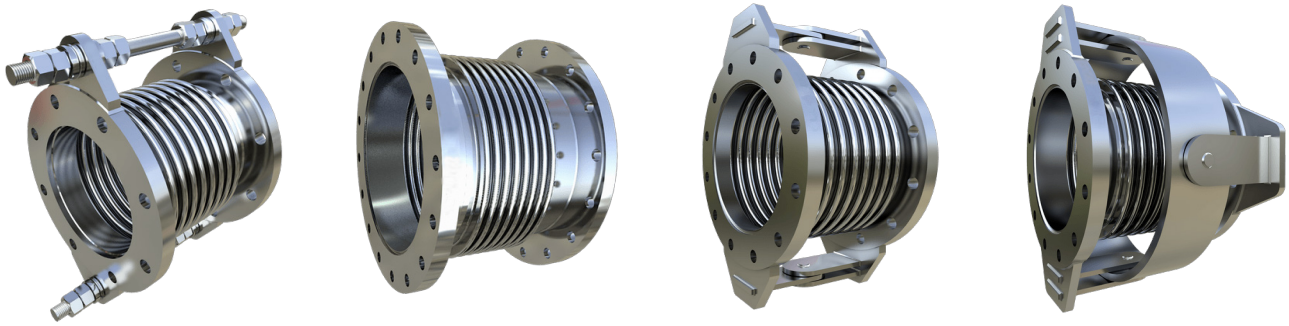
ABOUT

STAINLESS STEEL EXPANSION JOINTS

Singaflex Metallic Expansion Joints consist of a flexible bellow element with end fittings such as flanges installed in appliances, machines, apparatus, and pipe systems where space is restricted for movement compensation, expansion compensation, tension reduction, noise & oscillation transmission absorption, and installation inaccuracy compensation



High-Temperature Applications

Manufactured from stainless steel tubing to form a corrugated cylinder, our expansion bellows adds the structural reinforcement and flexibility necessary to contain system pressures and temperature (up to 600°C) customised in accordance with your specifications.

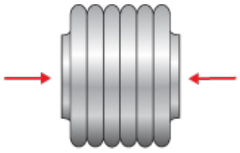
Singaflex Expansion Bellows are designed using the EJMA (Expansion Joint Manufacturers Association) standard with the general requirements of associated piping and vessel codes such as ASME / API / BS 5500 taken into consideration where appropriate.

With our in-house designing and manufacturing capabilities, suitable expansion joints can be fabricated with expedited lead times to replace existing parts without the need to modify the system to accommodate them.

Our expansion joints are supported by documentation including 3.1 material certificates and various test certification.

Axial Compression

Reduction of the bellows length due to piping expansion.

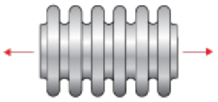


Angular Rotation

Bending about the longitudinal centre line of the expansion joint.

Axial Extension

Increase of the bellow length due to pipe correction.



Lateral Offset

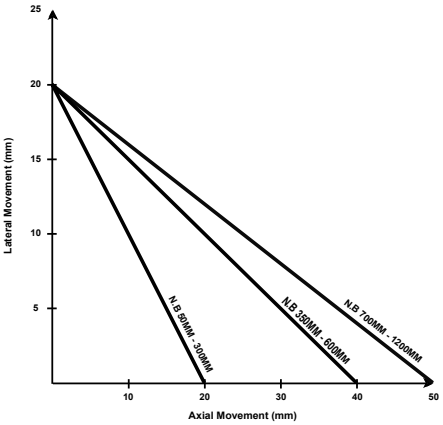
Refers to the traverse motion that is perpendicular to the plane of the pipe, while ensuring that the expansion joint ends remain parallel to each other.

Torsion

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 because of thermal change or settlement.

Chart of Movement Combination

Expansion Joints are generally designed to handle one main type of movement at a time. Although it is not recommended for the joints to be subjected to concurrent movement types, the movement types should not exceed two and be both of high velocity to ensure its optimum operability.



Cycle/Service Life

Singaflex Stainless Steel Expansion Bellows are rated for a load of 1000-2000 load cycles.Together with the tolerable operating conditions.

- **Pressure**
- **Temperature**
- **Movement**
- **Number of load cycles**

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.

The following parameters may also affect service life:
Corrosion: Incorrect selection or combination of materials, conveyance of aggressive media and inappropriate cleaning with cleaning agents.
Movement & Environment: Subjecting the element to high frequency oscillations, sympathetic vibration, temperature shocks and pressures exceeding its permitted maximum values may result in fatigue failure/fracture.
Incorrect Installation: Can be prevented by compliance with the installation and assembly instructions.

Application of Bellow Expansion Joints in Piping Systems

It is essential to distinguish between the unrestrained expansion joint, usually used for axial movement, and the restrained unit, using bellows fitted with tie bars or hinges taking up the offset and angular movement.

The two have different applications, act upon the pipe differently, and must be installed differently.

At the design stage, identifying the pipe movements, the working and test conditions, and the environment in which the piping system will operate is of utmost importance. While challenging, this task is essential for successfully installing expansion joints. Regardless of complexity, any piping system can be divided into several individual expanding or contracting sections, each with relatively simple configurations. The number and location of pipe anchors are determined by the piping configuration, the amount of movement that a single joint can accommodate due to expansion, and the availability of suitable structural points for anchors.

Expansion joint elements have a limited capacity to transmit torque and absorb torsional rotation.

Designers of piping systems must exercise caution and careful planning to prevent such loading on the expansion joint, as any oversight could lead to potential risks and complications.

Accessories

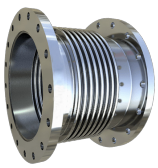
Flow Liners/Inner Sleeves can be installed in the inner bore of the expansion joint to protect the bellows from erosion damage due to an abrasive material or resonant vibration due to turbulent flow or high velocity applications.

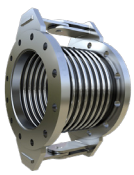
Range and Material

Sizes: DN50 TO DN3000
Bellow Material: Stainless Steel SS304L/SS316L, SMO, Duplex, Super Duplex

1. AXIAL EXPANSION JOINT
2. TIED AXIAL EXPANSION JOINT
3. HINGED EXPANSION JOINT
4. GIMBAL EXPANSION JOINT

1. 

2. 

3. 

4. 

UNRESTRAINED OR RESTRAINED EXPANSION JOINTS

Unrestrained Units

Axial expansion joints are not pressure restrained -when pressurised, they tend to open out lengthwise, like a piston in its cylinder. The thrust equals the effective area of the bellows multiplied by the internal pressure (including vacuum conditions). This force acts on pipes and anchors, and when the pipe expands, it must overcome the flexibility force of the bellows and the pressure force. The pressure force is nearly always much more significant than the elastic force

Note: In vacuum conditions, the bellows tend to contract and pull on the anchors — a phenomenon opposite to the expansion force. The following rules governing the installation of unrestrained units must be strictly observed to ensure a satisfactory installation..

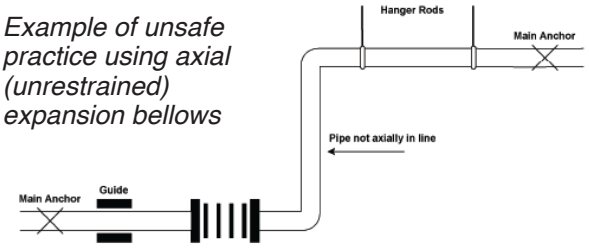
Inside Corner Connection

1. Anchor Points

It is the function of an anchor to absorb the line loads and to control the direction of the movement. To ensure a satisfactory installation the following should be observed.

- Only one expansion joint should be used between two anchor points. This ensures that each unit works only within its design movements.
- The pipe between anchors should be straight in plan and elevation. If the pipe is not straight the forces exerted by the expansion joint will tend to push the pipe sideways or bend any pipe offset unless the pipe is adequately guided. This can overextend the expansion joint and cause it to fail by instability.

Example of unsafe practice using axial (unrestrained) expansion bellows



- Anchor points at the end of the pipe must be strong and rigid enough to resist all forces acting upon them.

Points to Consider When Calculating Anchor Point Load

i) Deflection load (bellows spring rate x maximum deflection).
ii) Pressure thrust (effective area x design pressure)
iii) Frictional resistance of pipe moving over its guides.
iv) Centrifugal thrust.
v) Dead weight loads on vertical and sloping pipes.
vi) Shock loads, due to quick opening valves or bursting of safety discs.
vii) Wind Loading.
viii) Additional thrust due to test pressure.

