	34	14¾	7	11¼	36	13	21
3.5” Effective Area 15.9 in. ^{2}	**300**	4	0.26	0.03	6.6	2967	28613	127	7¾	4	5¼	34	6½	19
		8	0.51	0.14	10.0	1483	3577	64	9½	5	7	36	8¼	20
		12	0.77	0.30	10.0	989	1060	42	11¼	7	8¾	38	10	21
		16	0.96	0.50	10.0	1927	1195	85	13	8	10½	52	11¾	32
		20	1.19	0.77	*	1542	612	68	14¾	9	12¼	62	13½	36
4” Effective Area 19.1 in. ^{2}	**50**	4	0.39	0.05	9.0	1416	16905	75	7¾	6	4 3/8	26	6	16
		8	0.78	0.18	10.0	708	2113	38	9½	6	6 1/8	27	7¾	17
		12	1.17	0.41	10.0	472	626	25	11¼	6	7 7/8	31	9½	18
		16	1.55	0.73	*	354	264	19	13	7	9 5/8	31	11¼	19
		20	1.94	1.15	*	283	135	15	14¾	7	11 3/8	34	13	22
4” Effective Area 20.1 in. ^{2}	**150**	4	0.32	0.04	7.2	3046	38232	170	7¾	8	4 3/8	27	6	16
		8	0.64	0.15	10.0	1523	4779	85	9½	7	6 1/8	28	7¾	18
		12	0.96	0.33	10.0	1015	1416	57	11¼	7	7 7/8	32	9½	19
		16	1.28	0.59	*	761	597	43	13	8	9 5/8	36	11¼	22
		20	1.75	1.02	*	743	368	41	14¾	11	11 3/8	51	13	30
4” Effective Area 20.1 in. ^{2}	**300**	4	0.25	0.03	5.7	5263	66065	294	7¾	6	5½	47	6 5/8	25
		8	0.50	0.12	10.0	2631	8258	147	9½	7	7¼	47	8 3/8	27
		12	0.76	0.26	10.0	1754	2447	98	11¼	8	9	51	10 1/8	31
		16	1.01	0.47	10.0	1316	1032	74	13	9	10¾	56	11 7/8	32
		20	1.32	0.76	*	1451	719	80	14¾	12	12½	73	13 5/8	43
5” Effective Area 30.4 in. ^{2}	**50**	4	0.54	0.05	10.0	1218	23065	103	7¾	8	6 3/8	31	7	19
		8	1.08	0.20	10.0	609	2883	51	9½	0	8 1/8	32	8¾	21
		12	1.62	0.46	10.0	406	854	34	11¼	10	9 7/8	34	10½	22
		16	2.17	0.81	*	304	360	26	13	12	11 5/8	39	12¼	27
		20	2.71	1.27	*	244	185	21	14¾	11	13 3/8	44	14	28
5” Effective Area 29.5 in. ^{2}	**150**	4	0.31	0.03	5.9	3805	69923	311	7¾	8	6 3/8	31	7	19
		8	0.63	0.12	10.0	1903	8740	156	9½	11	8 1/8	32	8¾	21
		12	0.94	0.27	10.0	1268	2590	104	11¼	10	9 7/8	38	10½	23
		16	1.25	0.48	10.0	951	1093	78	13	11	11 5/8	40	12¼	25
		20	1.57	0.75	*	761	559	62	14¾	12	13 3/8	45	14	28

*For available angular rotation torsion, contact factory.

Single Expansion Joints – Metal, cont.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
5” Effective Area 29.5 in.^{2}	150	4	0.31	0.03	5.9	3805	69923	311	7¾	8	6 3/8	31	7	21
		8	0.63	0.12	10.0	1903	8740	156	9½	9	8 1/8	32	8¾	21
		12	0.94	0.27	10.0	1268	2590	104	11¼	10	9 7/8	36	10½	23
		16	1.25	0.48	10.0	951	1093	78	13	11	11 5/8	42	12¼	25
		20	1.57	0.75	*	761	559	62	14¾	12	13 3/8	45	14	28
5” Effective Area 29.2 in.^{2}	300	4	0.27	0.03	5.1	4529	82368	367	7¾	8	5¾	57	6¾	32
		8	0.54	0.10	10.0	2264	10296	183	9½	9	7½	58	8½	34
		12	0.81	0.23	10.0	1510	3051	122	11¼	10	9¼	63	10¼	36
		16	1.08	0.42	10.0	1696	1889	135	13	12	11	70	12	41
		20	1.35	0.65	10.0	1357	967	108	14¾	13	12¾	77	13 3/4	45
6” Effective Area 43 in.^{2}	50	4	0.62	0.07	9.7	1902	24823	226	8½	13	6 7/8	39	7 5/8	25
		8	1.25	0.28	10.0	951	3103	113	11	12	9 3/8	41	10 1/8	27
		12	1.87	0.63	10.0	634	919	75	13½	16	11 7/8	45	12 5/8	30
		16	2.50	1.13	*	475	388	55	16	15	14 3/8	51	15 1/8	35
		20	3.12	1.76	*	380	199	45	18½	16	16 7/8	59	17 5/8	38
6” Effective Area 43 in.^{2}	150	4	0.48	0.05	7.5	3286	42895	390	8½	11	6 7/8	39	7 5/8	25
		8	0.97	0.22	10.0	1643	5362	195	11	13	9 3/8	42	10 1/8	29
		12	1.45	0.49	10.0	1095	1589	130	13½	14	11 7/8	47	12 5/8	31
		16	1.98	0.90	*	1240	944	145	16	20	14 3/8	65	15 1/8	41
		20	2.47	1.41	*	992	509	116	18½	22	16 7/8	77	17 5/8	49
6” Effective Area 42 in.^{2}	300	4	0.32	0.04	5.0	6694	83720	761	8½	11	6 5/8	79	7½	45
		8	0.64	0.15	10.0	3347	10465	381	11	12	9 1/8	83	10	47
		12	0.95	0.33	10.0	2231	3101	254	13½	16	11 5/8	85	12½	50
		16	1.20	0.55	10.0	2539	2036	296	16	18	14 1/8	98	15	58
		20	1.50	0.85	10.0	2031	1043	237	18½	20	16 5/8	109	17½	64
8” Effective Area 70 in.^{2}	50	4	0.69	0.06	8.4	1967	41983	382	8½	16	7¼	61	7 7/8	39
		8	1.38	0.24	10.0	982	5248	191	11	18	9¾	64	10 3/8	41
		12	2.07	0.55	10.0	655	1555	127	13½	22	12¼	68	12 7/8	44
		16	2.77	0.98	*	491	656	95	16	22	14¾	74	15 3/8	48
		20	3.46	1.53	*	393	336	76	18	24	17¼	85	17 7/8	53
8” Effective Area 69 in.^{2}	150	4	0.47	0.04	5.8	4329	91322	830	8½	16	7¼	61	7 7/8	39
		8	0.95	0.17	10.0	2165	11415	415	11	19	9¾	64	10 3/8	41
		12	1.42	0.38	10.0	1443	3382	277	13½	21	12¼	69	12 7/8	45
		16	1.90	0.67	10.0	1082	1427	208	16	23	14¾	78	15 3/8	49
		20	2.39	1.07	*	1305	1087	247	18½	31	17¼	99	17 7/8	67
8” Effective Area 69 in.^{2}	300	4	0.34	0.03	4.1	10262	216468	1968	8½	17	7 3/8	117	7 7/8	67
		8	0.68	0.12	8.3	5131	27058	984	11	20	9 7/8	121	10 3/8	71
		12	1.01	0.27	10.0	3421	8017	656	13½	23	12 3/8	128	12 7/8	75
		16	1.35	0.48	10.0	2566	3382	492	16	26	14 7/8	139	15 3/8	83
		20	1.69	0.75	10.0	2052	1732	394	18½	29	17 3/8	149	17 7/8	89
10” Effective Area 109 in.^{2}	50	4	0.98	0.10	9.6	2067	35133	626	9½	24	9 1/8	87	9¼	56
		8	1.97	0.39	10.0	1034	4392	313	13	28	12 5/8	93	12¾	60
		12	2.95	0.88	10.0	689	1301	209	16½	31	16 1/8	98	16¼	65
		16	3.94	1.56	*	517	549	156	20	37	19 5/8	108	19¾	71
		20	5.04	2.51	10.0	639	428	191	23½	49	23 1/8	139	23¼	94

*For available angular rotation torsion, contact factory.

Single Expansion Joints – Metal, cont.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
10” Effective Area 110 in. ^{2}	**150**	4	0.62	0.06	6.1	5927	99661	1776	9½	25	9 1/8	88	9¼	56
		8	1.25	0.25	10.0	2963	12458	888	13	30	12 5/8	93	12¾	63
		12	1.86	0.55	10.0	1976	3691	592	16½	34	16 1/8	105	16¼	68
		16	2.48	0.99	10.0	1482	1557	444	20	39	19 5/8	114	19¾	76
		20	3.00	1.48	*	1600	1099	490	23½	52	23 1/8	146	23¼	99
10” Effective Area 108 in. ^{2}	**300**	4	0.49	0.05	4.8	10510	177675	3166	9½	26	8¾	164	9 1/8	95
		8	0.99	0.20	9.6	5255	22209	1583	13	32	12¼	173	12 5/8	102
		12	1.48	0.44	10.0	3503	6581	1055	16½	38	15¾	184	16 1/8	110
		16	1.97	0.78	10.0	2627	2776	791	20	46	19¼	198	19 5/8	121
		20	2.70	1.35	10.0	2619	1752	781	23½	66	22¾	247	23 1/8	156
12” Effective Area 154 in. ^{2}	**50**	4	0.98	0.08	8.0	3260	78244	1394	9½	35	9 5/8	130	9½	81
		8	1.97	0.33	10.0	1630	9781	697	13	40	13 1/8	137	13	88
		12	2.95	0.74	10.0	1087	2868	465	16½	46	16 5/8	147	16½	97
		16	3.93	1.31	*	815	1223	349	20	53	20 1/8	165	20	108
		20	4.91	2.05	*	652	626	279	23½	60	23 5/8	182	23½	121
12” Effective Area 153 in. ^{2}	**150**	4	0.68	0.06	5.6	7443	177051	3154	9½	34	9 5/8	131	9½	82
		8	1.36	0.23	10.0	3722	22131	1577	13	42	13 1/8	138	13	90
		12	2.03	0.51	10.0	2481	6557	1051	16½	50	16 5/8	153	16½	101
		16	2.71	0.91	10.0	1861	2766	789	20	59	20 1/8	169	20	116
		20	3.39	1.42	*	1489	1416	631	23½	67	23 5/8	192	23½	129
12” Effective Area 151 in. ^{2}	**300**	4	0.56	0.05	4.6	9558	224309	3996	9½	34	9¼	232	9 3/8	133
		8	1.12	0.19	9.3	4779	28039	1998	13	41	12¾	240	12 7/8	142
		12	1.68	0.43	10.0	3186	8308	1332	16½	49	16¼	252	16 3/8	150
		16	2.38	0.81	10.0	3213	4748	1325	20	71	19¾	289	19 7/8	179
		20	2.98	1.26	10.0	2570	2380	1060	23½	83	23¼	319	23 3/8	201
14” Effective Area 177 in. ^{2}	**50**	4	0.95	0.07	7.3	2720	75249	1341	9½	36	6	89	7¾	63
		8	1.91	0.30	10.0	1360	9406	670	13	41	9½	95	11¼	67
		12	2.86	0.67	10.0	907	2787	447	16½	48	13	100	14¾	73
		16	3.81	1.18	*	680	1176	335	20	51	16½	110	18¼	80
		20	4.77	1.85	*	544	602	268	23½	55	20	122	21¾	89
14” Effective Area 182 in. ^{2}	**150**	4	0.70	0.05	5.3	7582	215017	3831	9½	41	8	183	8¾	112
		8	1.41	0.22	10.0	3791	26877	1915	13	52	11½	190	12¼	120
		12	2.11	0.49	10.0	2527	7964	1277	16½	60	15	206	15¾	132
		16	2.81	0.86	10.0	1895	3360	958	20	69	18½	222	19¼	145
		20	3.52	1.35	*	1516	1720	766	23½	78	22	246	22¾	162
14” Effective Area 180 in. ^{2}	**300**	4	0.58	0.04	4.4	9669	270853	4826	9½	40	9½	332	9½	186
		8	1.16	0.18	8.8	4835	33857	2413	13	49	13	342	13	194
		12	1.74	0.40	10.0	3223	10032	1609	16½	58	16½	352	16½	207
		16	2.49	0.77	10.0	3224	5574	1589	20	83	20	389	20	236
		20	3.11	1.21	10.0	2579	2854	1271	23½	95	23½	421	23½	258
16” Effective Area 229 in. ^{2}	**50**	4	1.04	0.07	7.0	2612	93453	1665	9½	41	6	117	7¾	79
		8	2.08	0.28	10.0	1306	11682	833	13	47	9½	125	11¼	84
		12	3.12	0.64	10.0	871	3461	555	16½	53	13	129	14¾	93
		16	4.16	1.13	*	653	1460	416	20	59	16½	139	18¼	99
		20	5.20	1.77	*	522	748	333	23½	64	20	152	21¾	108

