



***flexican***<sup>®</sup> Since 1961  
BELLOWS & HOSES PVT. LTD



**METAL BELLOWS EXPANSION JOINTS**  
**AN ISO 9001 : 2008 COMPANY**





Whenever there is thermal expansion in piping/ ducting system, only “flexican” can provide the solution. What No Body Can....*flexi...can!* The important attribute is innovation in finding a technical solution that places *flexican* one step ahead of others.

**Zaverchand, Gaekwad Ltd.,** was established in 1961 and the Metal Bellows Expansion Joints was first manufactured in 1965 which made *flexican* Brand the pioneer in India in this Product.

“*flexican*” Bellows & Hoses Pvt Ltd. - (the successor to Zaverchand, Gaekwad Ltd.), established in 1989, have a factory and Head office at 283, GIDC, Makarpura, Baroda, India. It has a factory area of about 27,000 sq. Feet of first class construction.

The company’s modern workshop has been approved by the leading project Consultants viz. LRIS, NPCIL, MECON, CEIL, Bureau Veritas, TOYO, BHEL, KPG, UDHE, Avant Garde, JH&G, PDIL, DNV, Bax Council etc.

This product requires high precision designing and manufacturing capabilities. The product is used in steel plants, refineries, petrochemicals, cement, power plants, fertilizers, Sugar, Oil Exploration, Paper, Shipping Industries and other diverse industries, which are core industries with perennial growth.





*T*he Company has the capacity to produce Bellows in sizes up to 7000 mm diameter with present infrastructure. “flexican” manufacture and supply of Metal Bellows of any size in any shape in different types of material like austenitic stainless steel SA240 Gr304, Gr316, Gr321, Gr304L, Gr316L, Gr316Ti, C.S., and Nickel alloy steel like Inconel 600, 625, Incoloy 800, 825 etc.

The company has its own designing and marketing set up for Metal Expansion Bellows. It has also established a network of representatives in principal business centers in India.

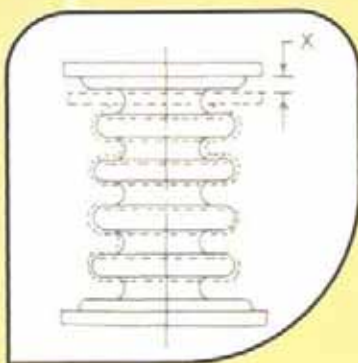
The company has over the years enriched its technical competence through various collaborations as in 1964 with **M/s Compoflex Company** U.K. (now known as **T.I. Flexible Ltd.**); in 1970 with **M/s Aeroquip Corporation**, U.S.A.; and in eighties with **Pathway** of USA in and **Flexweld Inc.**, USA, for manufacture of the state-of-art Bellows, Compensators and Metal Hoses for very sophisticated applications. The company has designed and manufactured various high precision import substitution Bellows using nickel alloys in multi-ply corrugations.





# How A Bellows Works

The Metal Bellows expansion Joint is a flexible seal and is designed to flex when thermal movements occurs in the piping system. It is the basic element of "flexicon" expansion Joints. "flexicon" expansion Joints may be subject to Axial movement, Lateral movement, and Angular movement or any combination of these movements - thermal or functional (Mechanical). The three links below discuss each movement in detail. Bellows behave like springs in a piping system. When the bellows are moved, they resist the movement the same as a spring would. The spring rate of a bellows is entirely dependent on bellows geometry and material properties. "flexicon" is able to vary bellows geometry such as convolution height, pitch, thickness and number of plies to provide a bellows to satisfy our customer's needs.