Reference should be made to the data sheets for details of deflection forces and effective areas.

2. Main Anchor

A main anchor is installed in any of the following locations in a pipe system containing one or more bellows.

- At a change in flow direction.
- Between two bellows of different size installed in the same straight run.
When small differences in pipe sizes occur, intermediate anchors should be adequate.
- At the entrance of a side branch into the main line, but this only applies when the side branch is approximately equal to the dimension of the main pipe.
- Where a shut-off or pressure reducing valve is situated in a pipe run between two bellows. A main anchor must be designed to take the pressure, deflection load, and other loads imposed upon it.

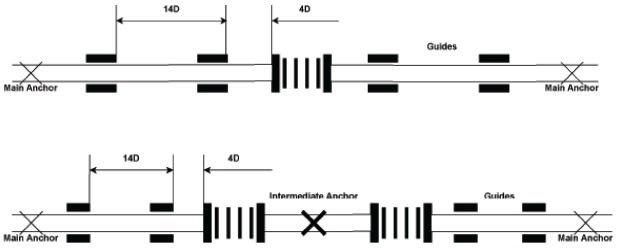
3. Intermediate Anchor

Theoretically, intermediate anchors need only light construction since the main anchors absorb the pressure thrust forces. However, in practice, except perhaps on high-pressure and large-diameter pipes, it is advisable to design intermediate anchors as ‘main anchors’ and eliminate the risk of failure if the line is later modified or tested incorrectly.

Guide Positions

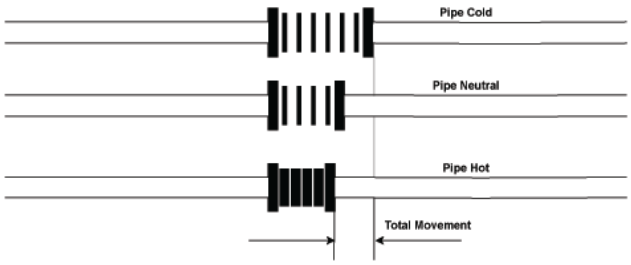
The first guide for axial expansion joints should be positioned as close as possible to the expansion joints and never more than four pipe diameters away. The distance between the first and second guide should be at most fourteen pipe diameters.

Note: There should be sufficient clearance between the guide and bellows flange for bolt access.



Cold Pulling Expansion Points

Expansion joints can take compression and extension from the natural free position. This facility is fully taken advantage of by pre-setting the joints.



Explanation of Cold Pull

Assuming that installation is carried out with the pipe at its minimum temperature, then setting is done by extending or compressing the joint by half the total movement it will ultimately be subjected to — and can be carried out in the final stages of installation.

It's important to note that axial expansion joints can be preset upon request. The setting process involves fitting temporary installation bars across the joint. However, these bars must be removed carefully at the installation stage and, most importantly, before the system pressure testing begins. This precaution is vital to ensure the installation's safety and effectiveness. Minimum loading is obtained by allowing movement to be taken equally on either side of the neutral position. When presetting on site, allowance should be made for the difference between the temperature at installation time and the operating temperature range. The necessary length adjustment of the joint can be calculated using the thermal expansion table.

One key factor to consider in the installation of axial expansion joints is temperature changes. This is particularly crucial in lines working at atmospheric temperatures, as they absorb expansions due to day/night and seasonal temperature changes. Understanding and accounting for these changes can play a vital role in maintaining the system's functionality and longevity.

Restrained Expansion Joint

These joints operate on a completely different principle from the unrestrained types. In this case, the expansion joints can bend and are restrained by spherical seated tie bars, hinges, or a braid preventing them from opening out axially due to internal pressure.

The restrained expansion joint has the advantage of eliminating pressure thrust and providing flexibility with minimal forces.

The free movement of the expanding pipe Influences rules governing the installation of restrained expansion joints. Both anchors and guides can usually be constructed in light.

1. Anchor Points

These absorb the line loads and control the direction of movement. Again, the anchor points at the end of pipes should be strong enough to resist all forces acting upon them.

When using restrained units, the unit carries the pressure load, so there is no need for main anchors; the only required types are intermediate or directional restraint anchors.

2. Intermediate Anchors
An intermediate anchor must withstand the transferred forces and movements of the pipe section to which it is attached. In a pipe with one or more expansion joints, these loads consist of the movements and forces required to deflect the expansion joint, together with forces from friction, self-weight, wind load, and centrifugal thrust. The expansion joint's tie rods, hinged restraints, and gimbal restraints absorb the pressure load.

3. Directional Restraint Anchor
This anchor prevents movement in one or more directions and permits motion in another. Depending upon its application, it may be a primary or intermediate anchor and function as a pipe guide. Designers minimise the friction load on these anchors by specifying low-friction surfaces.

4. Pipe Guides
When used in expansion joint systems, restrained units exert lesser forces on their anchors than their unrestrained counterparts. These forces consist only of the deflection forces* due to bellows spring rates, friction at tie bar spherical or hinge pins, and the frictional resistance of the pipe moving over its guides or supports.

**These forces can be critical in certain conditions and can be defined upon request.*

Because anchor loads are low, restrained expansion joint systems are frequently used. The pipe is supported on hangers, keeping alignment by its own weight.

When restrained units are displaced, there is a slight overall length change, which requires installing pipe guides on each side of the system. This allows for the change in length in one plane only.

Sliding supports may be used for horizontal pipes and spring supports for vertical systems on short runs in restricted space between vessels or machinery. The support is essential when large-diameter pipes are in use.

The design of additional strength supports can be requested to improve installation conditions.

The longer the pipe runs, the greater the force between the pipe supports and guides due to friction; consequently, the greater the load of the anchors.

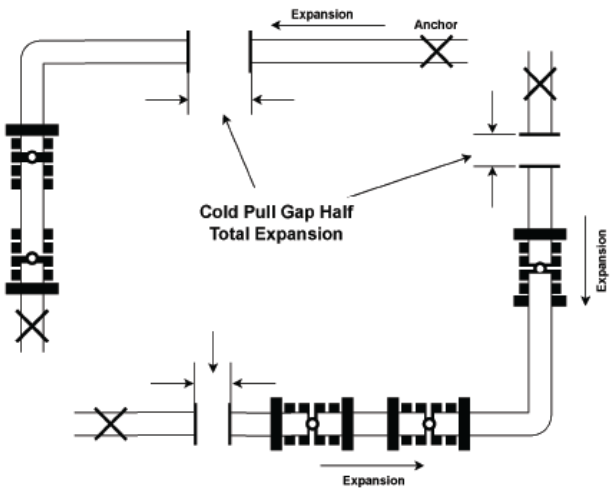
When restrained bellows are used on long runs, roller supports, or even low friction pads will keep friction to a minimum. Supports and guides located near a restrained expansion joint must be designed to accommodate the large movements that can occur, as there is a danger that the pipe could fall off the guide under maximum movement conditions or distort the support.

Guide Positions

Supports and guides should prevent bending and twisting of the expansion joints. If distortion occurs, the joints or its restraints may be incorrectly stressed.

Cold Pulling Expansion Joints

The theory of cold pull calculations in a restrained system is like the unrestrained system — except that the joint does not have to be extended or compressed. Presetting is applied by cutting the pipe run short by half the total movement to which the expansion joint will be subjected.



Examples of cold pull

Sleeves

Internal sleeves should be used on all expansion joints in the following cases:
- When it is necessary to hold media fiction losses to a minimum and achieve smooth flow.

Internal sleeves should be used on all expansion joints in the following cases:
- When it is necessary to hold media fiction losses to a minimum and achieve smooth flow.
- When velocities are high and could produce resonant vibration of the bellows. Sleeves are recommended when flow velocities exceed the following values: —

Air, Steam, or other gases
i) Up to 150MM diameter – 48MM/S per MM of diameter
ii) Over 150MM diameter – 8 M/S
Water and other liquids
i) Up to 150MM diameter – 20MM/S per MM of diameter
ii) Over 150MM diameter – 8 M/S

- Internal sleeves should be used when turbulent flow is generated upstream of the expansion joint by changes in flow direction, valves, tee or elbow section, and cyclonic devices. When the sleeves are long or large in diameter, and turbulence is high, heavy gauge sleeves may be required.
- Use of internal sleeves where there is the possibility of erosion.