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Single Expansion Joints – Metal, cont.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
16” Effective Area 234 in. 2	**150**	4	0.73	0.05	4.8	8064	293825	5235	9½	47	8½	199	9	125
		8	1.45	0.20	9.6	4032	36728	2618	13	58	12	207	12½	132
		12	2.18	0.44	10.0	2688	10882	1745	16½	68	15½	222	16	144
		16	2.90	0.79	10.0	2016	4591	1309	20	79	19	239	19½	159
		20	3.63	1.23	10.0	1613	2351	1047	23½	90	22½	263	23	176
16” Effective Area 231 in. 2	**300**	4	0.60	0.04	4.0	10217	368226	6561	9½	46	10	383	9¾	214
		8	1.20	0.16	8.0	5108	46028	3280	13	56	13½	392	13¼	223
		12	1.80	0.37	10.0	3406	13638	2187	16½	68	17	403	16¾	234
		16	2.59	0.71	10.0	3380	7531	2147	20	95	20½	440	20¼	268
		20	3.24	1.11	10.0	2704	3856	1717	23½	110	24	474	23¾	292
18” Effective Area 287 in. 2	**50**	4	1.08	0.07	6.5	2708	121273	2161	9½	48	6	119	7¾	83
		8	2.16	0.26	10.0	1354	15159	1080	13	53	9½	124	11¼	88
		12	3.24	0.59	10.0	903	4492	720	16½	60	13	133	14¾	95
		16	4.32	1.05	10.0	677	1898	540	20	66	16½	142	18¼	104
		20	5.40	1.65	*	542	970	432	23½	73	20	155	21¾	114
18” Effective Area 294 in. 2	**150**	4	0.81	0.05	4.8	7314	335135	5971	9½	53	10 5/8	263	10	158
		8	1.63	0.20	9.6	3657	41892	2986	13	66	14 1/8	275	13½	170
		12	2.44	0.44	10.0	2438	12512	1990	16½	79	17 5/8	290	17	186
		16	3.25	0.78	10.0	1829	5236	1493	20	92	211/8	312	20½	202
		20	4.07	1.23	10.0	1463	2681	1194	23½	105	24 5/8	339	24	222
18” Effective Area 295 in. 2	**300**	4	0.79	0.05	4.6	13643	627118	11173	9½	67	10½	506	10	286
		8	1.57	0.19	9.3	6822	78390	5587	13	93	14	523	13½	308
		12	2.36	0.43	10.0	4548	23227	3724	16½	119	17½	552	17	338
		16	3.14	0.76	10.0	3411	9799	2793	20	145	21	595	20½	369
		20	3.93	1.13	10.0	2729	5017	2235	23½	171	24½	645	24	408
20” Effective Area 352 in. 2	**50**	4	1.12	0.06	6.1	2777	152215	2712	9½	51	6	140	7¾	95
		8	2.24	0.25	10.0	1389	19027	1356	13	59	9½	144	11¼	101
		12	3.36	0.56	10.0	926	5638	904	16½	66	13	154	14¾	109
		16	4.49	0.99	10.0	694	2378	678	20	76	16½	162	18¼	118
		20	5.61	1.55	*	555	1218	542	23½	82	20	176	21¾	129
20” Effective Area 359 in. 2	**150**	4	0.84	0.05	4.5	7606	425551	7582	9½	59	11	333	10¼	196
		8	1.68	0.18	9.0	3803	53194	3791	13	76	14½	342	13¾	208
		12	2.52	0.41	10.0	2535	15761	2527	16½	88	18	356	17¼	222
		16	3.36	0.73	10.0	1902	6649	1896	20	103	21½	376	30¾	240
		20	4.20	1.15	10.0	1521	3404	1516	23½	117	25	403	24¼	260
20” Effective Area 361 in. 2	**300**	4	0.84	0.05	4.5	13294	748115	13329	9½	90	**11**	636	10¼	363
		8	1.69	0.18	9.0	6647	93514	6665	13	122	14½	654	13¾	387
		12	2.53	0.41	10.0	4431	27708	4443	16½	150	18	686	17¼	417
		16	3.38	0.73	10.0	3324	11689	3332	20	180	21½	726	20¾	455
		20	4.22	1.15	10.0	2659	5985	2666	23½	210	25	781	24¼	495
22” Effective Area 422 in. 2	**50**	4	1.16	0.06	5.7	2825	186005	3314	9½	56	7	154	8¼	105
		8	2.32	0.23	10.0	1413	23251	1657	13	65	10½	158	11¾	112
		12	3.48	0.53	10.0	942	6889	1105	16½	73	14	166	15¼	122
		16	4.64	0.93	10.0	706	2906	829	20	82	17½	179	18¾	129
		20	5.80	1.46	*	565	1488	663	23½	90	21	190	22¼	140

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Single Expansion Joints – Metal, cont.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
22” Effective Area 429 in.^{2}	**150**	4	0.84	0.04	4.1	8392	561448	10003	9½	65	11½	373	10½	219
		8	1.67	0.17	8.2	4196	70181	5002	13	81	15	382	14	233
		12	2.51	0.38	10.0	2797	20794	3334	16½	97	18½	398	17½	246
		16	3.34	0.67	10.0	2098	8773	2501	20	113	22	416	21	264
		20	4.18	1.04	10.0	1678	4492	2001	23½	129	25½	443	24½	286
22” Effective Area 431 in.^{2}	**300**	4	0.84	0.04	4.1	14668	986650	17579	9½	98	11½	748	10½	422
		8	1.68	0.17	8.2	7334	123331	8790	13	131	15	764	14	448
		12	2.52	0.38	10.0	4889	36543	5860	16½	166	18½	794	17½	479
		16	3.36	0.67	10.0	3667	15416	4395	20	198	22	836	21	517
		20	4.20	1.04	10.0	2934	7893	3516	23½	231	25½	891	24½	561
24” Effective Area 501 in.^{2}	**50**	4	1.26	0.06	5.7	2645	206485	3679	9½	64	7	232	8¼	147
		8	2.51	0.23	10.0	1322	25811	1839	13	72	10½	238	11¾	154
		12	3.77	0.52	10.0	882	7648	1226	16½	81	14	244	15¼	163
		16	5.02	0.93	10.0	661	3226	920	20	91	17½	256	18¾	173
		20	6.28	1.45	*	529	16552	736	23½	100	21	270	22¼	185
24” Effective Area 506 in.^{2}	**150**	4	0.83	0.04	3.8	9177	723559	12892	9½	70	10	445	9¾	257
		8	1.66	0.15	7.5	4589	90445	6446	13	88	13½	452	13¼	272
		12	2.50	0.34	10.0	3059	26798	4297	16½	105	17	466	16¾	286
		16	3.33	0.61	10.0	2294	11306	3223	20	122	20½	486	20¼	304
		20	4.16	0.96	10.0	1835	5788	2578	23½	140	24	513	23¾	326
24” Effective Area 508 in.^{2}	**300**	4	0.84	0.04	3.8	16043	1271132	22648	9½	106	11 7/8	956	10 5/8	533
		8	1.67	0.15	7.5	8022	158892	11324	13	143	15 3/8	976	14 1/8	558
		12	2.51	0.34	10.0	5348	47079	7549	16½	179	18 7/8	1004	17 5/8	592
		16	3.34	0.61	10.0	4011	19861	5662	20	215	22 3/8	1046	21 1/8	631
		20	4.18	0.96	10.0	3209	10169	4530	23½	251	25 7/8	1101	24 5/8	676
26” Effective Area 585 in.^{2}	**50**	4	1.30	0.06	5.5	2664	242809	4326	9½	67	7	252	8¼	159
		8	2.60	0.22	10.0	1332	30351	2163	13	78	10½	259	11¾	167
		12	3.90	0.50	10.0	888	8993	1442	16½	88	14	265	15¼	177
		16	5.20	0.89	10.0	666	3794	1082	20	99	17½	276	18¾	188
		20	6.50	1.39	*	533	1942	865	23½	112	21	291	22¼	200
26” Effective Area 589 in.^{2}	**150**	4	0.83	0.04	3.5	9963	914195	16288	9½	76	*	*	*	*
		8	1.66	0.14	7.0	4981	114274	8144	13	96	*	*	*	*
		12	2.49	0.32	10.0	3321	33859	5429	16½	113	*	*	*	*
		16	3.32	0.57	10.0	2491	14284	4072	20	132	*	*	*	*
		20	4.15	0.88	10.0	1993	7314	3258	23½	151	*	*	*	*
26” Effective Area 591 in.^{2}	**300**	4	0.83	0.04	3.5	17418	1605607	28607	9½	115	*	*	*	*
		8	1.67	0.14	7.0	8709	200701	14303	13	154	*	*	*	*
		12	2.50	0.32	10.0	5806	59467	9536	16½	193	*	*	*	*
		16	3.33	0.57	10.0	4354	25088	7152	20	234	*	*	*	*
		20	4.17	0.89	10.0	3484	12845	5721	23½	271	*	*	*	*
28” Effective Area 675 in.^{2}	**50**	4	1.35	0.05	5.3	2672	281143	5009	9½	72	7	282	8¼	177
		8	2.70	0.21	10.0	1336	35143	2505	13	86	10½	287	11¾	185
		12	4.04	0.48	10.0	891	10413	1670	16½	96	14	297	15¼	195
		16	5.39	0.86	10.0	668	4393	1252	20	107	17½	307	18¾	207
		20	6.74	1.34	*	534	2249	1002	23½	119	21	322	22¼	220

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Single Expansion Joints – Metal, cont.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
28” Effective Area 678 in. ^{2}	**150**	4	0.83	0.03	3.2	10748	1135669	20234	9½	81	*	*	*	*
		8	1.66	0.13	6.5	5374	141959	10117	13	103	*	*	*	*
		12	2.49	0.30	9.7	3583	42062	6745	16½	122	*	*	*	*
		16	3.32	0.53	10.0	2687	17745	5059	20	142	*	*	*	*
		20	4.14	0.82	10.0	2150	9085	4047	23½	162	*	*	*	*
28” Effective Area 681 in. ^{2}	**300**	4	0.83	0.03	3.2	18793	1994117	35529	9½	123	*	*	*	*
		8	1.66	0.13	6.5	9396	249265	17764	13	167	*	*	*	*
		12	2.50	0.30	9.7	6264	73856	11843	16½	208	*	*	*	*
		16	3.33	0.53	10.0	4698	31158	8882	20	250	*	*	*	*
		20	4.16	0.82	10.0	3759	15953	7106	23½	292	*	*	*	*
30” Effective Area 770 in. ^{2}	**50**	4	1.57	0.06	5.8	1659	199217	3549	9½	75	7	301	8¼	188
		8	3.15	0.23	10.0	830	24902	1775	13	85	10¼	306	11¾	196
		12	4.72	0.53	10.0	553	7378	1183	16½	98	14	313	15¼	204
		16	6.30	0.94	10.0	415	3113	887	20	106	17½	322	18¾	214
30” Effective Area 782 in. ^{2}	**150**	4	1.01	0.04	3.7	7837	955949	17032	9½	90	*	*	*	*
		8	2.02	0.15	7.3	3918	119494	8516	13	116	*	*	*	*
		12	3.03	0.34	10.0	2612	35406	5677	16½	138	*	*	*	*
		16	4.03	0.60	10.0	1959	14937	4258	20	163	*	*	*	*
30” Effective Area 782 in. ^{2}	**300**	4	0.95	0.04	3.4	15674	1911898	34064	9½	136	*	*	*	*
		8	1.90	0.14	6.9	7837	238987	17032	13	184	*	*	*	*
		12	2.85	0.32	10.0	5225	70811	11355	16½	235	*	*	*	*
		16	3.79	0.56	10.0	2918	29873	8516	20	281	*	*	*	*
32” Effective Area 872 in. ^{2}	**50**	4	1.57	0.06	5.4	1772	240826	4291	9½	82	7	411	8¼	246
		8	3.15	0.22	10.0	886	30103	2145	13	91	10½	416	11¾	253
		12	4.72	0.50	10.0	591	8919	1430	16½	102	14	425	15¼	262
		16	6.29	0.88	10.0	443	3763	1073	20	133	17½	432	18¾	273
32” Effective Area 886 in. ^{2}	**150**	4	1.04	0.04	3.5	7885	1089703	19415	9½	96	*	*	*	*
		8	2.08	0.14	7.1	3943	136213	9708	13	124	*	*	*	*
		12	3.12	0.33	10.0	2629	40359	6472	16½	149	*	*	*	*
		16	4.16	0.58	10.0	1971	17027	4854	20	175	*	*	*	*
32” Effective Area 886 in. ^{2}	**300**	4	0.98	0.03	3.3	15771	2179405	38830	9½	145	*	*	*	*
		8	1.96	0.14	6.7	7886	272426	19415	13	198	*	*	*	*
		12	2.94	0.31	10.0	5257	80719	12943	16½	253	*	*	*	*
		16	3.91	0.54	10.0	3943	34053	9708	20	303	*	*	*	*
34” Effective Area 981 in. ^{2}	**50**	4	1.63	0.05	5.3	1756	268595	4786	9½	85	7	431	8¼	258
		8	3.25	0.21	10.0	878	33574	2393	13	99	10½	436	11¾	266
		12	4.88	0.48	10.0	585	9948	1595	16½	109	14	445	15¼	276
		16	6.50	0.86	10.0	439	4197	1196	20	212	17½	453	18¾	287
34” Effective Area 995 in. ^{2}	**150**	4	1.04	0.03	3.3	8390	1301590	23190	9½	102	*	*	*	*
		8	2.08	0.14	6.7	4195	162699	11595	13	132	*	*	*	*
		12	3.11	0.31	10.0	2797	48207	7730	16½	158	*	*	*	*
		16	4.15	0.54	10.0	2098	20337	5798	20	186	*	*	*	*
34” Effective Area 997 in. ^{2}	**300**	4	1.01	0.03	3.2	15824	2459101	43814	9½	203	*	*	*	*
		8	2.02	0.13	6.5	7912	307388	21907	13	260	*	*	*	*
		12	3.03	0.30	9.7	5278	91078	14605	16½	319	*	*	*	*
		16	4.04	0.53	10.0	3956	38423	10953	20	374	*	*	*	*

