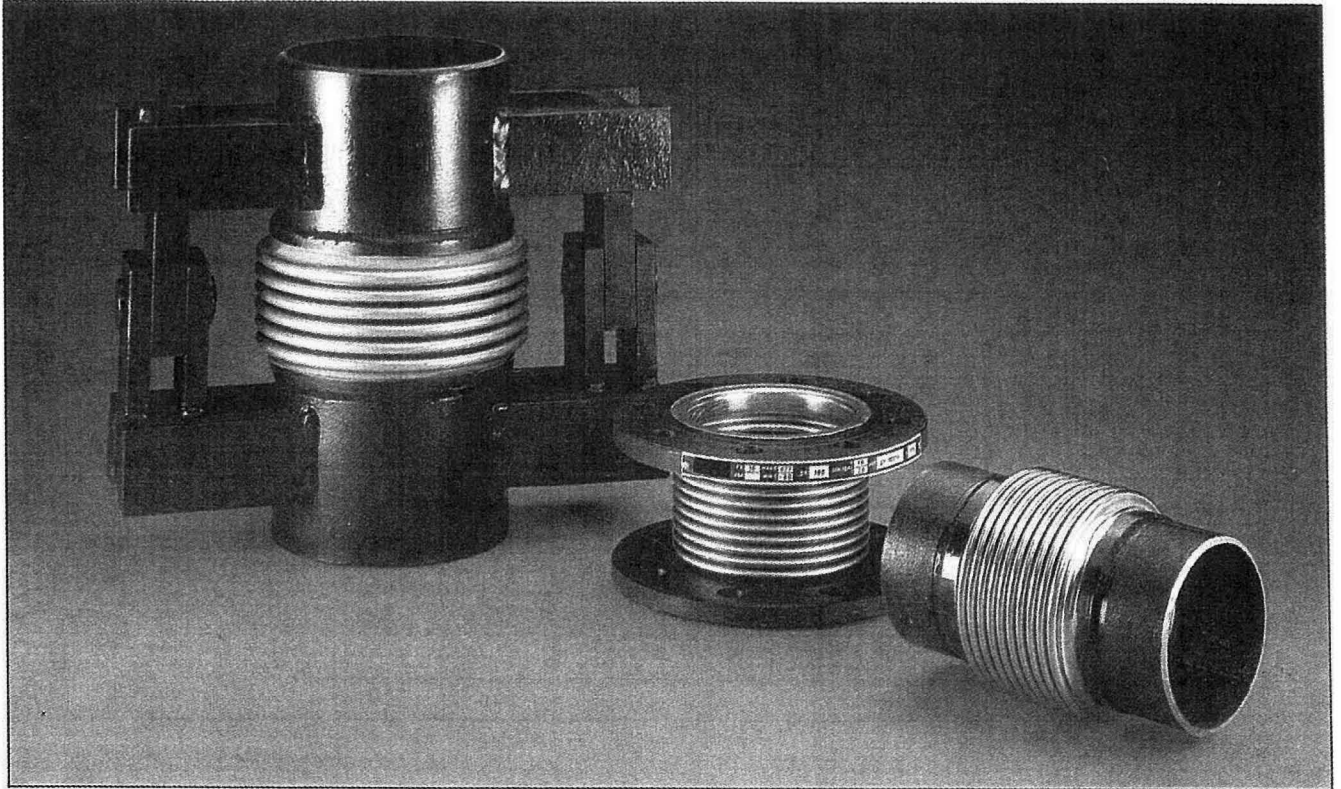


AMKO

BELLOWS EXPANSION JOINTS

FALTENBALG DEHNUNGS-KOMPENSATOREN



Construction:

Annularly corrugated metal bellows formed from butt-welded tubes. Designed and manufactured fully in accordance with the respective "EJMA" standards and in conformity with the pressure and temperature ratings as per DIN 2401.

Materials:

Bellows and internal sleeves (liners) made of stainless steel according to DIN 17440 bright. End connections either stainless steel or carbon steel. Other materials on request.

Connections:

Flanges, male or female threaded ends, swivel unions, welding ends.

Nominal diameters:

DN 25 (1") - DN 3600 (144")

Pressure Ratings:

up to max. 64 bar operation pressure depending on nominal diameter and operation temperature.

Temperature ranges:

- 196°C up to + 800°C depending on the material.

Operation applications:

Compensation of thermal and mechanical movements in pipelines of all kinds. Please consult us for advise on applications, specifications and installation.

Konstruktion:

Ringförmig gewellte Metallbälge aus stumpfgeschweissten Rohren geformt. Auslegung und Fertigung entsprechend den "EJMA" Normen sowie in Übereinstimmung mit den Druck- und Temperatur- Angaben gemäss DIN 2401.