Example:
in lines carrying catalyst or other abrasive media.
- Sleeves are used in high temperature applications to reduce the temperature of the bellows and enable the metal to retain its physical properties: (maximum effect will be obtained if the expansion joint is not externally insulated).

More About Sleeves

- Sleeves should not be used for mediums of high viscosity, such as tars. These fluids may cause “packing up” “coking” and “caking” of the convolutions which may create premature expansion joint failure.
- In cases of rotation or lateral deflection, a sleeve must be small enough in diameter to give clearance between its external diameter and internal diameter of the bellows. If the internal diameter of the sleeve cannot be reduced, an oversized or an alternative expansion joint design should be used.
- Sleeve should contain drain holes when used on expansion joints for steam or liquid service when the flow direction is vertically upward.

INSTALLATION GUIDE

Critical Phases of Expansion Joint Installation which affects operability, cyclic life, design limits, etc.

a) Care should be exercised to prevent any damage to the thin bellow section, such as dents, scores, arc strikes, and weld splatters.
b) Avoid subjecting the expansion joint to movements beyond its designed movement capabilities.
c) Any field pre-positioning shall be performed in accordance with specific instructions which include both the direction and magnitude of movement.
d) Anchors, guides, and pipe supports shall be installed in strict accordance with the piping system drawings. Any field variances from planned installation may affect proper functioning of the expansion joint and must be brought to the attention of the piping designer for resolution.
e) The expansion joint, if provided with internal sleeves, shall be installed with the correct orientation with respect to flow direction.
f) Once the pipeline anchors or other fixed points are in place and the piping is properly supported and guided, the expansion joint shipping restraints should normally be removed to allow the expansion joint to compensate for changes in ambient temperature during the remainder of the construction phase.

Inspection Prior to System pressure Test

A careful inspection of the entire piping system shall be made with particular emphasis on the following:

a. Are anchors, guides, and supports installed in accordance with the system drawings?
b. Is the proper expansion joint in its correct location?
c. Is the expansion joint flow direction and pre-positioning, correct?
d. Have all the expansion joint shipping restraints been removed?
e. If the system has been designed for gas, and is to be tested with water, has provision been made for proper support of the additional dead weight load on the piping and expansion joint?
(water from testing may remain in the bellow after tests, is this detrimental to the bellow or system operation, have means to remove the water been provided?)
f. Are all guides, supports and expansion joints free to permit pipe movement?
g. Has any expansion joint been damaged during handling and installation?
h. Is any expansion joint misaligned?
This can be determined by measuring the joint overall length, inspection of the convolution geometry, and checking clearances at critical points on the expansion joint and at other points in the system.

i. Are the bellows and other movable portions of the expansion joint free of foreign material?

Inspection During And Immediately After The System Pressure Tests

WARNING: Extreme care must be exercised while inspecting any pressurised system or component.

A visual inspection of the system shall include. checking for the following:
a) Evidence of leakage or loss of pressure.
b) Distortion or yielding of anchors, expansion joint hardware, bellows, and other wiping components.
c) Any unanticipated movement of the piping due to pressure.
d) Evidence of instability (squirm) in the bellows.
e) The guides, expansion joints, and other movable parts of the system shall be inspected for evidence of binding.
f) Any evidence of abnormality or damage shall be Reviewed and evaluated by the piping designer.

PERIODIC IN-SERVICE INSPECTION

WARNING: Extreme care must be exercised while inspecting any pressurised system or component.

a) Immediately after operating the system, a visual inspection shall be conducted to ensure that the thermal expansion is being absorbed by the expansion bellows in the way they were designed.
b) The system designer shall plan and conduct a program of periodic inspections throughout the system's operating life. The frequency of these inspections will be determined by the service and environmental conditions involved. These conditions shall include an examination for signs of external corrosion, loosening of threaded fasteners, and deterioration of anchors, guides, and other hardware.
It must be understood that this inspection program, without any other Dock-up information, cannot give evidence of damage due to fatigue, stress corrosion, or General internal corrosion. These can cause sudden failures and generally occur without visible or audible warning.
Where the system's critical nature warrants, it may be necessary to devise means for minimising the probability of this type of failure, including periodic preventive replacement of essential items.
c) When any inspection reveals evidence of malfunction, damage, or deterioration, the piping engineer shall review it and take necessary actions to rectify or resolve the defects.

SYSTEM OPERATION

A record shall be maintained of any changes in system operating conditions (such as pressure, temperature, thermal cycling, and water treatment) and piping modifications. The piping designer shall review any such change to determine its effect on the performance of the anchors, guides, and expansion joints.
Expansion joints properly designed and manufactured for specific piping system conditions have given many years of satisfactory service. Failures, of course, have occurred, which are of concern both to users and to reputable expansion joint manufacturers.
Failures can occur for many reasons, but experience has shown that specific causes of failure fall into distinct categories: -

a) Shipping and handling damage.
Examples:
Denting or gouging of bellows from being struck by hard objects (tools, forklifts, adjacent structures, etc.).
Improper stacking for shipping or storage.
Insufficient protection from weather or other adverse environmental conditions.
b) Improper installation and insufficient protection during and after installation.
Examples:
Joints with internal sleeves installed in reverse direction with respect to flow.
Installing a joint in a location other than as prescribed by the installation drawings.
Premature removal of shipping restraints.
Springing of bellows to make up for piping misalignment.
Insufficient protection from mechanical damage due to work in the surrounding area.Insufficient protection of bellows during nearby welding operations.
Failure to remove shipping restraints before placing the system in operation.
c)Improper anchoring, guiding, and supporting of the piping system.
d) Anchor failure in service.

e) Bellows corrosion.

Examples:

Improper selection of bellows material for the flowing medium and/or adverse external environment. Specifically, chloride leaching from insulation has frequently caused corrosion in stainless steel bellows. 300 series stainless steel can be subject to stress corrosion in the presence of chlorides. In these cases, the use of high nickel alloys should be considered.

f) System over-pressure (in-service or hydrotest}.

g) Bellows vibration (mechanical or flow-induced) resulting in high-cycle fatigue.

h) Excessive bellows deflection (axial, lateral, angular deflections greater than design values).

i) Bellows erosion.

Example:

Bellows without internal sleeves are installed in a system with a very high velocity and/or erosive flowing medium.

j) Packing of matter in bellows convolutions, which inhibits proper movement of the bellows components.

Expansion Rates for Piping Materials from 0°C (mm/m)

Temperature °C	Carbon and Carbon Molybdenum steel	4—6%Cr. Alloy steel	12%Cr. Stainless Steel	18Cr.8Ni. Stainless Steel
-130	-1.27	-1.25	-1.17	-1.96
-120	-1.19	-1.17	-1.09	-1.82
-110	-1.11	-1.09	-1.01	-1.68
-100	-1.03	-0.98	-0.91	-1.55
-90	-0.94	-0.94	-0.87	-1.39
-80	-0.84	-0.82	-0.76	-1.23
-70	-0.74	-0.75	-0.70	-1.08
-60	-0.64	-0.64	-0.60	-0.93
-50	-0.54	-0.55	-0.52	-0.78
-40	-0.43	-0.44	-0.42	-0.62
-30	-0.32	-0.33	-0.31	-0.47
-20	-0.21	-0.22	-0.21	-0.31
-10	-0.10	-0.11	-0.10	-0.15
0	0	0	0	0
10	0.11	0.10	0.10	0.15
20	0.22	0.20	0.20	0.31
30	0.33	0.33	0.31	0.51
40	0.45	0.42	0.40	0.65
50	0.57	0.53	0.50	0.81
60	0.69	0.63	0.60	0.98
70	0.80	0.74	0.70	1.15
80	0.92	0.85	0.80	1.32
90	1.03	0.96	0.91	1.49
100	1.15	1.07	1.02	1.66
110	1.27	1.19	0.12	1.83
120	1.38	1.31	1.22	2.00
130	1.51	1.43	1.33	2.17
140	1.64	1.54	1.43	2.34
150	1.78	1.66	1.54	2.52
160	1.92	1.78	1.65	2.69
170	2.05	1.88	1.77	2.87
180	2.18	2.02	1.87	3.01
190	2.31	2.14	1.98	3.23
200	2.44	2.26	2.10	3.41
210	2.58	2.39	2.22	3.59
220	2.72	2.52	2.34	3.78
230	2.86	2.64	2.45	3.96
240	3.00	2.77	2.57	4.14

Expansion Rates for Piping Materials from 0°C (mm/m)