Single Expansion Joints – Metal, cont.

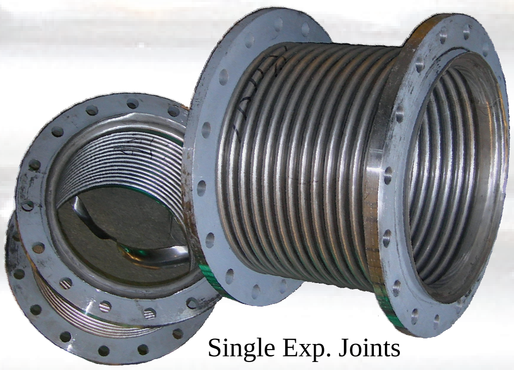
Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
36” Effective Area 1095 in. ^{2}	50	4	1.62	0.05	5.0	1861	317827	5663	9½	89	7	471	8¼	280
		8	3.25	0.20	10.0	931	39728	2831	13	102	10½	476	11¾	289
		12	4.87	0.46	10.0	620	1171	1888	16½	115	14	585	15¼	299
		16	6.50	0.81	10.0	465	4966	1416	20	128	17½	493	18¾	312
36” Effective Area 1110 in. ^{2}	150	4	1.03	0.03	3.2	8895	1539297	27425	9½	107	*	*	*	*
		8	2.07	0.13	6.3	4447	192412	13713	13	139	*	*	*	*
		12	3.10	0.29	9.5	2965	57011	9142	16½	167	*	*	*	*
		16	4.14	0.51	10.0	2224	24052	6856	20	196	*	*	*	*
36” Effective Area 1112 in. ^{2}	300	4	1.01	0.03	3.1	16776	2907999	51811	9½	214	*	*	*	*
		8	2.01	0.12	6.1	8388	363500	25906	13	277	*	*	*	*
		12	3.02	0.28	9.2	5592	107704	17270	16½	335	*	*	*	*
		16	4.03	0.50	10.0	4194	45437	12953	20	395	*	*	*	*
38” Effective Area 1216 in. ^{2}	50	4	1.62	0.05	4.7	1966	372734	6641	9½	96	7	501	8¼	298
		8	3.25	0.19	9.5	983	46592	3320	13	108	10½	508	11¾	307
		12	4.87	0.43	10.0	655	13805	2214	16½	121	14	513	15¼	317
		16	6.49	0.77	10.0	492	5824	1660	20	135	17½	523	18¾	329
38” Effective Area 1231 in. ^{2}	150	4	1.03	0.03	3.0	9399	1804308	32147	9½	113	*	*	*	*
		8	2.06	0.12	6.0	4700	225538	16074	13	144	*	*	*	*
		12	3.10	0.27	9.0	3133	66826	10716	16½	177	*	*	*	*
		16	4.13	0.49	10.0	2350	28192	8037	20	207	*	*	*	*
38” Effective Area 1233 in. ^{2}	300	4	1.00	0.03	2.9	17728	3408435	60728	9½	226	*	*	*	*
		8	2.01	0.12	5.8	8864	426054	30364	13	289	*	*	*	*
		12	3.01	0.27	8.7	5909	126238	20243	16½	355	*	*	*	*
		16	4.02	0.47	10.0	4432	53257	15182	20	416	*	*	*	*
40” Effective Area 1342 in. ^{2}	50	4	1.62	0.05	4.5	2072	433626	7726	9½	99	7	561	8¼	330
		8	3.25	0.18	9.0	1036	54203	3863	13	115	10½	566	11¾	339
		12	4.87	0.41	10.0	691	16060	2575	16½	127	14	575	15¼	352
		16	6.49	0.73	10.0	518	6775	1931	20	142	17½	583	18¾	362
40” Effective Area 1359 in. ^{2}	150	4	1.03	0.03	2.8	9904	2098106	37382	9½	119	*	*	*	*
		8	2.06	0.12	5.7	4952	262263	18691	13	153	*	*	*	*
		12	3.09	0.26	8.5	3301	77708	12461	16½	184	*	*	*	*
		16	4.12	0.46	10.0	2476	32783	9345	20	217	*	*	*	*
40” Effective Area 1361 in. ^{2}	300	4	1.00	0.03	2.8	18680	3963210	70612	9½	237	*	*	*	*
		8	2.01	0.11	5.5	9340	495401	35306	13	304	*	*	*	*
		12	3.01	0.24	8.3	6227	146786	23537	16½	373	*	*	*	*
		16	4.01	0.45	10.0	4670	61925	17653	20	438	*	*	*	*
42” Effective Area 1476 in. ^{2}	50	4	1.62	0.04	4.3	2177	500811	8923	9½	104	7	661	8¼	383
		8	3.24	0.17	8.6	1089	62601	4461	13	119	10½	666	11¾	392
		12	4.86	0.39	10.0	726	18549	2974	16½	135	14	673	15¼	403
		16	6.47	0.70	10.0	544	7825	2231	20	148	17½	683	18¾	418
42” Effective Area 1493 in. ^{2}	150	4	1.03	0.03	2.7	10409	2422175	43156	9½	126	*	*	*	*
		8	2.06	0.11	5.4	5204	302772	21578	13	159	*	*	*	*
		12	3.09	0.25	8.1	3470	89710	14385	16½	193	*	*	*	*
		16	4.12	0.44	10.0	2602	37846	10789	20	228	*	*	*	*

*For available angular rotation torsion, contact factory.

Single Expansion Joints – Metal, cont.

Nominal Diameter	Pressure	No. Of Cons	Axial (in.)	Lateral (in.)	Angular (Deg.)	Axial Sp Rate (lbs/in.)	Lateral Sp Rate (lbs/in.)	Angular Sp Rate (in.-lbs/Deg)	WW OAL (in.)	WW Wt. (lbs.)	FF/VV OAL (in.)	FF/VV Wt. (lbs.)	FW/VW OA (in.)	FW/VW Wt (lbs.)
42” Effective Area 1495 in. 2	**300**	4	1.00	0.03	2.6	19633	4575124	81514	9½	248	*	*	*	*
		8	2.01	0.11	5.3	9816	571890	40757	13	319	*	*	*	*
		12	3.01	0.24	7.9	6544	169449	27171	16½	389	*	*	*	*
		16	4.01	0.43	10.0	4908	71486	20379	20	452	*	*	*	*
44” Effective Area 1615 in. 2	**50**	4	1.61	0.04	4.1	2282	574600	10238	9½	108	8	701	8¾	405
		8	3.23	0.17	8.2	1141	71825	5119	13	124	11½	706	12¼	417
		12	4.84	0.37	10.0	761	21281	3413	16½	142	15	713	15¾	426
		16	6.46	0.66	10.0	571	8978	2559	20	155	18½	723	19¼	439
46” Effective Area 1760 in. 2	**50**	4	1.61	0.04	3.9	2388	655302	11675	9½	113	8	731	8¾	422
		8	3.22	0.16	7.8	1194	81913	5838	13	129	11½	736	12¼	435
		12	4.84	0.36	10.0	796	24270	3892	16½	146	15	743	15¾	444
		16	6.45	0.64	10.0	597	10239	2919	20	162	18½	755	19¼	457
48” Effective Area 1912 in. 2	**50**	4	1.61	0.04	3.7	2493	743225	13242	9½	118	8½	853	9	485
		8	3.22	0.15	7.5	1246	92903	6621	13	135	12	856	12½	495
		12	4.83	0.34	10.0	831	27527	4414	16½	154	15½	863	16	507
		16	6.44	0.61	10.0	623	11613	3310	20	169	19	873	19½	521

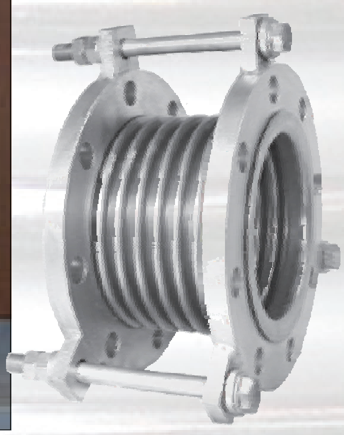
*For available angular rotation torsion, contact factory.



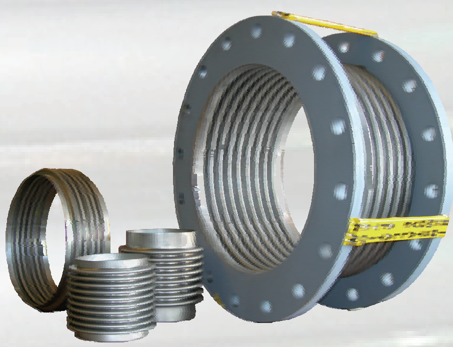
Single Exp. Joints

Single Exp. Joints in the Factory

Single Exp. Joint with Weld Ends



Single Exp. Joint Tied



Single Exp. Joints

Universal Expansion Joints – Metal

Standard Materials of Construction

Bellows: ASTM A240 T304
To specify alternate bellows material, add to part number.

Pipe: ASTM A53/A106
50 lb. Series: Sch. 40
150 lb. Series: Sch. 40

Flanges: ASTM A105/A36/A516-70
50 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
150 lb. Series: 150 lb. ANSI B16.5 R.F.S.O.
300 lb. Series: 300 lb. ANSI B16.5 R.F.S.O.
Covers: Carbon Steel
Tie Rods, Gimbals, Hinges: Carbon Steel
Liners: 300 Series Stainless Steel

1. Rated cycle life is 2000 cycles per EJMA 9th edition for any non-concurrent movement tabulated.
2. For torque values contact factory. See page 4 for more information.
3. Maximum axial extension movement is 50% of tabulated axial value.
4. To obtain greater movements or cycle life, contact the factory.
5. W for weld end, F for Flange, A for Angle Flange, V for Van Stoned Flange, E for Elbow.
6. Catalog pressure ratings are based upon a maximum bellows temperature of 800F. Actual operating temperature should always be specified.
7. To Combine axial, lateral movements, see page 3.
8. Maximum test pressure: 1 ½ x maximum working pressure.
9. To obtain greater movements or cycle life, contact the factory.