Materialien:

Faltenbälge sowie innere Schutzhülsen (Führungsbuchse) aus nichtrostendem Edelstahl gemäss DIN 17440 blank. Anschlüsse aus nichtrostendem Edelstahl oder unlegiertem Stahl. Andere Materialien auf Anfrage.

Anschlüsse:

Flansche, Innen- oder Aussengewinde, Überwurfmutter, Schweissenden.

Nennweiten::

DN 25 (1") - DN 3600 (144")

Druckbereiche:

bis max. 64 bar Betriebsdruck abhängig von der Nennweite und der Betriebstemperatur.

Temperaturbereiche:

— 196°C bis + 800°C Material abhängig.

Anwendungsbereiche:

Ausgleich von thermischen und mechanischen Bewegungen aller Art. Nutzen Sie unsere Beratung bezüglich Anwendung, Einsatz und Installation.

AXIAL EXPANSION JOINTS

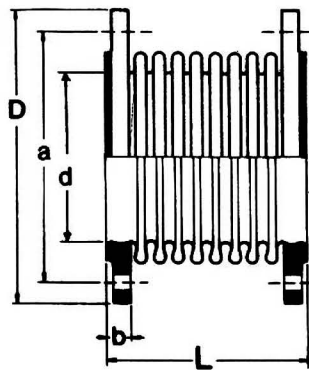
Single axial expansion joints featured in this leaflet are "Ex stock" units, which are available with floating or fixed flanges, male or female threaded ends as well as swivel unions and pipe welding ends according to DIN with short delivery times. Other standards (ANSI, BS, JIS) on request.

Pressure rating: PN 16

Designed and manufactured to compensate at least 1.000 full cycles at rated pressure and movements.

Axial Expansion Joints with Floating Flanges

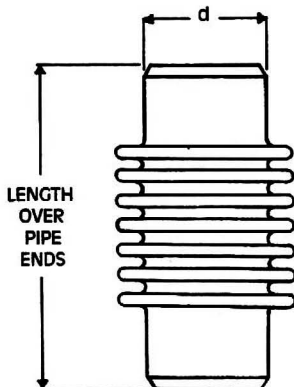
Axial Dehnungs - Kompensatoren - mit Losflanschen



DN	d	D	a	L ₃₀	L ₆₀	b	# of bolts	Effective Area cm ²
25	33	115	85	110	—	15	4	16
32	41	140	100	115	—	15	4	18
40	48	150	110	120	—	16	4	23
50	60	165	125	110	—	18	4	37
65	76	185	145	110	195	20	4	58
80	89	200	160	110	190	20	8	79
100	114	220	180	115	200	20	8	128
125	140	250	210	120	210	20	8	183
150	168	285	240	140	225	22	8	268
200	219	340	295	140	245	24	12	437
250	273	405	355	140	235	26	12	705

Axial Expansion Joints with weld ends

Axial Dehnungs - Kompensatoren - mit Schweissenden



DN	d	Effective area cm ²	L ₃₀	L ₆₀
25	33	16	210	—
32	41	18	215	—
40	48	23	220	—
50	60	37	210	—
65	76	58	210	295
80	89	79	210	290
100	114	128	215	300
125	140	183	220	310
150	168	268	240	325
200	219	437	240	345
250	273	705	240	335

L₃₀: Overall length for 30 mm rated movement.

L₆₀: Overall length for 60 mm rated movement.

L₃₀: Baulänge für 30 mm Axiale Dehnungs - aufnahme.

L₆₀: Baulänge für 60 mm Axiale Dehnungs - aufnahme.

Effective area: Wirksamer Querschnitt.

ofbolts: Anzahl

Dimensions in mm.

Masse in mm.

Please state in your order sheet:

"Ex stock" single axial expansion joints and: nominal diameter (DN), pressure rating (PN), materials, connections, medium and operation temperature as well as details of applications.

Lateral, universal, hinge, x-press, pressure balanced-types and rectangular expansion joints are available on request as well as designed and manufactured according to customers requirements.

AXIAL DEHNUNGS - KOMPENSATOREN

Die in diesem Datenblatt beschriebenen Einzelbalg Axial Dehnungs-Kompensatoren sind "Ab Lager" Geräte, welche mit Los- oder Festflansche, Innen- oder Aussengewinde sowie Überwurfmuttern oder Rohr- schweissenden gemäss DIN kurzfristig lieferbar sind. Andere Normen (ANSI, BS, JIS) auf Anfrage.

Druckbereich: PN 16

Ausgelegt und gefertigt zur Kompensation von mindestens 1.000 vollen Schwingungen im angegebenen Druck- und Momentenbereich.