Temperature °C	Carbon and Carbon Molybdenum steel	4—6%Cr. Alloy steel	12%Cr. Stainless Steel	18Cr.8Ni. Stainless Steel
250	3.13	2.89	2.68	4.32
260	3.27	3.02	2.80	4.50
270	3.42	3.16	2.93	4.68
280	3.57	3.29	3.05	4.87
290	3.71	3.42	3.17	5.06
300	3.85	3.55	3.29	5.24
310	4.00	3.69	3.42	5.48
320	4.16	3.82	3.54	5.61
330	4.31	3.96	3.67	5.81
340	4.46	4.08	3.79	6.00
350	4.62	4.23	3.92	6.18
360	4.77	4.36	4.04	6.38
370	4.93	4.49	4.16	6.57
380	5.09	4.63	4.28	6.76
390	5.25	4.78	4.41	6.96
400	5.41	4.92	4.54	7.15
410	5.57	5.07	4.68	7.34
420	5.73	5.21	4.81	7.54
430	5.89	5.35	4.94	7.74
440	6.06	5.50	5.08	7.94
450	6.22	5.65	5.22	8.13
460	6.39	5.79	5.35	8.33
470	6.56	5.94	5.48	8.53
480	6.73	6.08	5.61	8.73
490	6.89	6.22	5.74	8.93
500	7.05	6.39	5.89	9.14
510	7.21	6.52	6.01	9.34
520	7.38	6.67	6.15	9.54
530	7.54	6.82	6.29	9.75
540	7.71	6.97	6.43	9.95
550	7.84	7.11	6.56	10.16
560	8.05	7.26	6.70	10.36
570	8.22	7.41	6.84	10.56
580	8.40	7.56	6.97	10.77
590	8.57	7.71	7.11	10.97
600	8.73	7.85	7.24	11.13
610	8.89	7.99	7.37	11.38
620	9.04	8.14	7.50	11.58

Expansion Rates for Piping Materials from 0°C (mm/m)

Temperature °C	Carbon and Carbon Molybdenum steel	4—6%Cr. Alloy steel	12%Cr. Stainless Steel	18Cr.8Ni. Stainless Steel
630	9.20	8.28	7.63	11.79
640	9.36	8.43	7.77	11.99
650	9.53	8.58	7.91	12.2
660	9.70	8.74	8.05	12.4
670	9.87	8.90	8.19	12.6
680	10.03	9.06	8.33	12.81
690	10.20	9.21	8.46	13.01
700	10.37	9.35	8.59	13.22
710	10.54	9.52	8.74	13.42
720	10.71	9.67	8.87	13.62
730	10.87	9.82	9.01	13.83
740	11.04	9.97	9.15	14.03
750	11.21	10.12	9.28	14.24
760	11.38	10.27	9.41	14.44
770				14.67
780				14.90
790				15.14
800				15.37
810				15.60

Single Axial (Van Stone)

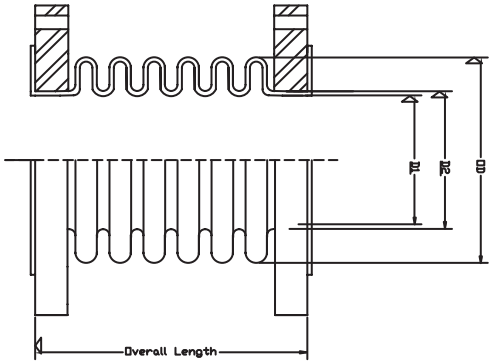
Specification

BELLOW: Stainless Steel 304L or 316L

FLANGES: Carbon Steel, SS304L or SS316L

OPTIONAL ACCESSORIES: Galvanized Steel Tie Rods

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	EFFECTIVE AREA
MM	Bar g	MM	+/- MM	TOTAL MM	N/mm	cm2
50	6	150	15	30	160	36
	16	150	15	30	318	37
65	6	150	20	40	103	55
	16	150	20	40	205	56
80	6	150	20	40	101	78
	16	150	20	40	202	79
100	6	150	25	50	89	126
	16	150	25	50	177	127
125	6	180	25	50	98	187
	16	180	25	50	187	188
150	6	180	25	50	69	265
	16	180	25	50	138	266
200	6	180	25	50	89	432
	16	180	25	50	178	433
250	6	200	25	50	77	668
	16	200	25	50	154	670
300	6	200	25	50	91	921
	16	200	25	50	182	923
350	6	250	25	50	593	1170
	16	250	25	50	1234	1173
400	6	250	25	50	608	1493
	16	250	25	50	1214	1499
450	6	250	25	50	621	1855
	16	250	25	50	1239	1863
500	6	250	25	50	635	2256
	16	250	25	50	1268	2264
600	6	250	25	50	676	3176
	16	250	25	50	1349	3186

Single Axial with Pipe Ends

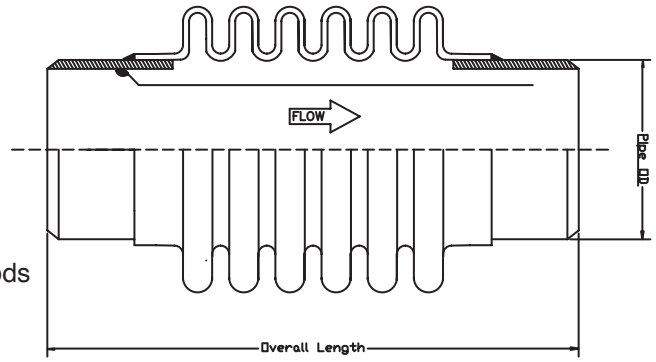
Specification

BELLOW: Stainless Steel 304L or 316L

FLANGES: Carbon Steel, SS304L or SS316L

OPTIONAL ACCESSORIES: Galvanized Steel Tie Rods

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	EFFECTIVE AREA
MM	Bar g	MM	MM	+/- MM	TOTAL MM	N/mm	cm2
50	10	60.3	200	15	30	160	36
	16	60.3	200	15	30	318	37
	25	60.3	200	15	30	476	38
65	10	73.0	200	20	40	103	55
	16	73.0	200	20	40	205	56
	25	73.0	200	20	40	306	57
80	10	88.9	200	20	40	101	78
	16	88.9	200	20	40	202	79
	25	88.9	200	20	40	300	80
100	10	114.3	250	25	50	89	126
	16	114.3	250	25	50	177	127
	25	114.3	250	25	50	265	128
125	10	141.3	250	25	50	98	187
	16	141.3	250	25	50	187	188
	25	141.3	250	25	50	280	189
150	10	168.28	250	25	50	69	265
	16	168.28	250	25	50	138	266
	25	168.28	250	25	50	206	268
200	10	219.08	250	25	50	89	432
	16	219.08	250	25	50	178	433
	25	219.08	250	25	50	266	435

Single Axial with Pipe Ends (cont.)

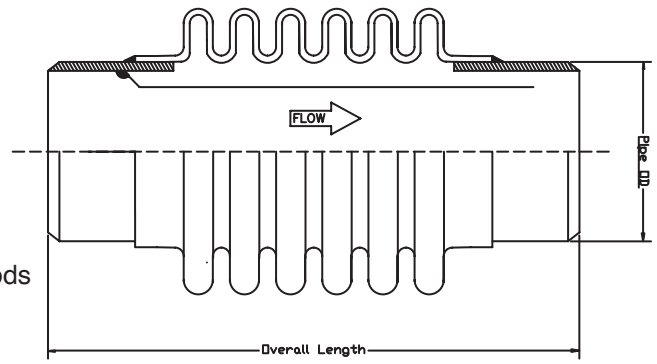
Specification

BELLOW: Stainless Steel 304L or 316L

FLANGES: Carbon Steel, SS304L or SS316L

OPTIONAL ACCESSORIES: Galvanized Steel Tie Rods

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	EFFECTIVE AREA
MM	Bar g	MM	MM	+/- MM	TOTAL MM	N/mm	cm2
250	10	273.05	300	25	50	77	668
	16	273.05	300	25	50	154	670
	25	273.05	300	25	50	229	672
300	10	323.85	300	25	50	91	921
	16	323.85	300	25	50	182	923
	25	323.85	300	25	50	272	926
350	10	355.6	350	25	50	593	1170
	16	355.6	350	25	50	1234	1173
	25	355.6	350	25	50	1927	1176
400	10	406.4	350	25	50	608	1493
	16	406.4	350	25	50	1214	1499
	25	406.4	350	25	50	1817	1506
450	10	457.2	350	25	50	621	1855
	16	457.2	350	25	50	1239	1863
	25	457.2	350	25	50	1855	1870
500	10	508.0	350	25	50	635	2256
	16	508.0	350	25	50	1268	2264
	25	508.0	350	25	50	1899	2273
600	10	609.6	350	25	50	676	3176
	16	609.6	350	25	50	1349	3186
	25	609.6	350	25	50	2022	3196