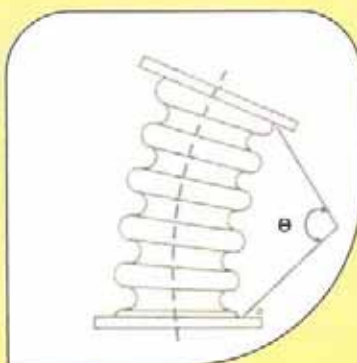
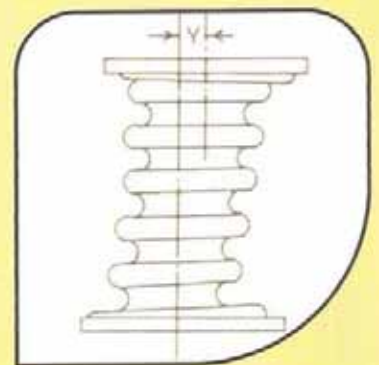


## Axial Movement (TRAVERSE )

Axial Movement (TRAVERSE) is the change in dimensional length of the bellows from its free length in a direction parallel to its longitudinal axis. Compression is always expressed as negative (-) and extension as positive (+).

## Lateral Movement (SHEAR)

Lateral Movement (SHEAR) is the Single plane deflection from the center line of one end of the bellows, But that end is keeping to remain parallel with the other end.



## Angular Movement ( RADIAL)

Angular Movement (RADIAL) is the rotational displacement of the longitudinal axis of the bellows toward a point of rotation. The convolutions at the inner most point are in compression (-) while those furthest away are in extension (+).

## Tortional Movements (TWISTING)

Tortional Movements (TWISTING) must be avoided as twisting produces extremely high shear stress in the bellows.



# Types of Bellows

SINGLE PLY



HEAVY WALL (SINGLE)

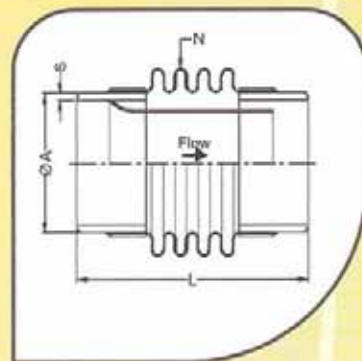


MULTIPLY



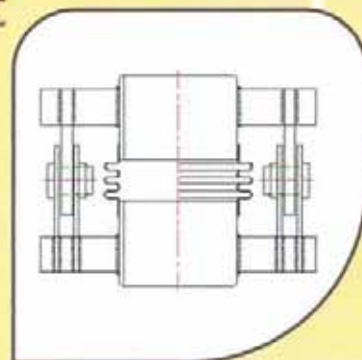
## Axial Expansion Joint

Axial Expansion Joint the simplest form of Expansion Joint



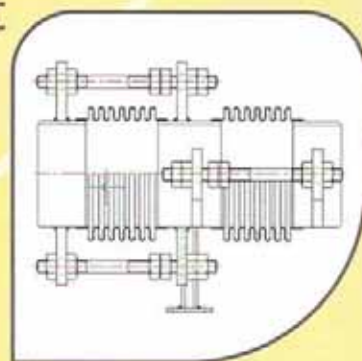
## Hinged Expansion Joint

A Hinged Expansion Bellows, either Axial or Universal type, designed to absorb Angular rotation in one plane only by the use of a pair of pins through hinge plates attached to the expansion bellows. Hinged Expansion Bellows should be used in sets of 2 or 3 to function properly.

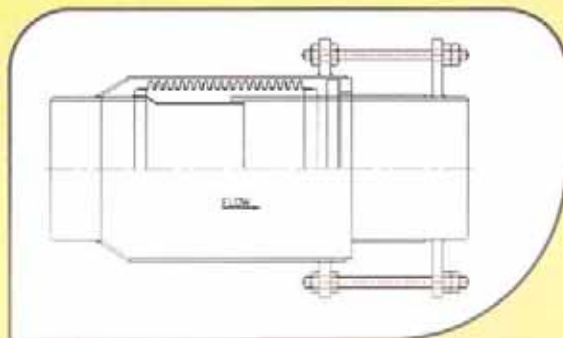


## Double Expansion Joint

Absorption of high thermal expansion or contraction of straight pipe runs when the joint can be located near the center of the run, and proper anchors and guides must be provided each Bellows act as a Single Expansion Joint.