Nominal Size	Pres	Axial	Lateral Movement (In.) Lateral Spring Rate (Lbs./In.)						Length of end Fitting (In.) Add to LL		
		Axial (Ins/in.)	12"LL	18"LL	24'LL	36"LL	48"LL	84"LL	F,V	W	E
2" Effective Area 5.7 in. 2	50	0.96	1.79	2.84	3.9	6.02	8.13	14.48	1	4	3
		199	7	3	1.5	0.6	0.3	0.1	1	4	3
	150	0.7	1.79	2.84	3.9	6.02	8.13	14.48	1	4	3
		389	14	5	2.9	1.2	0.7	0.2	1	4	3
	300	0.54	1.75	2.84	3.9	6.02	8.13	14.48	1 5/16	4	3
		673	23	9	5	2.1	1.1	0.4	1 5/16	4	3
2.5" Effective Area 8.3 in. 2	50	1.26	1.79	2.84	3.9	6.02	8.13	14.48	1 1/8	4	3¾
		140	7	3	1.5	0.6	0.3	0.1	1 1/8	4	3¾
	150	0.89	1.79	2.84	3.9	6.02	8.13	14.48	1 1/8	4	3 ¾
		546	28	11	5.9	2.5	1.4	0.4	1 1/8	4	3¾
	300	0.63	1.69	2.84	3.9	6.02	8.13	14.48	1½	4	3¾
		1074	54	22	11	4.8	2.6	0.8	1½	4	3¾
3" Effective Area 12.4 in. 2	50	138	1.65	2.71	8.77	5.88	8	14.35	1 3/16	4	4½
		294	26	10	5	2.1	1.1	0.3	1 3/16	4	4½
	150	0.72	1.36	2.41	3.47	5.62	7.79	14.31	1 3/16	4	4½
		1359	119	45	2.3	9.6	5.2	1.6	1 3/16	4	4½
	300	0.62	1.18	2.08	3.01	4.87	6.75	12.4	1 11/16	4	4½
		1678	144	55	28	11.7	6.3	2	1 11/16	4	4½
3.5" Effective Area 15.9 in. 2	50	1.5	1.65	2.71	3.77	5.88	8	14.35	1¼	4	5¼
		278	31	12	6.1	2.5	1.4	0.4	1¼	4	5¼
	150	0.79	1.32	2.33	3.37	5.46	7.56	13.88	1¼	4	5¼
		1285	144	55	28	11.7	6.3	2	1¼	4	5¼
	300	0.77	1.31	2.3	3.33	5.39	7.46	13.71	1¾	4	5¼
		989	108	41	21	8.4	4.7	1.5	1¾	4	5¼
4" Effective Area 20.1 in. 2	50	1.17	1.65	2.71	3.77	5.88	8	14.35	1 5/16	4	6
		472	64	24	13	5.2	2.8	0.9	1 5/16	4	6
	150	0.96	1.42	2.51	3.62	5.86	8	14.35	1 5/16	4	6
		1015	144	55	2.8	12	6.3	2	1 5/16	4	6
	300	0.76	1.12	1.98	2.86	4.64	6.42	11.8	1 7/8	4	6
		1754	249	94	49	20	11	3.4	1 7/8	4	6
5" Effective Area 30.4in. 2	50	1.62	1.65	2.71	3.77	5.88	8	14.35	1 7/16	4	7½
		406	87	33	17	7	3.8	1.2	1 7/16	4	7½
	150	0.94	1.15	2.04	2.94	4.76	6.59	12.1	1 7/16	4	7½
		1268	264	100	52	21	12	3.6	1 7/16	4	7½
	300	0.81	1	1.77	2.55	4.13	5.73	10.51	2	4	7½
		1510	311	117	61	25	14	4.2	2	4	7½

Universal Expansion Joints – Metal

Nominal Size	Pres	Axial	Lateral Movement (In.) Lateral Spring Rate (Lbs./In.)						Length of end Fitting (In.) Add to LL		
		Axial (lns/in.)	12"LL	18"LL	24'LL	36"LL	48"LL	84"LL	L,V	W	E
6" Effective Area 42.7 in. ^{2}	50	1.87	1.45	2.51	3.57	5.69	7.8	14.15	1 9/16	6	9
		634	237	83	42	17	8.8	2.7	1 9/16	6	9
	150	1.45	1.2	2.28	3.41	5.69	7.8	14.15	1 9/16	6	9
		1095	409	143	72	29	15	5	1 9/16	6	9
	300	0.95	0.8	1.53	2.28	3.84	5.4	10.14	2 1/16	6	9
		2231	779	280	140	56	30	9	2 1/16	6	9
8" Effective Area 70 in. ^{2}	50	2.07	1.33	2.51	3.57	5.69	7.8	14.15	1 3/4	6	12
		655	401	140	70	38	15	5	1 3/4	6	12
	150	1.42	0.92	1.75	2.62	4.4	6.2	11.64	1 3/4	6	12
		1443	872	305	153	61	32	10	1 3/4	6	12
	300	1.01	0.66	1.25	1.87	3.14	4.43	8.3	2 7/16	6	12
		3421	2066	724	362	144	77	23	2 7/16	6	12
10" Effective Area 109 in. ^{2}	50	2.95	1.14	2.25	3.31	5.42	7.54	13.89	1 15/16	6	15
		689	873	278	133	50	26	8	1 15/16	6	15
	150	1.86	0.72	1.51	2.38	4.2	6.07	11.72	1 15/16	6	15
		1976	2478	790	376	142	74	22	1 15/16	6	15
	300	1.48	0.57	1.2	1.89	3.34	4.82	9.31	2 5/8	6	15
		3503	4417	1408	670	253	132	39	2 5/8	6	15
12" Effective Area 154 in. ^{2}	50	2.95	0.96	2.01	3.17	5.42	7.54	13.89	2 3/16	8	18
		1087	1945	620	295	112	58	17	2 3/16	8	18
	150	2.03	0.67	1.39	2.19	3.87	5.58	10.78	2 3/16	8	18
		2481	4402	1403	668	252	131	39	2 3/16	8	18
	300	1.68	0.55	1.16	1.83	3.22	4.65	8.98	2 7/8	8	18
		3186	5576	1778	846	320	166	49	2 7/8	8	18
14" Effective Area 182 in. ^{2}	50	2.86	1.82	2.86	3.94	5.05	7.28	13.89	1 1/4	8	21
		907	596	284	165	107	56	16	1 1/4	8	21
	150	2.11	1.32	2.08	2.87	3.68	5.3	10.25	2 1/4	8	21
		2527	1704	811	471	307	159	47	2 1/4	8	21
	300	1.74	1.1	1.73	2.39	3.06	4.41	8.52	3	8	21
		3223	2146	1022	593	386	201	59	3	8	21
16" Effective Area 234 in. ^{2}	50	3.12	1.74	2.74	3.78	4.84	6.98	13.48	1 1/4	8	24
		871	741	353	205	133	69	20	1 1/4	8	24
	150	2.18	1.21	1.9	2.62	3.35	4.83	9.34	2 1/2	8	24
		2688	2329	1109	643	419	218	64	2 1/2	8	24
	300	1.8	1	1.58	2.17	2.78	4.02	7.76	3 1/4	8	24
		3406	2918	1389	806	525	273	81	3 1/4	8	24
18" Effective Area 295 in. ^{2}	50	3.24	1.62	2.55	3.51	4.49	6.48	12.52	1 1/4	8	27
		903	961	458	265	173	90	27	1 1/4	8	27
	150	2.44	1.2	1.9	2.61	3.35	4.83	9.33	2 11/16	8	27
		2438	2656	1264	734	478	248	73	2 11/16	8	27
	300	2.36	1.16	1.83	2.52	3.22	4.65	8.99	3 1/2	8	27
		4548	4970	2366	1373	894	456	137	3 1/2	8	27

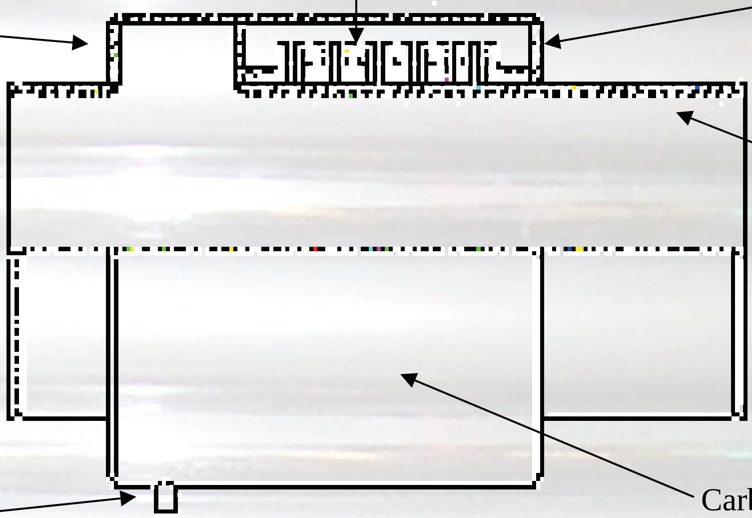
Universal Expansion Joints – Metal

Nominal Size	Pres	Axial	Lateral Movement (In.) Lateral Spring Rate (Lbs./In.)						Length of end Fitting (In.) Add to LL		
		Axial (Ins/in.)	12"LL	18"LL	24'LL	36"LL	48"LL	84"LL	L,V	W	E
20" Effective Area 361 in. ^{2}	50	3.36	1.52	2.39	3.3	4.22	6.09	11.76	1 1/4	9	30
		926	1206	574	333	217	113	33	1 1/4	9	30
	150	2.52	1.13	1.77	2.45	3.13	4.51	8.72	2 7/8	9	30
		2535	3372	1606	932	607	315	93	2 7/8	9	30
	300	2.53	1.13	1.78	2.45	3.13	4.52	8.73	3 3/4	9	30
		4431	5929	2823	1638	1067	554	164	3 3/4	9	30
20" Effective Area 361 in. ^{2}	50	3.36	1.52	2.39	3.3	4.22	6.09	11.76	1 1/4	9	30
		926	1206	574	333	217	113	33	1 1/4	9	30
	150	2.52	1.13	1.77	2.45	3.13	4.51	8.72	2 7/8	9	30
		2535	3372	1606	932	607	315	93	2 7/8	9	30
	300	2.53	1.13	1.78	2.45	3.13	4.52	8.73	3 3/4	9	30
		4431	5929	2823	1638	1067	554	164	3 3/4	9	30
22" Effective Area 431 in. ^{2}	50	3.48	1.43	2.26	3.11	3.98	5.74	11.1	1 3/4	9	33
		942	1474	702	407	265	138	41	1 3/4	9	33
	150	2.51	1.02	1.61	2.22	2.84	4.1	7.93	3 1/8	9	33
		2797	4449	2118	1229	800	416	123	3 1/8	9	33
	300	2.52	1.02	1.61	2.23	2.85	4.11	7.94	4	9	33
		4889	7819	3723	2160	1407	731	216	4	9	33
24" Effective Area 508 in. ^{2}	50	3.77	1.42	2.24	3.09	3.96	5.71	11.03	1 3/4	9	36
		882	1636	779	452	294	153	45	1 3/4	9	36
	150	2.5	0.94	1.48	2.04	2.61	3.77	7.28	3 1/4	9	36
		3059	5734	2730	1584	1032	536	159	3 1/4	9	36
	300	2.51	0.94	1.48	2.04	2.61	3.77	7.29	4 3/16	9	36
		5348	10074	4796	2783	1812	942	279	4 3/16	9	36
26" Effective Area 591 in. ^{2}	50	3.9	1.36	2.15	2.96	3.79	5.47	10.58	1 3/4	10	39
		888	1924	916	532	346	180	53	1 3/4	10	39
	150	2.49	0.87	1.37	1.89	2.41	3.48	6.73	*	10	39
		3321	7245	3449	2001	1303	677	200	*	10	39
	300	2.5	0.87	1.37	1.89	2.42	3.49	6.74	*	10	39
		5806	12724	6058	3515	2289	1190	352	*	10	39
28" Effective Area 681 in. ^{2}	50	4.04	1.32	2.07	2.86	3.66	5.28	10.2	1 3/4	10	42
		891	2228	1061	615	401	208	62	1 3/4	10	42
	150	2.49	0.81	1.27	1.75	2.24	3.24	6.26	*	10	42
		3583	9000	4285	2486	1619	842	249	*	10	42
	300	2.5	0.81	1.27	1.76	2.25	3.24	6.27	437	10	42
		6264	15803	75803	7524	4365	2843	1478	437	10	42
30" Effective Area 782 in. ^{2}	50	4.72	1.44	2.27	3.13	4	5.77	11.15	1 3/4	10	45
		553	1579	752	436	284	148	44	1 3/4	10	45
	150	3.03	0.91	1.44	1.99	2.54	3.67	7.09	*	10	45
		2612	7576	3607	2093	1363	708	210	*	10	45
	300	2.85	0.86	1.36	1.87	2.39	3.45	6.67	*	10	45
		5225	15152	7214	4185	2726	1417	419	*	10	45