Single Axial with Flanges

Specification

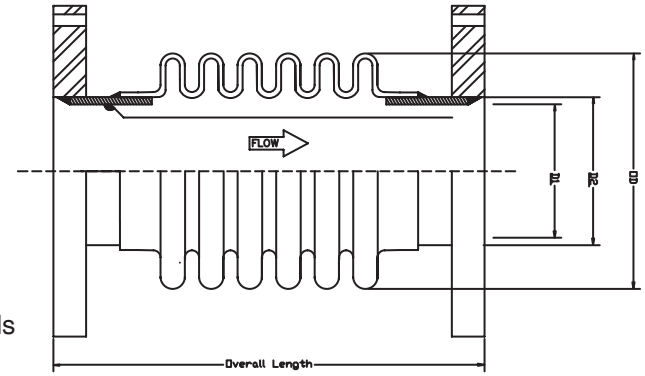
BELLOW: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

FLANGES: Carbon Steel, SS304L or SS316L
(BS, ANSI, DIN & Special)

OPTIONAL ACCESSORIES: Galvanized Steel Tie Rods

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	EFFECTIVE AREA
MM	Bar g	MM	+/- MM	TOTAL MM	N/mm	cm2
50	10	200	15	30	160	36
	16	200	15	30	318	37
	25	200	15	30	476	38
65	10	200	20	40	103	55
	16	200	20	40	205	56
	25	200	20	40	306	57
80	10	200	20	40	101	78
	16	200	20	40	202	79
	25	200	20	40	300	80
100	10	250	25	50	89	126
	16	250	25	50	177	127
	25	250	25	50	265	128
125	10	250	25	50	98	187
	16	250	25	50	187	188
	25	250	25	50	280	189
150	10	250	25	50	69	265
	16	250	25	50	138	266
	25	250	25	50	206	268
200	10	250	25	50	89	432
	16	250	25	50	178	433
	25	250	25	50	266	435

Single Axial with Flanges (cont.)

Specification

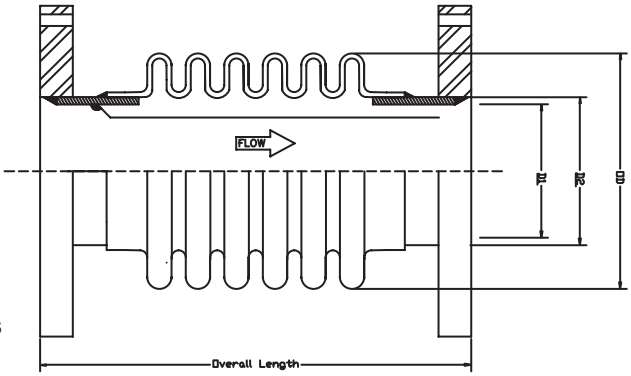
BELLOW: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

FLANGES: Carbon Steel, SS304L or SS316L
(BS, ANSI, DIN & Special)

OPTIONAL ACCESSORIES: Galvanized Steel Tie Rods

OTHER MATERIALS AVAILABLE UPON REQUEST



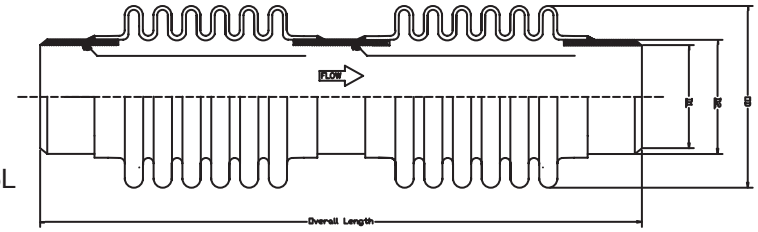
NOMINAL SIZE	PRESSURE	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	EFFECTIVE AREA
MM	Bar g	MM	+/- MM	TOTAL MM	N/mm	cm2
250	10	300	25	50	77	668
	16	300	25	50	154	670
	25	300	25	50	229	672
300	10	300	25	50	91	921
	16	300	25	50	182	923
	25	300	25	50	272	926
350	10	350	25	50	593	1170
	16	350	25	50	1234	1173
	25	350	25	50	1927	1176
400	10	350	25	50	608	1493
	16	350	25	50	1214	1499
	25	350	25	50	1817	1506
450	10	350	25	50	621	1855
	16	350	25	50	1239	1863
	25	350	25	50	1855	1870
500	10	350	25	50	635	2256
	16	350	25	50	1268	2264
	25	350	25	50	1899	2273
600	10	350	25	50	676	3176
	16	350	25	50	1349	3186
	25	350	25	50	2022	3196

Untied Double with Pipe Ends

Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel SS304L or SS316L



OTHER MATERIALS AVAILABLE UPON REQUEST

NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	LATERAL SPRING RATE	EFFECTIVE AREA
				AXIAL	LATERAL			
MM	Bar g	MM	MM	+/- MM	+/- MM	N/mm	N/mm	cm2
50	6	60.3	500	20	25	76	2	36
65	6	73.0	500	20	25	61	2	55
80	6	88.9	500	20	25	60	3	78
100	6	114.3	500	20	25	60	5	126
125	6	141.3	500	20	25	66	8	187
150	6	168.28	500	20	25	46	8	265
200	6	219.08	500	20	25	53	16	432
250	6	273.05	500	20	25	46	23	668
300	6	323.85	500	20	25	54	38	921
350	6	355.6	600	40	25	272	167	1171
400	6	406.4	600	40	25	285	223	1493
450	6	457.2	600	40	25	290	282	1855
500	6	508.0	600	40	25	297	352	2256
600	6	609.6	600	40	25	317	529	3177
700	6	711.2	700	50	25	564	951	4255
800	6	812.8	700	50	25	601	1308	5489
900	6	914.4	700	50	25	595	1626	6896
1000	6	914.4	700	50	25	633	1380	8446
1100	6	1116.0	800	50	25	680	1783	10153
1200	6	1116.0	900	50	25	584	1484	12018

Untied Double with Flanged Ends

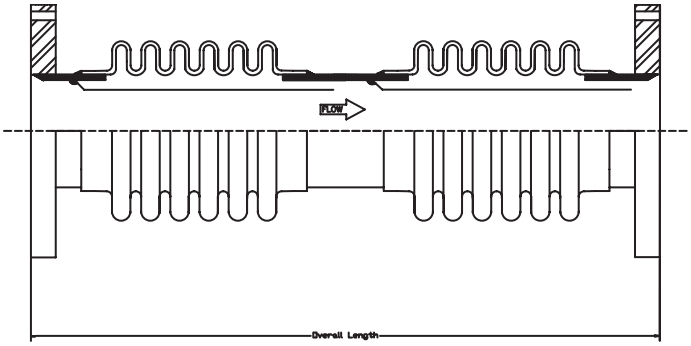
Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

FLANGES: Carbon Steel, SS304L or SS316L
(BS, ANSI, DIN & Special)

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	LATERAL SPRING RATE	EFFECTIVE AREA
				AXIAL	LATERAL			
MM	Bar g	MM	MM	+/- MM	+/- MM	N/mm	N/mm	cm2
50	6	60.3	500	20	25	76	2	36
65	6	73.0	500	20	25	61	2	55
80	6	88.9	500	20	25	60	3	78
100	6	114.3	500	20	25	60	5	126
125	6	141.3	500	20	25	66	8	187
150	6	168.28	500	20	25	46	8	265
200	6	219.08	500	20	25	53	16	432
250	6	273.05	500	20	25	46	23	668
300	6	323.85	500	20	25	54	38	921
350	6	355.6	600	40	25	272	167	1171
400	6	406.4	600	40	25	285	223	1493
450	6	457.2	600	40	25	290	282	1855
500	6	508.0	600	40	25	297	352	2256
600	6	609.6	600	40	25	317	529	3177
700	6	711.2	700	50	25	564	951	4255
800	6	812.8	700	50	25	601	1308	5489
900	6	914.4	700	50	25	595	1626	6896
1000	6	914.4	700	50	25	633	1380	8446
1100	6	1116.0	800	50	25	680	1783	10153
1200	6	1116.0	900	50	25	584	1484	12018