## District Heating Piping System Expansion Joint





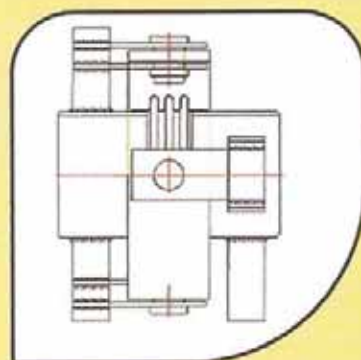


# Types of Bellows



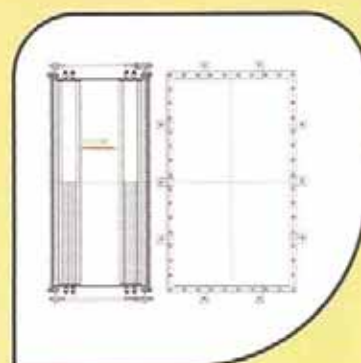
## Gimbal Expansion Joint

Gimbal Expansion Bellows which can permit angular rotation in any plane, consist of two pair of hinges affixed to a common floating gimbal ring.



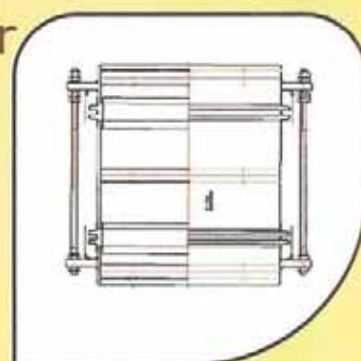
## Single Miter Rectangular Expansion Joint

Rectangular Expansion Joints are most commonly used in low pressure ducting to absorb thermal growth, addition of flexibility in short runs, and as vibration absorbers adjacent to fans, blowers and other mechanical equipments. This types of expansion joints are used for flue gases & dust media.



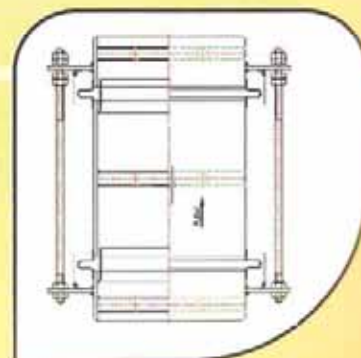
## Round Corner Rectangular Expansion Joint

Application Turbine exhaust made for M/s IOCL, Panipat through M/s BHEL under third party inspection by M/s Lloyd's Register Asia.



## Oval Expansion Joint

Application Turbine Exhaust made for M/s HNL kottayam through M/s BHEL under third party inspection by M/s Lloyd's Register Asia.





# Special Type of Bellows



## HBM Bellows Expansion Joint

Hot Blast Main Bellows Temp.  $1400^{\circ}\text{C}$  made from Incoloy 825 to SB424 UNS NO8825 made first time in India for steel plants. Size : 2200 NB x 1600 mm Long.

## Tuyere Stock Compensator

Blast Furnace Stove Bellows with Refractory lining, Temp.  $1400^{\circ}\text{C}$ , Size : 350 NB to 550 NB for steel plants.



## Universal Gimbal Bellows

This type of expansion joint is used to absorb multiplane thermal growth of complex piping and pressure thrust.

## Pressure Balance Bellows Expansion Joint

This type of Bellows Expansion Joints is normally used where a change of direction occurs in a run of piping and pressure thrust to be absorbed.