Universal Expansion Joints – Metal

Nominal Size	Pres	Axial	Lateral Movement (In.) Lateral Spring Rate (Lbs./In.)						Length of end Fitting (In.) Add to LL		
		Axial (lns/in.)	12"LL	18"LL	24'LL	36"LL	48"LL	84"LL	L,V	W	E
32" Effective Area 886 in. ^{2}	50	4.72	1.35	2.13	2.94	3.76	5.42	10.47	1 3/4	11	48
		591	1909	909	527	343	178	53	1 3/4	11	48
	150	3.12	0.89	1.4	1.92	2.46	3.55	6.87	*	11	48
		2629	8636	4111	2386	1554	808	239	*	11	48
	300	2.94	0.83	1.31	1.81	2.32	3.34	6.46	*	11	48
		5257	17272	8223	4771	3107	1615	478	*	11	48
34" Effective Area 997 in. ^{2}	50	4.88	1.32	2.07	2.86	3.66	5.28	10.21	1 3/4	11	51
		585	2129	1013	588	383	199	59	1 3/4	11	51
	150	3.11	0.83	1.31	1.81	2.32	3.35	6.47	*	11	51
		2797	10315	4911	2849	1856	965	285	*	11	51
	300	3.03	0.81	1.28	1.76	2.25	3.25	6.28	*	11	51
		5275	19488	9278	5383	3506	1822	539	*	11	51
36" Effective Area 1112 in. ^{2}	50	4.87	1.25	1.96	2.71	3.46	5	9.65	1 3/4	11	54
		620	2519	1199	696	453	236	70	1 3/4	11	54
	150	3.1	0.79	1.24	1.71	2.19	3.16	6.1	*	11	54
		2965	12199	5808	3370	2194	1141	337	*	11	54
	300	3.02	0.77	1.21	1.66	2.13	3.07	5.93	*	11	54
		5592	23046	10972	6366	4146	2155	637	*	11	54
38" Effective Area 1233 in. ^{2}	50	4.87	1.18	1.86	2.57	3.28	4.74	9.15	1 3/4	12	57
		655	2954	1406	816	531	276	82	1 3/4	12	57
	150	3.1	0.75	1.18	1.62	2.07	2.99	5.78	*	12	57
		3133	14299	6808	3950	2572	1337	395	*	12	57
	300	3.01	0.73	1.14	1.58	2.02	2.91	5.62	*	12	57
		5909	27012	12860	7462	4859	2526	747	*	12	57
49" Effective Area 1361 in. ^{2}	50	4.87	1.12	1.77	2.44	3.12	4.51	8.71	1 3/4	12	60
		691	3436	1636	949	618	321	95	1 3/4	12	60
	150	3.09	0.71	1.12	1.54	1.97	2.84	5.5	*	12	60
		3301	16627	7916	4593	2991	1555	460	*	12	60
	300	3.01	0.69	1.09	1.5	1.92	2.77	5.35	*	12	60
		6227	31408	14953	8676	5650	2937	869	*	12	60
42" Effective Area 1495 in. ^{2}	50	4.86	1.07	1.68	2.32	2.97	4.29	8.28	1 3/4	12	63
		726	3969	1890	1096	714	371	110	1 3/4	12	63
	150	3.09	0.68	1.07	1.47	1.88	2.71	5.24	*	12	63
		3470	19196	9139	5303	3453	1795	531	*	12	63
	300	3.01	0.66	1.04	1.43	1.83	2.64	5.1	*	12	63
		6544	36258	17262	10016	6522	3390	1003	*	12	63
44" Effective Area 1615 in. ^{2}	50	4.84	2.21	2.83	4.09	5.35	7.9	11.73	2 1/4	8	66
		761	1258	819	426	260	126	59			
46" Effective Area 1760 in. ^{2}	50	4.84	2.12	2.71	3.91	5.12	7.55	11.22	2 1/4	8	69
		796	1435	934	486	297	144	68			
48 Effective Area 1912 in. ^{2}	50	4.83	2.03	2.6	3.75	4.91	7.24	10.75	2 1/2	8	72
		831	1627	1060	551	336	163	77			

Externally Pressurized Expansion Joints (XPEJ)



Features
- Long axial movements
- Self draining convolutions
- Integral cover and liner
- Leak proof – packless
- Maintenance free
- Integral guide ring
- 5 Year Warranty with alloy 625 bellows

The Externally Pressurized Bellows absorbs a very long stroke that minimizes the number of expansion joints required for a typical installation. Inherent in the design are internal guide rings, a full thickness cover, self-draining convolutions, and an integral liner that is insensitive to the flow direction. The internal guide rings permit the designer to reduce the number of guides compared with a conventional internally pressurized bellows system. The schedule "standard" pipe thickness cover is designed to contain the full pressure of the system. If a bellows leak were to occur, flow is directed along the pipe rather than radically toward personnel. The heavy wall cover is also very easy to insulate due to its nominal pipe size. The self-draining convolutions eliminate the possibility of sediment and residue collecting in the convolutions and causing corrosive attack.

Externally Pressurized Expansion Joints (XPEJ)

How To Order: An example part number is done for you in the table below. Follow the instructions given to find the required part number used when ordering.

See table below that shows the Nominal Diameter required. Must be three digits.

Identify the style (XPEJS for Single, XPEJD for Double). See page 27 for more information.

Review the material information to understand the standard flange rating, weld end thickness, and materials of construction that will be applied. See page 14 or 23 for more information. Use the material table on page 13 to select a letter code.

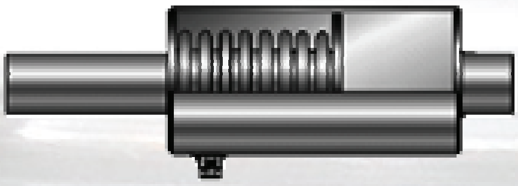
Order an Anchor Foot by inserting the letter A.

NOM. DIAM.	STYLE	STYLE MATERIAL	#1 END FITTINGS	#1 MATERIAL	#2 END FITTINGS	#2 MATERIAL	ACCESSORIES	BELLOWS MATERIAL
025	XPEJS	AA	W4	AH	VS	YZ	A	AA

Identify Style Material using table on page 13.

Choose the type of end fitting required (W4 or W8 for weld end, FF for forge flange, PF for plate flange, VS for van stone flange).

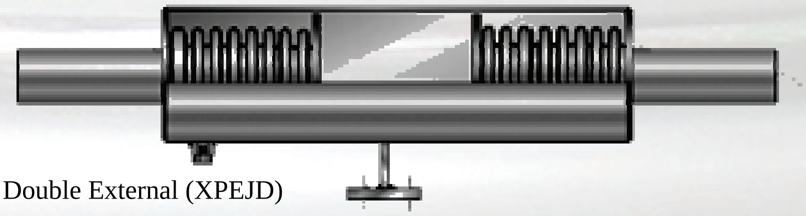
Identify Style Material using table on page 13.



Single External (XPEJS)

The Externally Pressurized design is inherently safe. In the event of an anchor failure, the bellows compress and actually increase its strength. The end rings limit the extension of the expansion joint so that an anchor failure is controlled and contained. The XPEJ does not require maintenance; therefore, it can be installed in areas where accessibility is limited. Lubrication and repacking are eliminated.

Normally located near an anchor, the single XPEJ should be placed with the fixed end adjacent to the anchor. The double XPEJ is typically mounted in the middle of a long pipe run to absorb similar movements from either direction. A support foot is included as a standard accessory with the double externally pressurized expansion joint and acts as an intermediate anchor.



Double External (XPEJD)

Externally Pressurized Expansion Joints (XPEJ)

Materials of Construction

<u>Bellows: ASTM A240-321</u>.
To specify alternate bellows
material, add to part number.
<u>Pipe: ASTM A53/A106/A516-70</u>
Standard Wall
<u>Flanges: ASTM A105</u>
50 lb. (10.5 Kg/CM2)Series: 150 lb. ANSI B16.5 R.F.S.O.
300 lb. (21 Kg/Cm2)Series: 300 lb. ANSI B16.5 R.F.S.O.
<u>Drain/Purge: ASTMA105</u>
¾” Diameter 3000# Threaded half coupling with plug.
<u>Anchor: ASTM A36/A516-70</u>
Carbon Steel

1. Rated cycle life is 1000 cycles per EJMA 9th edition for the full rated movement shown.
2. Maximum installation misalignment is +/- ¼” axial, +/- 1/16” lateral.
3. Maximum test pressure: 1 ½ x maximum working pressure.
4. Anchor Feet are designed for full pressure thrust.
5. All double (XPEJ’s) will come with anchor foot “A”.

Externally Pressurized 150 PSIG. Temperature – 500F

Nominal Diameter (in)	Axial Mvmt (in) XPEJS	Axial Mvmt (in) XPEJD	Spring Rate (lb/in)	Bellows Effective Area (in²)	Type of Anchor Foot for XPEJS	S OD (in)	Anchor Height (in)	Overall Length (in) XPEJS	Overall Length (in) XPEJD	Weight (lb) XPEJS WW	Weight (lb) XPEJS FF	Weight (lb) XPEJS FW	Weight (lb) XPEJD WW	Weight (lb) XPEJD FF	Weight (lb) XPEJD FW
1	4	8	43	8.4	A	4½	6¼	23	37	31	35	33	55	59	57
	6	12	31	8.4	A	4½	6¼	30	54	44	46	46	78	82	80
	8	16	22	8.4	A	4½	6¼	36	64	52	56	54	96	100	98
1½	4	8	43	8.4	A	4½	6¼	23	37	36	42	39	62	68	65
	6	12	31	8.4	A	4½	6¼	30	54	49	52	48	82	88	79
	8	16	22	8.4	A	4½	6¼	36	64	54	60	57	98	104	101
2	4	8	43	8.4	A	4½	6¼	23	37	41	51	46	71	81	76
	6	12	31	8.4	A	4½	6¼	30	54	53	63	58	96	106	101
	8	16	22	8.4	A	4½	6¼	36	64	63	73	68	116	126	121
2½	4	8	163	11.4	A	5 9/16	6¾	27	46	57	70	63	99	113	106
	6	12	113	11.4	A	5 9/16	6¾	36	63	79	94	84	134	148	140
	8	16	82	11.4	A	5 9/16	6¾	44	80	91	115	103	167	181	174
3	4	8	195	15.5	A	6 5/8	7 5/16	27	46	63	78	70	107	123	115
	6	12	146	15.5	A	6 5/8	7 5/16	36	63	85	96	92	144	158	154
	8	16	98	15.5	A	6 5/8	7 5/16	44	80	97	113	105	177	193	185
3½	4	8	216	19.2	A	6 5/8	7 5/16	27	46	75	96	86	131	152	142
	6	12	166	19.2	A	6 5/8	7 5/16	36	63	98	114	104	154	160	165
	8	16	108	19.2	A	6 5/8	7 5/16	44	80	110	129	119	174	168	183

Externally Pressurized 150 PSIG. Temperature – 500F, Cont.

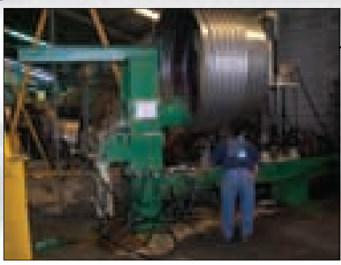
Nominal Diameter (in)	Axial Mvmt (in) XPEJS	Axial Mvmt (in) XPEJD	Spring Rate (lb/in)	Bellows Effective Area (in²)	Type of Anchor Foot for XPEJS	S OD (in)	Anchor Height (in)	Overall Length (in) XPEJS	Overall Length (in) XPEJD	Weight (lb) XPEJS WW	Weight (lb) XPEJS FF	Weight (lb) XPEJS FW	Weight (lb) XPEJD WW	Weight (lb) XPEJD FF	Weight (lb) XPEJD FW
4	4	8	124	24.9	B	8 5/8	8 5/16	25	41	88	114	101	155	181	168
	6	12	95	24.9	B	8 5/8	8 5/16	33	55	105	132	118	190	230	192
	8	16	62	24.9	B	8 5/8	8 5/16	39	69	119	145	132	217	275	215
5	4	8	141	35.6	B	8 5/8	8 5/16	25	41	107	139	123	189	221	205
	6	12	110	35.6	B	8 5/8	8 5/16	33	55	125	156	142	221	272	215
	8	16	70	35.6	B	8 5/8	8 5/16	39	69	140	172	156	253	320	244
6	4	8	168	47.9	B	10¾	9 3/8	25	41	126	164	145	222	320	241
	6	12	130	47.9	B	10¾	9 3/8	33	55	145	184	164	262	295	275
	8	16	84	47.9	B	10¾	9 3/8	39	69	161	200	180	289	327	308
8	4	8	218	75.6	C	12¾	10 3/8	26	42	234	294	264	399	459	429
	6	12	170	75.6	C	12¾	10 3/8	34	56	275	335	300	475	535	505
	8	16	109	75.6	C	12¾	10 3/8	40	70	306	366	336	542	602	572
10	4	8	267	112	C	14	11	26	42	291	377	335	414	500	457
	6	12	205	112	C	14	11	34	56	320	413	372	492	578	535
	8	16	134	112	C	14	11	40	70	344	441	398	559	645	602
12	4	8	362	152.6	C	16	12	26	41	361	489	425	617	745	681
	6	12	270	152.6	C	16	12	33	55	395	543	370	726	854	790
	8	16	181	152.6	C	16	12	40	69	464	592	528	824	952	888
14	4	8	451	185.7	C	18	13	27	43	388	568	476	665	845	755
	6	12	339	185.7	C	18	13	35	58	450	630	540	791	971	881
	8	16	226	185.7	C	18	13	42	73	509	689	599	907	1087	997
16	4	8	513	235.4	C	20	14	27	43	384	580	483	640	836	739
	6	12	385	135.4	C	20	14	35	58	485	682	584	839	1035	937
	8	16	257	235.4	C	20	14	42	73	577	774	675	1027	1224	1125
18	4	8	577	293	C	24	16	28	44	437	697	568	729	989	859
	6	12	433	293	C	24	16	36	59	540	803	673	933	1193	1063
	8	16	289	293	C	24	16	43	74	637	898	767	1127	1387	1257
20	4	8	641	356.8	E	24	Custom	28	44	487	817	652	812	1143	978
	6	12	481	336.8	E	24	Custom	36	59	615	630	540	1065	1395	1230
	8	16	321	356.8	E	24	Custom	43	74	734	1064	899	1307	1636	1471
24	4	8	769	503.2	E	30	Custom	29	45	624	1065	845	1057	1496	1277
	6	12	577	503.2	E	30	Custom	37	60	770	1210	990	1341	1780	1561
	8	16	385	503.2	E	30	Custom	44	75	904	1344	1124	1614	2054	1834