Tied Double with Flange Ends

Specification

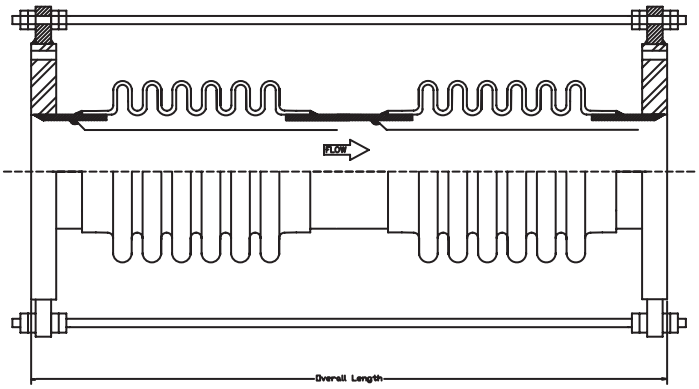
BELLOWS: Stainless Steel 304L or 316L

WELD ENDS: Carbon Steel, SS304L or SS316L

FLANGES: Carbon Steel, SS304L or SS316L

TIE RODS: Galvanized Steel / SS304L

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	LATERAL SPRING RATE	EFFECTIVE AREA
				AXIAL	LATERAL			
MM	Bar g	MM	MM	+/- MM	+/- MM	N/mm	N/mm	cm2
50	6	60.3	500	20	25	76	2	36
	16	60.3	500	20	25	151	3	37
	25	60.3	500	20	25	225	5	38
65	6	73.0	500	20	25	61	2	55
	16	73.0	500	20	25	121	4	56
	25	73.0	500	20	25	181	6	57
80	6	88.9	500	20	25	60	3	78
	16	88.9	500	20	25	119	5	79
	25	88.9	500	20	25	178	8	80
100	6	114.3	500	20	25	60	5	126
	16	114.3	500	20	25	119	9	127
	25	114.3	500	20	25	179	14	128
125	6	141.3	500	20	25	66	8	187
	16	141.3	500	20	25	126	15	188
	25	141.3	500	20	25	189	23	189
150	6	168.28	500	20	25	46	8	265
	16	168.28	500	20	25	93	16	266
	25	168.28	500	20	25	139	24	268
200	6	219.08	500	20	25	53	16	432
	16	219.08	500	20	25	105	33	433
	25	219.08	500	20	25	157	50	435

Tied Double with Flange Ends (cont.)

Specification

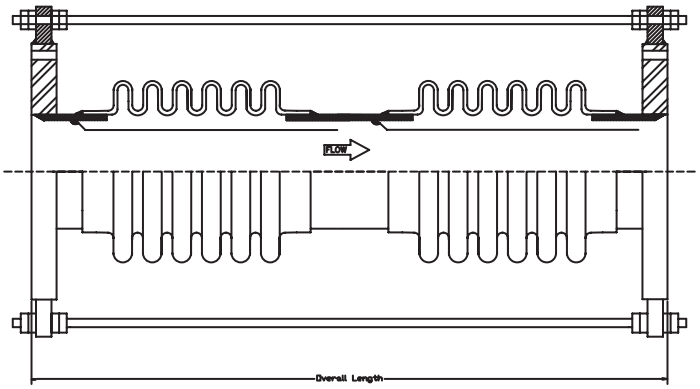
BELLOWS: Stainless Steel 304L or 316L

WELD ENDS: Carbon Steel, SS304L or SS316L

FLANGES: Carbon Steel, SS304L or SS316L

TIE RODS: Galvanized Steel / SS304L

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	LATERAL SPRING RATE	EFFECTIVE AREA
				AXIAL	LATERAL			
MM	Bar g	MM	MM	+/- MM	+/- MM	N/mm	N/mm	cm2
250	6	273.05	500	20	25	46	23	668
	16	273.05	500	20	25	91	47	670
	25	273.05	500	20	25	135	69	672
300	6	323.85	500	20	25	54	38	921
	16	323.85	500	20	25	106	75	923
	25	323.85	500	20	25	159	112	926
350	6	355.6	600	25	25	412	253	1171
	16	355.6	600	25	25	870	536	1174
	25	355.6	600	25	25	1467	906	1178
400	6	406.4	600	25	25	540	270	1494
	16	406.4	600	25	25	957	575	1498
	25	406.4	600	25	25	1033	814	1500
450	6	457.2	600	25	25	290	282	1855
	16	457.2	600	25	25	613	599	1863
	25	457.2	600	25	25	965	948	1870
500	6	508.0	600	25	25	297	352	2256
	16	508.0	600	25	25	622	740	2265
	25	508.0	600	25	25	981	1170	2273
600	6	609.6	600	25	25	317	529	3177
	16	609.6	600	25	25	745	810	3186
	25	609.6	600	25	25	1054	1195	3194

Tied Double with Pipe Ends

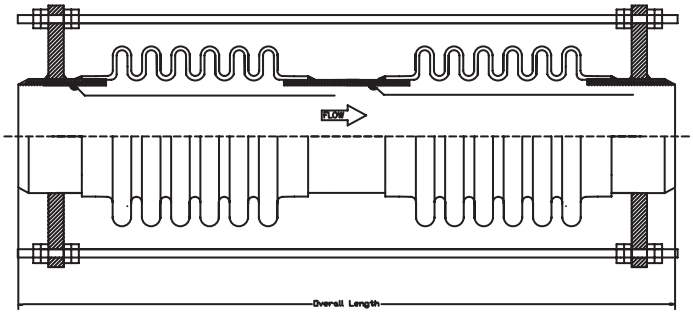
Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

TIE RODS: Galvanized Steel / SS304L

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	LATERAL SPRING RATE	EFFECTIVE AREA
				AXIAL	LATERAL			
MM	Bar g	MM	MM	+/- MM	+/- MM	N/mm	N/mm	cm2
50	6	60.3	500	20	25	76	2	36
	16	60.3	500	20	25	151	3	37
	25	60.3	500	20	25	225	5	38
65	6	73.0	500	20	25	61	2	55
	16	73.0	500	20	25	121	4	56
	25	73.0	500	20	25	181	6	57
80	6	88.9	500	20	25	60	3	78
	16	88.9	500	20	25	119	5	79
	25	88.9	500	20	25	178	8	80
100	6	114.3	500	20	25	60	5	126
	16	114.3	500	20	25	119	9	127
	25	114.3	500	20	25	179	14	128
125	6	141.3	500	20	25	66	8	187
	16	141.3	500	20	25	126	15	188
	25	141.3	500	20	25	189	23	189
150	6	168.28	500	20	25	46	8	265
	16	168.28	500	20	25	93	16	266
	25	168.28	500	20	25	139	24	268
200	6	219.08	500	20	25	53	16	432
	16	219.08	500	20	25	105	33	433
	25	219.08	500	20	25	157	50	435

Tied Double with Pipe Ends (cont.)

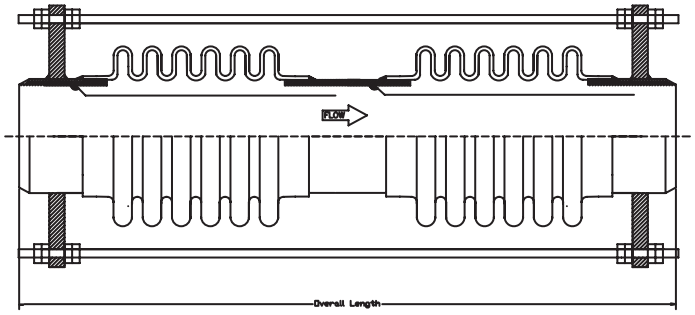
Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

TIE RODS: Galvanized Steel / SS304L

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		AXIAL SPRING RATE	LATERAL SPRING RATE	EFFECTIVE AREA
				AXIAL	LATERAL			
MM	Bar g	MM	MM	+/- MM	+/- MM	N/mm	N/mm	cm2
250	6	273.05	500	20	25	46	23	668
	16	273.05	500	20	25	91	47	670
	25	273.05	500	20	25	135	69	672
300	6	323.85	500	20	25	54	38	921
	16	323.85	500	20	25	106	75	923
	25	323.85	500	20	25	159	112	926
350	6	355.6	600	25	25	412	253	1171
	16	355.6	600	25	25	870	536	1174
	25	355.6	600	25	25	1467	906	1178
400	6	406.4	600	25	25	540	270	1494
	16	406.4	600	25	25	957	575	1498
	25	406.4	600	25	25	1033	814	1500
450	6	457.2	600	25	25	290	282	1855
	16	457.2	600	25	25	613	599	1863
	25	457.2	600	25	25	965	948	1870
500	6	508.0	600	25	25	297	352	2256
	16	508.0	600	25	25	622	740	2265
	25	508.0	600	25	25	981	1170	2273
600	6	609.6	600	25	25	317	529	3177
	16	609.6	600	25	25	745	810	3186
	25	609.6	600	25	25	1054	1195	3194