# Standard Bellows Design

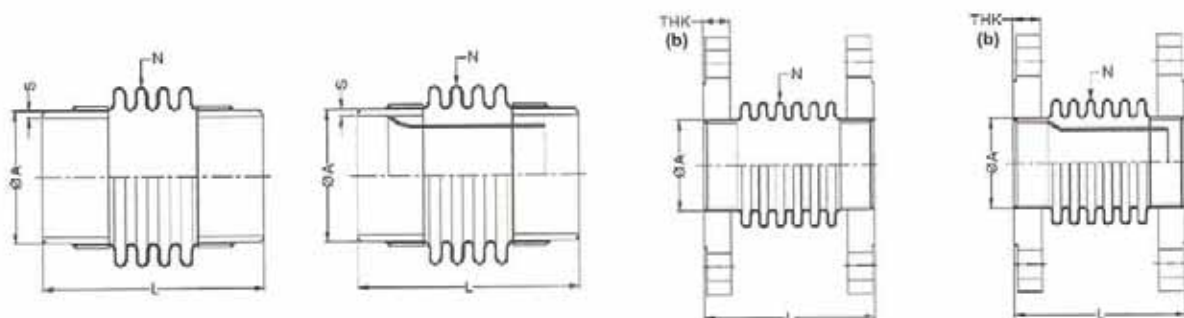


TABLE-1

Standard Pressure 5 kg/cm<sup>2</sup>g @ 350°C temperature

Fatigue Life Above 3000 Cycle

Nominal Dia (Pipe) mm NB	flexican Type	Bellow ID mm	No. of Con- volution	Weld End Thk	Flange Thk.	Overall Length in mm		Movement Refer Graph					Spring Rate ± 30% in kg/mm		Effective C.S. Area in cm <sup>2</sup>
								Axial in mm			Lateral in mm	Angular in Deg			
						Flange End L	Weld Ends L	Comp	Expn.	Total					
80	F00802006	89	6	6	16	104	220	20	10	30	4.5	3.6	13	42	107
80	F00804012	89	12	6	16	176	295	40	20	60	16	6.4	7	10	107
100	F01002006	114	6	6	16	104	220	20	10	30	4	3.2	14	67	168
100	F01004011	114	11	6	16	164	280	40	20	60	12	5.2	9	13	165
125	F01252006	141	6	6	18	108	220	20	10	30	3	2.4	17	119	243
125	F01253011	141	11	6	18	188	280	30	15	45	10	4.3	9	19	245
150	F01502006	168	6	6	20	112	220	20	10	30	2.7	2.1	20	193	337
150	F01504012	168	12	6	20	184	295	40	20	60	10	4.0	10	46	337
200	F02003004	219	4	6	22	116	220	30	15	45	3.1	2.5	26	444	586
200	F02007009	219	9	6	22	208	310	70	35	105	15	5.3	12	39	586
200	F02009012	219	12	6	22	260	370	90	45	135	26	6.9	11	22	595
250	F02503004	273	4	6	24	120	220	30	15	45	2.5	2.0	32	807	876
250	F02509012	273	12	6	24	264	370	90	45	135	22	5.8	17	85	895
250	F02505009	273	9	6	24	210	310	70	35	105	12	4.2	13	36	895
300	F03003004	324	4	6	24	120	220	30	15	45	2	1.6	10	52	1204
300	F03006509	324	9	6	24	210	310	65	33	98	10	3.5	20	138	1226
300	F03009012	324	12	6	24	264	370	90	45	135	19	5.0	15	57	1222
350	F03503004	356	4	6	26	224	320	30	15	45	1.9	0.6	43	1800	1463
350	F03506509	356	9	6	26	214	310	65	33	98	9	3.2	21	176	1455
350	F03509012	356	12	6	26	268	370	90	45	135	17	4.5	14	67	1463
400	F04003204	406	4	6	28	136	230	32	16	48	2	1.4	49	2138	1877
400	F04005006	406	6	6	28	176	270	50	25	75	4.5	2.1	32	633	1877
400	F04009012	406	12	6	28	296	390	90	45	135	18	4.3	16	79	1877
450	F04503003	457	3	6	28	134	230	30	15	45	1.5	1.1	65	3746	2354
450	F04506006	457	6	6	28	212	310	60	30	90	6	2.2	32	468	2354
450	F45010010	457	10	6	28	316	410	100	50	150	18	4.0	20	279	2364
500	F05003003	508	3	6	30	138	230	30	15	45	1.5	1.1	78	44	2921
500	F05006006	508	6	6	30	216	310	60	30	90	6	2.2	39	705	2921
500	F50010010	508	10	6	30	320	410	100	50	150	16	3.5	24	152	2921
550	F05503003	558	3	6	30	138	230	30	15	45	1.3	1.0	85	7347	3486
550	F05506006	558	6	6	30	216	310	60	30	90	5	1.8	43	918	3486
550	F55010010	558	10	6	30	320	410	100	50	150	15	3.3	26	198	3486
600	F06003403	610	3	6	30	150	240	34	17	51	1.6	1.0	93	7189	4181
600	F06007006	610	6	6	30	240	330	70	35	105	6.5	2.1	46	899	4181
600	F60011610	610	10	6	30	360	450	116	58	174	18	3.4	28	194	4181