Externally Pressurized 300 PSIG. Temperature – 500F

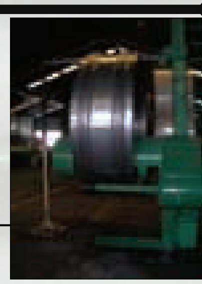
1	4	8	86	8.4	A	4½	6¼	23	37	37	45	40	67	72	70
	6	12	65	8.4	A	4½	6¼	30	51	52	61	58	96	102	99
	8	16	43	8.4	A	4½	6¼	36	64	61	67	65	115	121	118
1½	4	8	86	8.4	A	4½	6¼	23	37	42	54	48	75	86	80
	6	12	65	8.4	A	4½	6¼	30	51	55	72	66	105	117	111
	8	16	43	8.4	A	4½	6¼	36	64	67	80	74	125	137	131
2	4	8	86	8.4	A	4½	6¼	23	37	49	65	56	88	101	95
	6	12	65	8.4	A	4½	6¼	30	51	69	85	77	123	137	130
	8	16	43	8.4	A	4½	6¼	36	64	80	94	87	148	162	155
2½	4	8	163	11.4	A	5 9/16	6¾	27	46	57	77	67	102	123	113
	6	12	123	11.4	A	5 9/16	6¾	36	63	78	99	90	141	162	152
	8	16	82	11.4	A	5 9/16	6¾	44	80	91	111	102	170	190	180

Externally Pressurized 300 PSIG. Temperature – 500F

Nominal Diameter (in)	Axial Mvmt (in) XPEJS	Axial Mvmt (in) XPEJD	Spring Rate (lb/in)	Bellows Effective Area (in^2)	Type of Anchor Foot for XPEJS	S OD (in)	Anchor Height (in)	Overall Length (in) XPEJS	Overall Length (in) XPEJD	Weight (lb) XPEJS WW	Weight (lb) XPEJS FF	Weight (lb) XPEJS FW	Weight (lb) XPEJD WW	Weight (lb) XPEJD FF	Weight (lb) XPEJD FW
3	4	8	195	15.5	A	6 5/8	7 5/16	27	46	74	100	87	131	157	144
	6	12	147	15.5	A	6 5/8	7 5/16	36	63	110	128	115	180	156	168
	8	16	98	15.5	A	6 5/8	7 5/16	44	80	118	145	132	219	145	182
3½	4	8	216	19.2	A	6 5/8	7 5/16	27	46	100	129	114	158	187	172.5
	6	12	162	19.2	A	6 5/8	7 5/16	36	63	133	165	149	220	227	223
	8	16	108	19.2	A	6 5/8	7 5/16	44	80	156	191	173.5	272	256	263.5
4	4	8	249	24.9	B	8 5/8	8 5/16	25	41	124	158	141	185	229	207
	6	12	187	24.9	B	8 5/8	8 5/16	32	55	164	203	184	259	303	281
	8	16	125	24.9	B	8 5/8	8 5/16	39	69	194	238	216	323	366	344
5	4	8	282	35.6	B	8 5/8	8 5/16	25	41	131	187	159	215	275	244.5
	6	12	212	35.6	B	8 5/8	8 5/16	32	55	175	233	204	295	356	325
	8	16	141	35.6	B	8 5/8	8 5/16	39	69	208	269	239	365	426	395.5
6	4	8	337	47.9	B	10 ¾	9 3/8	25	41	137	215	176	242	320	281
	6	12	253	47.9	B	10 ¾	9 3/8	32	55	184	262	234	330	408	369
	8	16	169	47.9	B	10¾	9 3/8	39	69	221	299	261	408	486	447
8	4	8	436	75.6	C	12¾	10 3/8	26	42	251	367	310	435	548	490
	6	12	327	75.6	C	12¾	10 3/8	33	56	330	446	388	586	700	643
	8	16	218	75.6	C	12¾	10 3/8	40	70	398	514	456	726	842	785
10	4	8	535	112	C	14	11	26	42	296	458	378	523	684	603
	6	12	402	112	C	14	11	33	56	381	543	463	624	785	704
	8	16	268	112	C	14	11	40	70	455	618	537	714	876	795
12	4	8	731	152.6	C	16	12	26	41	385	615	500	663	893	778
	6	12	549	152.6	C	16	12	33	55	489	720	605	1725	1098	6283
	8	16	366	152.6	C	16	12	40	69	583	815	700	1062	1292	1177
14	4	8	676	185.7	E	18	Custom	27	43	435	765	600	759	1088	923
	6	12	507	185.7	E	18	Custom	35	58	534	864	699	949	1279	1114
	8	16	338	185.7	E	18	Custom	42	73	623	953	788	1129	1459	1295
16	4	8	769	235.4	E	20	Custom	27	43	427	807	617	728	1107	917
	6	12	577	235.4	E	20	Custom	35	58	520	900	710	908	1287	1097
	8	16	385	235.4	E	20	Custom	42	73	602	982	792	1077	1457	1267
18	4	8	865	293	E	24	Custom	28	44	500	1000	750	854	1354	1105
	6	12	649	293	E	24	Custom	36	59	619	1119	869	1087	1587	1338
	8	16	433	293	E	24	Custom	43	74	728	1228	978	1309	1809	1560
20	4	8	961	356.8	E	24	Custom	28	44	604	1234	919	1043	1673	1358
	6	12	721	356.8	E	24	Custom	36	59	768	1383	1075	1366	1996	1681
	8	16	481	356.8	E	24	Custom	43	74	921	1521	1221	1678	2308	1994
24	4	8	1538	503.2	E	30	Custom	29	45	698	1648	1173	1200	2150	1675
	6	12	1154	503.2	E	30	Custom	37	60	859	1809	1334	1516	2467	1992
	8	16	769	503.2	E	30	Custom	44	75	1009	1959	1484	1822	2773	2299



Large Diameter Forming Machine



Re-roll Machine Creates Final Shape and Size

Bellows Type Pump Connectors

Why Use PisaFlex Pump Connectors?
The basic function of pump connectors is to provide piping systems with the flexibility needed to absorb noise and vibration, compensate for thermal growth, or permit motion of other piping elements.

PisaFlex pump connectors are a perfect match of style, wall thickness and are design to minimize the forces and stress within piping systems. These connectors are factory engineered, manufactured and tested to effectively minimize the stress on a pump and compressor housings and to isolate vibrations transmitted by mechanical equipment. PisaFlex can help you comply with noise level requirements by reducing pipe vibration throughout the structure.

Stainless Steel Pump Connectors:

Pipe Size	Model	OAL	Live Length	Fitting Length	Approx WT. (lb)	Design Data Working Pressure @ 70 F	@ 360 F	Effective Area in. 2
2	PC	4 3/8	3 1/8	5/8	10 1/2	225	210	6.9
2½	PC	4 3/8	3 1/8	5/8	14 1/2	225	210	6.9
3	PC	4 3/8	3 1/8	5/8	16 1/2	225	210	8.8
4	PC	4 3/8	3 1/8	3/4	26	225	210	15.1
5	PC	4 7/8	3 3/8	3/4	32	225	210	23.5
6	PC	5	3 1/2	3/4	37	225	210	33.2
8	PC	5 7/8	3 7/8	1	65	225	210	59.3
10	PC	6 ¼	4 ¼	1	86	225	210	93.5
12	PC	6 5/8	4 5/8	1	112	225	210	134.0
14	PC	9 ½	7	1 ¼	183	225	210	171.0
16	PC	10	7½	1¼	217	225	210	220.0

Stainless Steel Pump Connectors:

Pipe Size	Model	OAL	Live Length	Fitting Length	Approx WT. (lb)	Design Data Working Pressure @ 70 F	@ 360 F	Effective Area in. 2
2	PC-T	6	4¾	5/8	20½	225	210	6.9
2½	PC-T	6	4¾	5/8	24	225	210	6.9
3	PC-T	6	4¾	5/8	25	225	210	8.8
4	PC-T	6	4½	3/4	35	225	210	15.1
5	PC-T	6	4½	3/4	38	225	210	23.5
6	PC-T	6	4½	3/4	41½	225	210	33.2
8	PC-T	6	4	1	68	225	210	59.3
10	PC-T	8	6	1	118	225	210	93.5
12	PC-T	8	6	1	147	225	210	134.0
14	PC-T	8	5½	1 ¼	205	225	210	171.0
16	PC-T	8	5½	1¼	233	225	210	220.0
18	PC-T	8	5½	1¼	234	225	210	279.0
20	PC-T	8	5	1½	312	225	210	342.0
24	PC-T	10	7	1½	380	225	210	493.0

Note: Model PC rated for ½" compression, 1/8" lateral & pump vibration. Model PC-T rated for 1" compression, 3/8" extension, 1/8" – 5/16" lateral and pump vibration. (Depending on size.)

Design Characteristics:
Model PC Connectors
Stainless Steel 300 Series Multiply Bellows with Carbon Steel Flanges
Model PCT Connectors
Stainless Steel 300 Series Multiply Bellows with Carbon Steel Flanges and Limit Rods.

Features:

- Absorbs Thermal Growth Motion
  Excellent protection to adjacent piping and equipment
- Compensates for Misalignment
  Helps to eliminates stresses.
- Controls Vibration
  Normal mechanical equipment vibrations are reduced at the connector.
- Reduces Noise
  High pipe vibration noise is greatly reduced…often eliminated.
- All Metal Construction
  Eliminates shelf life problems and allows for operation at elevated temperature.

PisaFlex Protection Means:

- Longer Service Life
- Multiply Construction for Improved Flexibility
- Lower Overall Operating Costs
- Years of "Trouble-Free" Service

How to order: Example

SIZE	MODEL
16	PCT

Exhaust Flexible Connectors

PisaFlex exhaust flexible connectors are specifically designated for low pressure (up to 15 psi) applications that require a high degree of flexibility.

These Connectors are designed to produce low spring forces with a reduced assembly weight, our exhaust flexible connectors are an ideal solution for vibration and corrosive gas applications such as marine and stationary diesel engines, gas turbines, and forced air-ducting applications.

Standard Materials of Construction

Bellows: ASTM A240 T304
Pipe: ASTM A53/A106/A516GR70
Plate Angle Carbon Steel
Covers: Carbon Steel
Liners: 300 Series Stainless Steel

Exhaust Connector Data

	Single
Size Range	2½" to 144"* NPS
Allowable Pressure Stainless Steel Bellows	Vacuum to 15 psi
Temperature Limits Stainless Steel Bellows	-20F to 800F **
Axial Traverse	To 4.67"… (depending on size)
Lateral Motion	Up to 0.82"… (depending on size)

*For sizes larger than 48" consult factory for information.
** With special alloys, temperatures of minus 300F to plus 1600F can be handled.