Hinge Double with Pipe Ends

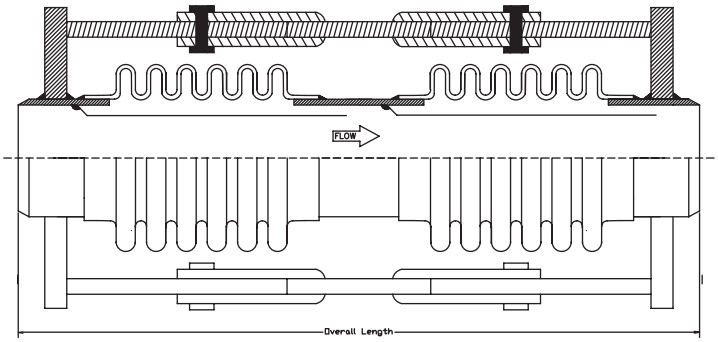
Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		LATERAL SPRING RATE	ANGULAR SPRING RATE	EFFECTIVE AREA
				TOTAL LAT'L	LATERAL			
MM	Bar g	MM	MM	MM	+/- MM	N/mm	NM/Deg	cm2
50	6	60.3	500	50	25	2	1	36
	16	60.3	500	50	25	3	2	37
	25	60.3	500	50	25	5	2	38
65	6	73.0	500	50	25	2	1	55
	16	73.0	500	50	25	4	2	56
	25	73.0	500	50	25	6	3	57
80	6	88.9	500	50	25	3	1	78
	16	88.9	500	50	25	5	3	79
	25	88.9	500	50	25	8	4	80
100	6	114.3	500	50	25	5	2	126
	16	114.3	500	50	25	9	4	127
	25	114.3	500	50	25	14	6	128
125	6	141.3	500	50	25	8	3	187
	16	141.3	500	50	25	15	7	188
	25	141.3	500	50	25	23	10	189
150	6	168.28	500	50	25	8	3	265
	16	168.28	500	50	25	16	7	266
	25	168.28	500	50	25	24	10	268
200	6	219.08	500	50	25	16	6	432
	16	219.08	500	50	25	33	13	433
	25	219.08	500	50	25	50	19	435

Hinge Double with Pipe Ends (cont.)

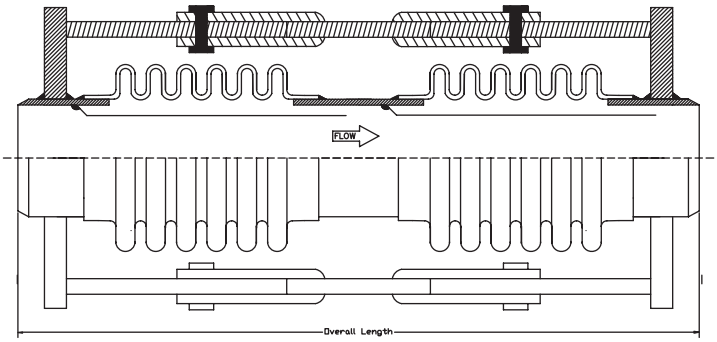
Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		LATERAL SPRING RATE	ANGULAR SPRING RATE	EFFECTIVE AREA
				TOTAL LAT'L	LATERAL			
MM	Bar g	MM	MM	MM	+/- MM	N/mm	NM/Deg	cm2
250	6	273.05	500	50	25	23	8	668
	16	273.05	500	50	25	47	17	670
	25	273.05	500	50	25	69	25	672
300	6	323.85	500	50	25	38	14	921
	16	323.85	500	50	25	75	27	923
	25	323.85	500	50	25	112	41	926
350	6	355.6	600	50	25	253	134	1171
	16	355.6	600	50	25	536	284	1174
	25	355.6	600	50	25	906	480	1178
400	6	406.4	600	50	25	270	215	1494
	16	406.4	600	50	25	575	310	1498
	25	406.4	600	50	25	814	467	1500
450	6	457.2	600	50	25	282	150	1855
	16	457.2	600	50	25	599	317	1863
	25	457.2	600	50	25	948	502	1870
500	6	508.0	600	50	25	352	186	2256
	16	508.0	600	50	25	740	391	2265
	25	508.0	600	50	25	1170	619	2273
600	6	609.6	600	50	25	529	280	3177
	16	609.6	600	50	25	810	580	3186
	25	609.6	600	50	25	1195	904	3194

Hinge Double with Flange Ends

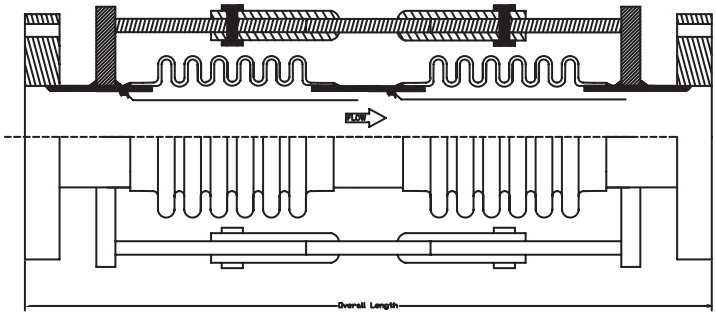
Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		LATERAL SPRING RATE	ANGULAR SPRING RATE	EFFECTIVE AREA
				TOTAL LAT'L	LATERAL			
MM	Bar g	MM	MM	MM	+/- MM	N/mm	NM/Deg	cm2
50	6	60.3	500	50	25	2	1	36
	16	60.3	500	50	25	3	2	37
	25	60.3	500	50	25	5	2	38
65	6	73.0	500	50	25	2	1	55
	16	73.0	500	50	25	4	2	56
	25	73.0	500	50	25	6	3	57
80	6	88.9	500	50	25	3	1	78
	16	88.9	500	50	25	5	3	79
	25	88.9	500	50	25	8	4	80
100	6	114.3	500	50	25	5	2	126
	16	114.3	500	50	25	9	4	127
	25	114.3	500	50	25	14	6	128
125	6	141.3	500	50	25	8	3	187
	16	141.3	500	50	25	15	7	188
	25	141.3	500	50	25	23	10	189
150	6	168.28	500	50	25	8	3	265
	16	168.28	500	50	25	16	7	266
	25	168.28	500	50	25	24	10	268
200	6	219.08	500	50	25	16	6	432
	16	219.08	500	50	25	33	13	433
	25	219.08	500	50	25	50	19	435

Hinge Double with Flange Ends (cont.)

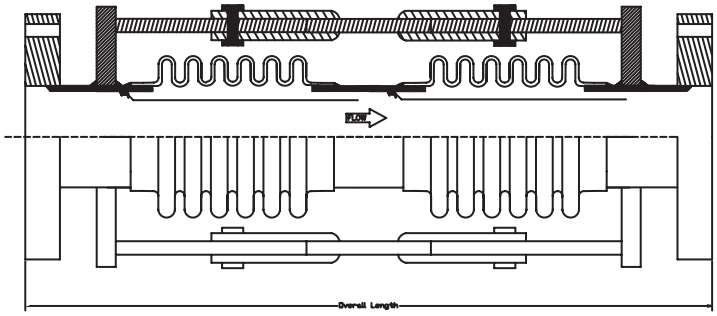
Specification

BELLOWS: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT		LATERAL SPRING RATE	ANGULAR SPRING RATE	EFFECTIVE AREA
				TOTAL LAT'L	LATERAL			
MM	Bar g	MM	MM	MM	+/- MM	N/mm	NM/Deg	cm2
250	6	273.05	500	50	25	23	8	668
	16	273.05	500	50	25	47	17	670
	25	273.05	500	50	25	69	25	672
300	6	323.85	500	50	25	38	14	921
	16	323.85	500	50	25	75	27	923
	25	323.85	500	50	25	112	41	926
350	6	355.6	600	50	25	253	134	1171
	16	355.6	600	50	25	536	284	1174
	25	355.6	600	50	25	906	480	1178
400	6	406.4	600	50	25	270	215	1494
	16	406.4	600	50	25	575	310	1498
	25	406.4	600	50	25	814	467	1500
450	6	457.2	600	50	25	282	150	1855
	16	457.2	600	50	25	599	317	1863
	25	457.2	600	50	25	948	502	1870
500	6	508.0	600	50	25	352	186	2256
	16	508.0	600	50	25	740	391	2265
	25	508.0	600	50	25	1170	619	2273
600	6	609.6	600	50	25	529	280	3177
	16	609.6	600	50	25	810	580	3186
	25	609.6	600	50	25	1195	904	3194