Notes:

1. Owing to continuous development, data subject to change without notice.
2. Flange Drilling dimension as per ANSI B16.5 ASA 150 #
3. Spring rate values are calculated values for guideline, subject to ±30%
4. Thrust force in Kgs in C.S. area times pressure in Kg/cm<sup>2</sup>.
5. Standard bellows material is ASTM-A-240 TP 304. Other material such as SS 316, 321, 304L, 316L, Monel, Inconel-600, 625, Incoloy 800 & 825 are offered on specific request.
6. Higher pressure-temperature rating bellows are offered on specific request.
7. Large size bellows expansion joints are offered against specific requirements.
8. Different types of bellows expansion joints-Universal, Axial, Tied-Lateral, Angular, Hinged/Gimbal, Pressure Balanced, Inline Pressure Balanced Bellows are offered to suit customer requirement upon request.



# Tested & Testing Bellows

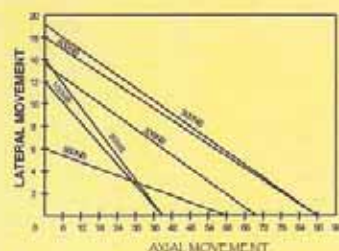
Lateral Deflection Test



Combined Squirm Yield & Rupture Test

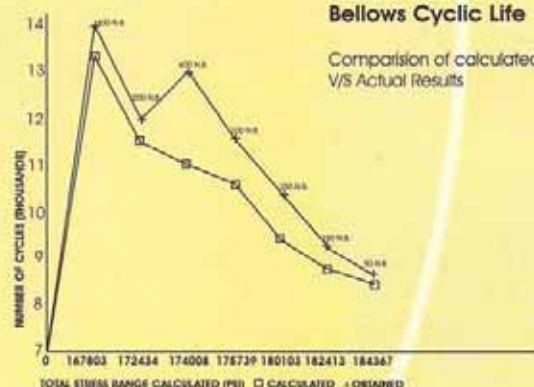


GRAPHIC ILLUSTRATION OF AXIAL V/S LATERAL MOVEMENTS



Austenitic S.S. Bellows Cyclic Life

Comparison of calculated V/S Actual Results



Cycle Life Test



Design of "flexican" bellows have been correlated with actual test results to demonstrate predictability of especially cyclic life and also squirm, yield and rupture type testings are carried out. Specific custom built design can also be offered with type tests.