How to order:
Example P/N

NOM. DIAM.	STYLE	ENDS	PRESSURE	CONS	LINER	COVER
6	HFF	W	50	8	L	C

Nominal Diameter	# of Cons	Max Axial Mvmt (in)	Max Lateral Mvmt (in)	Max Angular Mvmt (deg)	Axial Spring Rate (lbs/in)	Lateral Spring Rate (lbs/in)	Angular Spring Rate (deg)	OAL with plate flanges (in)	Weight with plate flanges (in)	OAL with Angle flanges (in)	Weight with Angle Flange (in)	OAL with Angle Flanges	Weight with Angle Flanges	Natural Freq. Axial	Natural Freq. Latest (ht)
2	14	.053	0.15	10	224	554	3.4	8.375	2	3.625	8	-	-	310	890
2	28	1.06	0.59	10	112	69	1.7	10.625	2	5.875	8	-	-	155	222
2.5	13	0.69	0.14	10	174	611	3.9	8.500	3	3.750	11	-	-	236	779
2.5	26	1.39	0.55	10	87	77	1.9	11.000	4	6.125	11	-	-	118	195
3	13	0.70	0.17	10	291	918	9.4	9.000	5	4.250	12	-	-	235	757
3	26	1.40	0.69	10	146	115	4.7	12.125	5	7.250	13	-	-	118	190
4	11	0.69	0.15	10	365	1693	18.9	9.125	6	4.375	16	5.125	3	243	955
4	22	1.39	0.59	10	182	212	9.4	12.875	7	7.500	17	8.250	3	121	239
5	10	1.15	0.16	10	201	1302	16.1	9.500	0	5.000	22	5.500	3	147	635
5	20	2.31	0.63	10	100	163	8.1	13.125	9	8.625	23	9.125	4	73	158

Exhaust Gas Expansion Joints

Nominal Diameter	# of Cons	Max Axial Mvmt (in)	Max Lateral Mvmt (in)	Max Angular Mvmt (deg)	Axial Spring Rate (lbs/in)	Lateral Spring Rate (lbs/in)	Angular Spring Rate (deg)	OAL with plate flanges (in)	Weight with plate flanges (in)	OAL with Angle flanges (in)	Weight with Angle Flange (in)	OAL with Angle Flanges	Weight with Angle Flanges	Natural Freq. Axial	Natural Freq. Latest (ht)
6	10	1.33	0.14	10	177	1653	19.9	9.625	11	5.125	25	6.125	5	120	604
6	20	2.66	0.56	10	88	207	10.0	13.250	12	8.750	26	9.750	6	60	150
8	10	1.14	0.11	10	298	4150	54.2	9.625	16	5.125	35	6.125	6	143	911
8	20	2.29	0.44	10	149	519	27.1	13.250	18	8.750	37	9.750	7	71	228
10	10	1.70	0.14	10	122	3305	64.1	10.625	24	6.125	46	7.000	9	84	532
10	20	3.39	0.56	10	111	413	32.1	15.250	27	10.750	49	11.625	12	42	133
12	10	1.70	0.12	10	266	5449	105.7	10.625	29	6.125	66	7.625	16	85	629
12	20	3.39	0.48	10	133	680	52.9	15.250	33	10.750	69	12.125	19	42	157
14	10	2.19	0.20	10	260	3412	123.4	12.250	32	7.750	81	9.250	18	78	467
14	20	4.38	0.82	10	130	427	61.7	18.500	36	13.785	85	15.375	22	39	117
16	10	2.17	0.18	10	295	4965	180.4	12.250	37	7.750	96	9.750	24	77	529
16	20	4.34	0.72	10	147	621	90.2	18.500	41	13.875	101	15.875	28	39	132
18	10	2.34	0.16	10	261	5802	202.0	12.250	42	7.750	97	9.750	27	66	508
18	20	4.67	0.64	10	131	725	101.0	18.500	47	13.875	103	15.875	32	33	127
20	8	2.32	0.14	10	210	6079	202.1	12.125	46	7.750	114	9.625	30	57	498
20	16	4.63	0.56	10	105	759	101.1	18.250	52	13.875	120	15.625	36	28	124
22	8	2.28	0.12	10	444	15324	515.0	12.125	53	7.625	164	9.625	35	67	639
22	16	4.56	0.05	10	222	1916	257.5	18.250	63	13.625	174	15.625	45	33	160
24	8	2.28	0.11	10	482	19647	660.2	12.1225	58	7.125	192	9.625	38	66	693
24	16	4.56	0.46	10	241	2456	330.1	18.250	69	14.125	203	15.625	49	33	173
26	7	2.32	0.11	10	381	18191	616.1	12.125	64	8.125	212	10.125	46	56	630
26	14	4.63	0.43	10	190	2272	308.4	18.250	75	14.125	233	16.250	58	28	158
28	7	2.32	0.10	10	408	22473	761.8	12.125	68	8.125	232	10.125	50	56	675
28	14	4.63	0.40	10	204	2806	381.0	18.250	81	14.250	245	16.250	62	28	169
30	6	1.99	0.07	10	403	34806	866.4	11.250	72	8.125	256	9.250	53	56	841
30	12	3.97	0.28	10	202	4346	433.4	16.500	85	14.250	268	14.500	65	28	210
32	6	1.99	0.06	10	429	41888	1042.7	11.250	77	7.250	299	9.250	56	56	893
32	12	3.97	0.26	10	215	5230	521.5	16.500	91	12.500	313	14.500	69	28	233
34	6	1.99	0.66	10	455	49866	1241.3	11.250	82	7.250	313	9.250	59	55	946
34	12	3.97	0.24	10	227	6226	620.0	16.500	96	12.500	327	14.500	73	28	236
36	6	1.99	0.06	10	480	58792	1463.5	11.250	87	7.250	341	9.250	63	55	998
36	12	3.97	0.23	10	240	7340	732.0	16.500	102	12.500	356	14.500	78	28	250
38	4	2.30	0.07	10	684	73073	2359.4	12.000	93	8.000	393	10.000	67	61	1023
38	8	4.61	0.29	10	342	9143	1179.3	18.000	111	14.000	411	16.000	84	31	256
40	4	2.30	0.07	10	716	84286	272.15	12.000	98	8.000	409	10.000	72	60	1071
40	8	4.61	0.28	10	358	10546	1360.3	18.000	117	14.000	427	16.000	90	30	268
42	4	2.30	0.07	10	747	96578	3118.4	12.000	103	8.000	440	10.000	75	60	1119
42	8	4.61	0.26	10	373	12084	1558.6	18.000	123	14.000	460	16.000	94	30	280
44	4	2.30	0.06	10	779	11010	3556.4	12.000	108	8.000	468	10.000	78	60	1168
44	8	4.61	0.25	10	389	13782	1777.5	18.000	129	14.000	489	16.000	99	30	292
46	4	2.30	0.06	10	811	12490	4034.1	12.000	133	8.000	489	10.000	81	60	1216
46	8	4.61	0.24	10	405	15633	2016.3	18.000	134	14.000	511	16.000	103	30	304
48	4	2.30	0.06	10	843	14100	4552.4	12.000	188	8.000	518	10.000	85	60	1265
48	8	4.61	0.23	10	421	17642	2275.4	18.000	140	14.000	541	16.000	108	30	316

- Movements shown are non-concurrent

Exhaust Expansion Joints

Angle & Plate Flanges Low Pressure – 5 PSIG Max

Economical flanges for low pressure service <5.
Can be added to single and universal expansion joints.

Nominal Diameter (inch)	Actual ID (inch)	Angle Thickness T (inch)	H	L	Approx. WT. (lbs)	Bolt Circle (inch)	Hole Size (inch)	Number of Holes
14	14 3/16	3/16	1 1/2	1 1/2	7	15 13/16	13/32	12
16	16 1/4	3/16	1 3/4	1 3/4	9.5	18 1/8	13/32	16
18	18 1/4	3/16	1 3/4	1 3/4	10.5	20 1/8	13/32	16
20	20 1/4	3/16	1 3/4	1 3/4	11.6	22 1/8	13/32	20
22	22 1/4	3/16	1 3/4	1 3/4	12.8	24 1/8	9/16	20
24	24 1/4	3/16	1 3/4	1 3/4	14	26 1/8	9/16	20
26	26 1/4	3/16	2	2	17.3	28 1/2	9/16	24
28	28 1/4	3/16	2	2	18.5	30 1/2	9/16	24
30	30 1/4	3/16	2	2	20	32 1/2	9/16	28
32	32 1/4	3/16	2	2	21.3	34 1/2	9/16	28
34	34 1/4	3/16	2	2	22.5	36 1/2	9/16	32
36	36 1/4	3/16	2	2	23.8	38 1/2	9/16	32
38	38 1/4	3/16	2	2	24.6	40 1/2	9/16	36
40	40 1/4	3/16	2	2	26.2	42 1/2	9/16	36
42	42 1/4	3/16	2	2	27.5	44 1/2	9/16	40
44	44 1/4	3/16	2	2	28.8	46 1/2	9/16	40
46	46 1/4	3/16	2	2	30	48 1/2	9/16	44
48	48 1/4	3/16	2	2	31.5	50 1/2	9/16	44

Material: carbon steel.
Other materials are available on request.

Single overall length using
angle flanges = WW OAL – 6 Inches + 2L

Notes:

1. Plate flanges are designed for use with sheet gasket.
2. Flange gasket seating surface is a smooth mill finish.
3. May be used against raised face or flat face mating flanges.
4. Not recommended for use with spiral wound gaskets.
5. A36 material not recommended for use above 700F or below 20F.
6. Not recommended for applications where ASME B31.3 or Section VIII Vessel Code requirements apply.
7. Consult factory for drilling above 24” NPS.

Expansion Joint Glossary of Terms

Angular Rotation: Bending about the longitudinal centerline of the expansion joint.

Axial Extension: Extension of the bellows length due to pipe contraction when piping system is anchored properly.

Axial Compression: Compression of the bellows length due to the pipe expansion when piping system is anchored properly.

Bellows: The flexible element of an expansion joint consisting of one or more convolutions.

Bellows Expansion Joint: Any device containing one or more bellows used to absorb directional changes, such as those caused by thermal expansion or contraction of a pipeline, duct or vessel.

Concurrent Movement: Simultaneous movement axially, laterally and angularly.

Control Rod: Devices attached to the expansion joint with the primary function of distributing movement between the two bellows of a universal joint.

Convolution or Corrugation: The smallest flexible unit of a bellows, with total movement of a bellows being proportional to the number of convolutions.

Cycle: A cycle is one complete movement from initial position to operating position and back.

Cycle Life: Also known as fatigue life expectancy, is affected by various factors including (but most limited to): operating pressure, operating temperature, bellows material, and bellows design/profile. Change to any of these factors will change cycle life.

Directional Anchor: A directional anchor, or sliding anchor, is one that is designed to absorb loads in one direction while permitting motion in another. It may be either a main or intermediate anchor, depending upon the application considered. When designing a directional anchor, an effort should be made to minimize the friction between its moving or sliding parts, since this will reduce the loading on the pipe and equipment, and will ensure proper function of the anchor.

External Cover/Shroud: Expansion Joints require careful handling; they must be protected from any impact, weld spatter, etc. Before installation of an expansion joint, care must be taken that foreign material is not trapped in the corrugations. It is suitable to install a metal cover over the flanges to protect the convolutions and then wrap the insulation around it.

Flow Liner: Installed in the inlet bore of the expansion joint to protect the bellows from erosion damage due to abrasive media or resonant vibration due to turbulent flow or excessive velocities. Directional flow arrow should be placed on the exterior of the expansion joint to indicate the direction of flow.

Intermediate Anchor: An intermediate anchor is one which divides a pipeline into individual expanding pipe sections containing multiple expansion devices of the same pipe size. Such an anchor must be designed to withstand the forces and moments imposed upon it by each of the pipe sections to which it is attached. In the case of a pipe section containing one or more bellows units, these forces will consist of forces and/or moments required to deflect the bellows unit plus the frictional forces due to the pipe moving over its guides. The pressure thrust is absorbed by the other anchors or devices on the bellows unit such as limit rods, tie rods, hinged restraints, etc.

Lateral Offset: Motion, which is perpendicular to the plane of the pipe with the expansion joint fittings remaining parallel.

Limit Rod: Devices with the primary function of restricting the bellows movement range. The limit rods are designed to prevent bellows over-extension or over-compression while restraining the full pressure thrust in the event of a main anchor failure.

Main Anchor: A main anchor is one installed at any of the following locations in a pipe system containing one or more bellows:
1. At a change in directions of flow
2. Between two bellows units of different size installed in the same straight run
3. At the entrance of a side branch onto the main line
4. Where a shut-off or pressure-reducing valve is installed in a pipe run between two bellows units at a capped end of pipe.

A main anchor must be designed to withstand the forces and moments imposed upon it by each of the pipe sections to which it is attached. In the case of a pipe section containing an unrestrained bellows, these will consist of the pressure thrust, the force required to deflect the bellows unit, and the frictional force due to the pipe moving over its guides.

Pipe Alignment Guide: A pipe alignment guide is a form of sleeve fastened to some rigid part of the installation, which permits the pipeline to move freely in only one direction, i.e. along the axis of the pipe. Pipe alignment guides are designed primarily for use in applications involving axial movement only.