Hinge Single with Pipe Ends

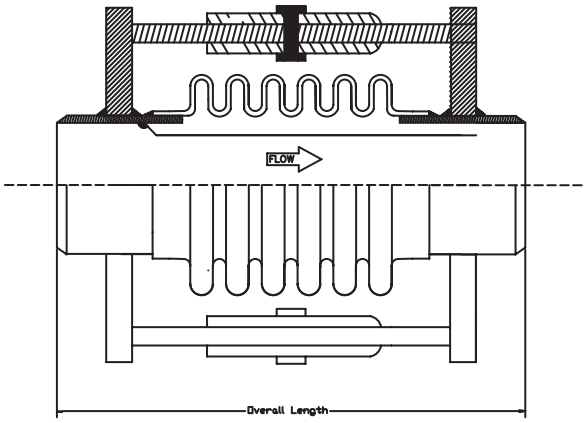
Specification

BELLOW: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT	ANGULAR SPRING RATE	EFFECTIVE AREA
				ANGULAR		
MM	Bar g	MM	MM	+/- DEG	NM/Deg	cm2
50	6	60.3	200	10	2	36
	16	60.3	200	10	3	37
	25	60.3	200	10	3	38
65	6	73.0	200	10	2	55
	16	73.0	200	10	3	56
	25	73.0	200	10	5	57
80	6	88.9	200	10	2	78
	16	88.9	200	10	4	79
	25	88.9	200	10	7	80
100	6	114.3	250	8	3	126
	16	114.3	250	8	6	127
	25	114.3	250	8	9	128
125	6	141.3	250	7	5	187
	16	141.3	250	7	10	188
	25	141.3	250	7	15	189
150	6	168.28	250	7	4	268
	16	168.28	250	7	9	269
	25	168.28	250	7	13	271
200	6	219.08	250	7	11	432
	16	219.08	250	7	21	433
	25	219.08	250	7	35	434

Hinge Single with Pipe Ends (cont.)

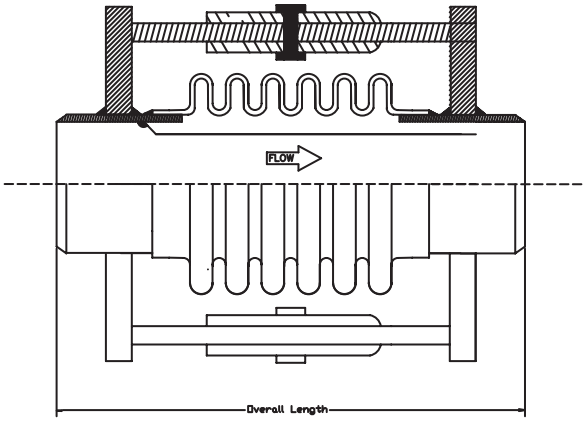
Specification

BELLOW: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT	ANGULAR SPRING RATE	EFFECTIVE AREA
				ANGULAR		
MM	Bar g	MM	MM	+/- DEG	NM/Deg	cm2
250	6	273.05	300	7	14	668
	16	273.05	300	7	29	670
	25	273.05	300	7	43	672
300	6	323.85	300	7	23	920
	16	323.85	300	7	47	923
	25	323.85	300	7	70	926
350	6	355.6	350	6	193	1170
	16	355.6	350	6	386	1176
	25	355.6	350	6	605	1179
400	6	406.4	350	6	252	1493
	16	406.4	350	6	526	1496
	25	406.4	350	6	821	1499
450	6	457.2	350	6	320	1855
	16	457.2	350	6	666	1859
	25	457.2	350	6	1040	1862
500	6	508.0	350	6	398	2256
	16	508.0	350	6	828	2260
	25	508.0	350	6	1292	2264
600	6	609.6	350	6	596	3176
	16	609.6	350	6	1195	3186
	25	609.6	350	6	1795	3196

Hinge Single with Flange Ends

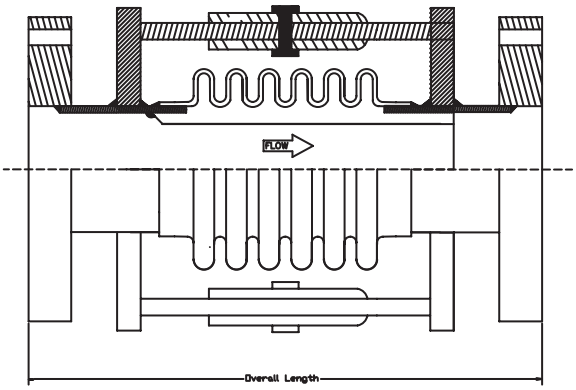
Specification

BELLOW: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT	ANGULAR SPRING RATE	EFFECTIVE AREA
				ANGULAR		
MM	Bar g	MM	MM	+/- DEG	NM/Deg	cm2
50	6	60.3	200	10	2	36
	16	60.3	200	10	3	37
	25	60.3	200	10	3	38
65	6	73.0	200	10	2	55
	16	73.0	200	10	3	56
	25	73.0	200	10	5	57
80	6	88.9	200	10	2	78
	16	88.9	200	10	4	79
	25	88.9	200	10	7	80
100	6	114.3	250	8	3	126
	16	114.3	250	8	6	127
	25	114.3	250	8	9	128
125	6	141.3	250	7	5	187
	16	141.3	250	7	10	188
	25	141.3	250	7	15	189
150	6	168.28	250	7	4	268
	16	168.28	250	7	9	269
	25	168.28	250	7	13	271
200	6	219.08	250	7	11	432
	16	219.08	250	7	21	433
	25	219.08	250	7	35	434

Hinge Single with Flange Ends (cont.)

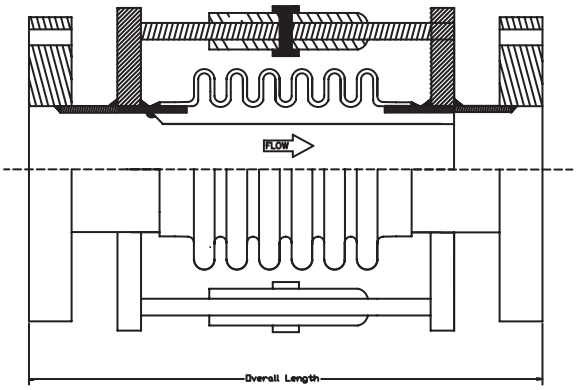
Specification

BELLOW: Stainless Steel 304L or 316L

PIPE ENDS: Carbon Steel, SS304L or SS316L

HINGES: Galvanized Steel / SS304

OTHER MATERIALS AVAILABLE UPON REQUEST



NOMINAL SIZE	PRESSURE	PIPE OD	OVERALL LENGTH	MOVEMENT	ANGULAR SPRING RATE	EFFECTIVE AREA
				ANGULAR		
MM	Bar g	MM	MM	+/- DEG	NM/Deg	cm2
250	6	273.05	300	7	14	668
	16	273.05	300	7	29	670
	25	273.05	300	7	43	672
300	6	323.85	300	7	23	920
	16	323.85	300	7	47	923
	25	323.85	300	7	70	926
350	6	355.6	350	6	193	1170
	16	355.6	350	6	386	1176
	25	355.6	350	6	605	1179
400	6	406.4	350	6	252	1493
	16	406.4	350	6	526	1496
	25	406.4	350	6	821	1499
450	6	457.2	350	6	320	1855
	16	457.2	350	6	666	1859
	25	457.2	350	6	1040	1862
500	6	508.0	350	6	398	2256
	16	508.0	350	6	828	2260
	25	508.0	350	6	1292	2264
600	6	609.6	350	6	596	3176
	16	609.6	350	6	1195	3186
	25	609.6	350	6	1795	3196