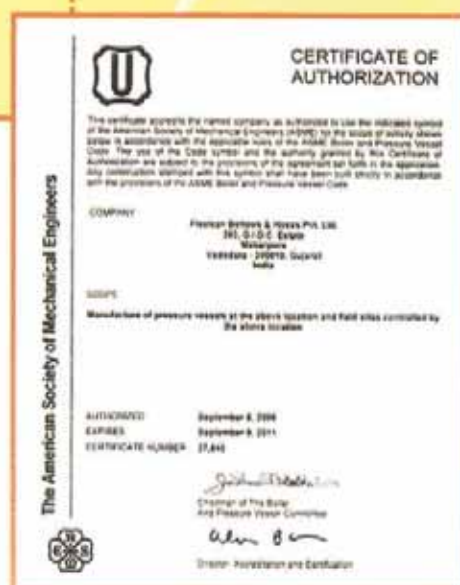
Certificates



TÜV NORD GmbH



CE Marking



ASME-U-Stamp





# How to Select and order your Expansion Joint

## BELLOW APPLICATION DATA SHEET

COMPANY		DATE			
		SHEET			
PROJECT		INQUIRY			
		JOB NO.			
ITEM NO./EJ TAG NO.		Unit			
1	Sr. No.				
2	Location				
3	Installation				
4	Type				
5	Matching Pipe (OD x THK)	mmXmm			
6	Design Pressure	Kg/cm <sup>2</sup> g			
7	Design Temperature	°C			
8	Flow Velocity at operating condition	M/sec			
9	Required Design Cycle Life	Cycles			
10	Axial Compression (Design)	mm			
11	Axial Elongation (Design)	mm			
12	Lateral Deflection (Design)-Principal	mm			
13	Lateral Deflection (Design)-Transverse	mm			
14	Angular Rotation (Design)	Deg.			
15	Manufacturing free length	mm			
16	II. Bellow Centre Distance	mm			
17	Axial Spring Rate	Kg/mm			
18	Lateral Spring Rate	Kg/mm			
19	Angular Spring Rate	Kg/mm			
20	Min. Flange/Lug Material & thickness	mm			
21	Bellow Material				
22	Spool Pipes/End pipe Material				
23	Internal Sleeve Material				
24	External Cover Material				
25	Hinge Plate/Gimbal Ring Material				
26	Hinge Pin Material				
27	No. of Tie Rods				
28	Tie Rod/Limit Rod with nuts				
29	Spherical Washer				
30	Buttweld details (To suite matching pipe)				
31	Codes / Standard applicable				
32	Other requirements-Pl.attach piping diagram, if any				

• Note: Fill up above maximum available data & send to us...



# Installation Instruction

Metal Bellows Expansion Joints have been designed to absorb a specified amount by flexing of the thin gauge convolutions. If proper care is not taken during installation, it may reduce the cycle life and the pressure capacity of the expansion joints which could result in an early failure of the bellow element or damage the piping system the following recommendations are included to avoid the most common errors that occur during installation. When in doubt about an installation procedure, contact flexican for clarification before attempting to install the Expansion Joint.

## DO'S

- Inspect for damage during shipment, i.e dents, broken hardware, water marks on carton, etc.
- Store in clean dry area where it will not be exposed to heavy traffic or damaging environment.
- Use only designated lifting Lugs.
- Make the piping systems fit the expansion joint. By stretching, compressing, or offsetting the joint to fit the piping, it may be overstressed when the system is in service.
- It is good practice to leave one flange loose until the expansion joint has been fitted into position. Make necessary adjustment of loose flange before welding.
- Install joint with arrow pointing in the direction of flow.
- Install single Van Stone liners pointing in the smallest I.D. liner pointing in the direction of flow.
- Remove all shipping devices after the installation is complete and before any pressure test of the fully installed system.
- Remove any foreign material that may have become lodged between the convolutions.
- Refer to EJMA Standards for proper guide spacing and anchor recommendations.

## DON'T

- Do not drop or strike carton
- Do not remove shipping bars until installation is complete.
- Do not remove any moisture-absorbing desiccant bags or protective coatings bags or protective coatings until ready for installation.
- Do not use hanger lugs as lifting lugs without approval of manufacturer.
- Do not use chains or any lifting device directly on the bellow's or bellow's cover.
- Do not allow weld splatter to hit unprotected bellows. Protect with wet chloridefree asbestos.
- Do not use cleaning agents that contain chlorides.
- Do not use steel wool or wire brushes on bellows.
- Do not force-rotate one end of an expansion joint for alignment of bolt holes. Ordinary bellows are not capable of absorbing torque.
- Do not hydrostatic pressure test or evacuate the system before proper installation of all guides and anchors.
- Pipe hangers are not adequate guides.
- Do not exceed a pressure test of 1.5 times the rated working pressure of the expansion joint.
- Do not use shipping bars to retain the pressure thrust if tested prior to installation.

For more details on installation, refer "flexican" installation manual.



What nobody can  
*flexi...can*



*flexican*<sup>®</sup>  
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