Pipe Support: A pipe support is any device, which permits free movement of the piping and carries the total weight of in line equipment such as valves, meters, expansion joints, and the weight of the contained fluid. Pipe supports cannot be substituted for pipe alignment guides. Pipe rings, U-bolts, roller supports, and spring hangers are some examples of conventional pipe supports.

Planar Guide: A directional pipe planar guide is a pipe alignment guide modified to permit limited movement and/or bending of the pipe in one plane. It is used only in applications involved lateral deflection or angular rotation resulting from 2- or 3-hinge piping configurations.

Pressure Thrust: Extension of the bellows due to line pressure. This pressure thrust must then be absorbed by some means or the line pressure will cause the bellows to over extend and tear itself apart.

Spring Rate: In very low pressure application the more significant force, transmitted to the piping system, may be the spring rate, which is expressed in pounds per inch of motion. Thus, as the pipe grows due to increasing temperature, the bellows will resist compression by the force noted in the spring rate.

Squirm: Structural instability caused by internal pressure on the bellows.

Thermal Movement: Expansion and/or contraction due to temperature changes. In a piping or ducting system, these thermal changes can produce stress on the system at fixed points such as vessels, rotating equipment as well as the piping or duct work system itself.

Tie Rod: Devices with the primary function to restrain the bellows pressure thrust.

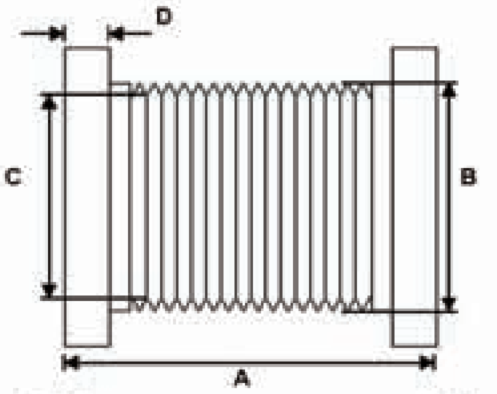
Torsion: Twisting about the longitudinal axis of a metal expansion joint when it is located at any point in a piping system that would impose torque as a result of thermal change. Structure settling, or a seismic event will impose torque.

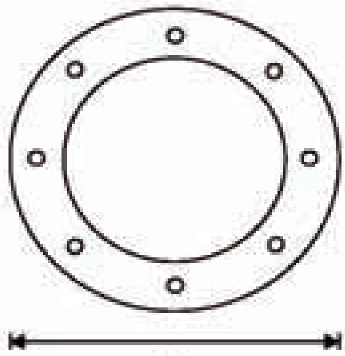
Technical Information Request Form

SPECIALTY ITEM
EXPANSION JOINT

REV.: 1
DATE:

PROJECT: ______ DOC. NO.: ______ SHEET 1 OF 1
LOCATION: ______ PROJ. NO.: ______ SPEC. NO.: ______
CHECKED BY: ______ DATE: ______ P.O. NO.: ______ EQUIPMENT NO.: ______
PREPARED BY: ______ DATE: ______ PRICE EACH $ ______ TOTAL NO. REQ'D.: ______





DIMENSIONS (BY VENDOR)

A	IN.
B	IN.
C	IN.
D	IN.
E	IN.
WEIGHT	LBS

SPECIFICATION DATA

SERVICE: **EXHAUST**	MANUFACTURER:
FLUID TYPE: ☐ GAS ☐ LIQUID	TYPE/MODEL:
FLUID:	PIPE SIZE:
☐ BOILING ☐ FOAMING ☐ COMBUSTIBLE	PIPE SCHEDULE:
☐ TOXIC ☐ FLAMMABLE	BELLOWS ID (IN): OD(IN):
DSGN. PRES. (PSIG): MIN. MAX. NORM.	NO. OF CONVOLUTIONS:
DSGN. TEMP. (°F): MIN. MAX. NORM.	INDIVIDUAL PLY THICKNESS: IN.
FLOWRATE:	NUMBER OF PILES:
SP. GR. @OPER. TEMP.:	BELLOWS ELEMENT LENGTH: IN.
VISC. @OPER. TEMP. (cP):	BELLOWS EFFECTIVE AREA: IN.^2
	CENTERSPOOL LENGTH: IN.
DESIGN CODE:	END "1":
☐ B31.1 ☐ B31.4 ☐ B31.8	END "2":
☐ B31.3 ☐ ASME VIII, DIV. 1 ☐ OTHER:	FLANGE THICKNESS:
"U" STAMP REQUIRED: ☐ YES ☐ NO	AXIAL COMPRESSION (IN): EXTENSION (IN):
CORROSION ALLOWANCE (IN):	LATERAL (IN): ANGULAR (°):
NDE: ☐ RADIOGRAPHY ☐ OTHER:	EXPANSION: ☐ CONCURRENT ⚠ ☐ NONCONCURRENT

MATERIAL SPECIFICATION

BELLOWS MATERIAL:	FLANGE MATERIAL:
COLLAR MATERIAL:	

NOTES

1.
2.
3

VTC - VENDOR TO COMPLETE

PisaFlex

PROMOCIONES INDUSTRIALES S.A. DE C.V.

Installation and Maintenance Instructions for Single-Ply and Multi-Ply Expansion Joints

1. Piping system must be adequately anchored and guided to limit piping movements the expansion joint must absorb. See EJMA Standard [Expansion Joint Manufactures Association] for anchor and guide spacing requirements.
2. Be sure all pipe lines are supported such that the expansion joint does not carry the pipe load.
3. Operating conditions must be within the limits specified in the catalog and/or drawing.
4. Install expansion joints with the neutral face-to-face dimensions as shown on the submittal drawing.
5. If the expansion joint must be installed with an initial misalignment, compression, and/or expansion, then the maximum allowable movements are reduced by the amount of the initial deflection.
6. ***CAUTION:*** The expansion joints are not design for reacting to torque or absorbing torsion movements {in a plane perpendicular to the centerline}. Be certain that these conditions do not exist due to system design or installation misalignment.
7. Shipping restraints may be welded or threaded into place at the factory to insure installation at the correct length and alignment. Whenever possible leave these restraints in place during installation. However they must be removed before operating the system.
8. Tie rods or control rods may be included on some expansion joints. They are designed to (1) limit over-travel (2) absorb pressure thrust from the expansion joint in the event of the main anchor failing (3) to absorb pressure thrust for systems design for lateral movement only and no anchors are provided in the system. Note: The system design should be carefully reviewed for correct use of these rods. They can restrict the expansion joints travel is used incorrectly.
9. ***WARNING:*** Provide protection to the thin wall expansion joint corrugations during the removal of the shipping restraints whenever cutting or grinding. Sparks can damage the corrugations.
10. Flow liners or sleeves that extend through the bore of the connector are included in some designs. A marking indicating the flow direction shall be provided on the external surface of the expansion joint to indicate the designed flow direction. The expansion joint must be installed as directed. If there is any possibility of reverse flow or entrapment of material behind the liner/sleeve the design engineer or PisaFlex representative should be consulted before operating the system.
11. All expansion joints are tested to 1.5 times the designed operating pressure. System tests should not exceed this pressure.

Post Installation and Maintenance Instructions

1. Are anchors, guides, supports installed in accordance with the system design?
2. Is the expansion joint installed in the correct location?
3. Is the expansion joint installed with the correct flow direction (if liner is required)?
4. Have the shipping restraints been removed?
5. Are all the guides, supports, and expansion joint free to permit the movements required?
6. Has the expansion joint been damaged during handling and installation?
7. Is the expansion joint installed correctly:
   a. Installed length correct and aligned correctly?
   b. Clearance from other objects enough to allow for the design movements.
8. Maintenance: Expansion Joints do not require maintenance other than routine cleaning and/or painting to prevent external corrosion. If this expansion joint is being using in a system in which the liquid may form during shutdown and operates at a high temperature in which the liquid may turn to vapor. The expansion joint must be drained of this liquid prior to start-up to prevent flashing and water hammer.

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Tel: (660) 284-6960
Fax: (660) 284-6965
E-mail: sales@pisaflex.com

Warranty

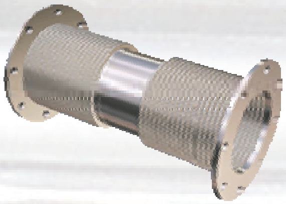
Rectangle Expansion Joints

PisaFlex warrants that products furnished will, at the time of delivery, be free from defects in material and workmanship. PisaFlex will repair or replace any defects, which occur within one year from the date of installation or eighteen months from the date of shipment, whichever occurs first.

Repair or replacement of the product will be, at PisaFlex's option. Products to be examined, and replaced or repaired at PisaFlex's facilities must be returned to the factory by Purchaser within the warranty period with transportation charges prepaid. If the examined equipment is found not to be defective; or is not for some other reason within the warranty coverage, PisaFlex service time and all other costs incurred on and off location will be charged to Purchaser.

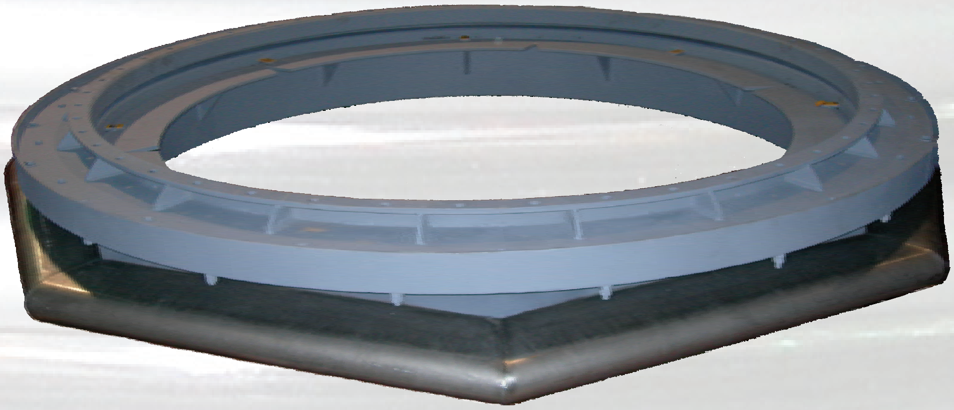
Bellows

Purchaser shall be responsible for proper installation of the units and operating within the design limits of each unit. Warranty shall not apply if the products are used for any purpose or under any condition beyond those specified including without limitation: (1) abuse or misuse, or (2) modification by others, or (3) used subject to product abnormal conditions exceeding design limitations.



Dual Universal Expansion Joint

Correction of defects by repair or replacement shall constitute PisaFlex sole and exclusive responsibility to Purchaser under this Warranty. PisaFlex shall in no event be liable for injuries to person or property or direct, incidental, liquid dated or consequential damages caused by use of the product.

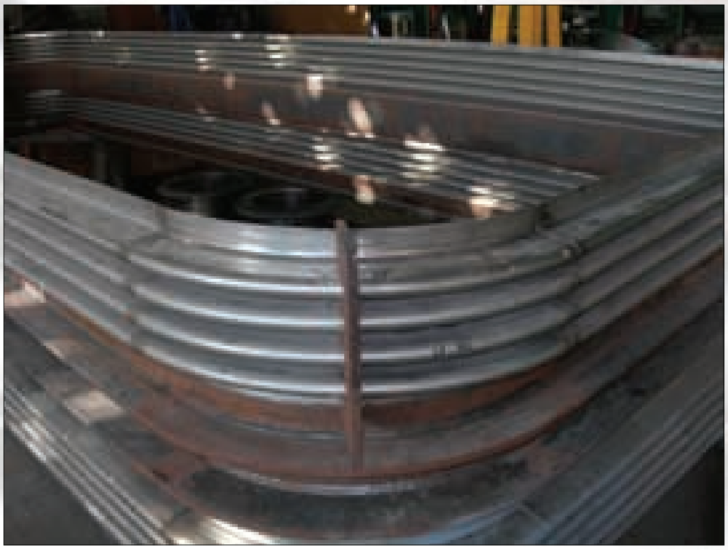


Custom Design Expansion Joint

Disclaimer

The products illustrated reflect the design characteristics at time of printing. Please contact the factory for certified prints with exact dimensions when required.

This catalog is provided to assist the user in selection and application of PisaFlex Expansion Joints. The technical data contained herein is a guide to the user of PisaFlex products. The data contained herein is based upon tests and information believed to be reliable, but users should not rely upon it absolutely for specific applications. It is given and accepted at user's risk and confirmation of its validity and suitability in particular cases should be obtained independently.



Rectangle Expansion Joint

Pisaflex makes no guarantee of results and assumes no obligation or liability in connection with this data. This publication is not to be taken as a license to operate under or recommendation to infringe any patents.

PisaFlex policy is one of continuous improvement and development. PisaFlex reserves the right to change specifications and introduce improved designs without notice.

Large Universal Tied Expansion Joint

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