Bei Bestellung bitte angeben:

"Ab Lager" Einzelbalg Axial Kompensatoren sowie: Nennweite (DN), Druckbereich (PN), Material, Anschlüsse, Medium und Betriebstemperatur sowie Angaben über den vorgesehenen Einsatz.

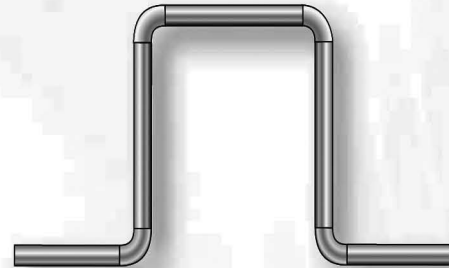
Laterale, universale, Anlenkung-, x-Druck-Druckentastet- und Rechteckig- Dehnungs-Kompensatoren auf Anfrage und entsprechend Kundenwünschen ausgelegt und gefertigt.

— [EXPANSION JOINT DESIGN BASICS] —

Piping Flexibility

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

Pipe loops may add the required flexibility to a piping system if space permits, however the initial cost of the additional pipe, elbows and supports must be considered. 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. 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.

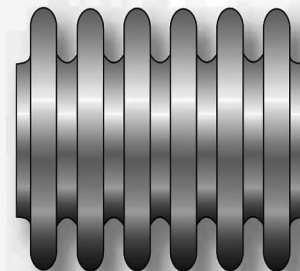
Expansion joints provide an excellent solution for isolation of settlement, seismic deflection, mechanical vibration and sound attenuation transmission produced by rotating equipment.

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.

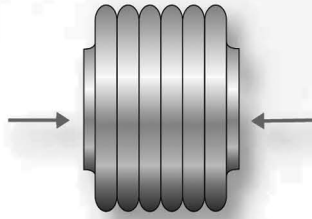
BELLOWS DESIGN

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 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.

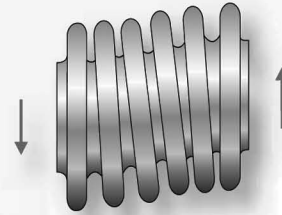


Flexibility of the bellows is achieved through bending of the convolution sidewalls, as well as flexing within their crest and root radii. In most cases, multiple convolutions are required to provide sufficient flexibility to accommodate the expected expansion and contraction of the piping system.

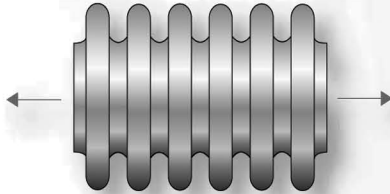
MOVEMENT CAPABILITIES



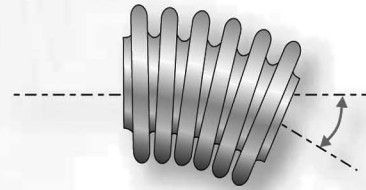
Axial Compression: Reduction of the bellows length due to piping expansion.



Lateral Offset: Transverse motion which is perpendicular to the plane of the pipe with the expansion joint ends remaining parallel.



Axial Extension: Increase of the bellows length due to pipe contraction.



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

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 as a result of thermal change or settlement.

CYCLE LIFE

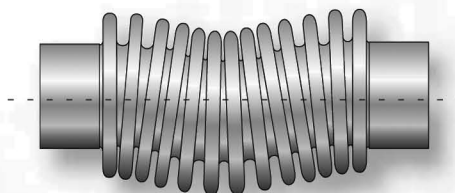
In most applications, design movements cause the individual convolutions to deflect beyond their elastic limits, producing fatigue due to plastic deformation, or yielding. One movement cycle occurs each time the expansion joint deflects from the installed length, to the operating temperature length, 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 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.

SQUIRM

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.





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 conservative margin of column stability beyond the required design pressure.

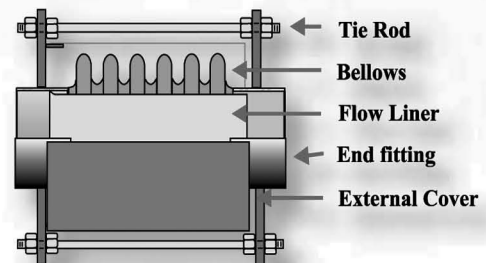
END FITTINGS

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.

ACCESSORIES

Flow liners are installed in the inlet bore of the expansion joint to protect the bellows from erosion damage due to an abrasive media or resonant vibration due to turbulent flow or velocities which exceed:

- For air, steam and other gases
 - a) Up to 6" dia.- 4 ft./sec./inch of diameter
 - b) Above 6" dia. -25 ft/sec
- For water and other liquids
 - a) Up to 6" dia. - 2 ft./sec./inch of diameter
 - b) Above 6" dia. -10 ft./sec.



Expansion joints that are installed within ten pipe diameters downstream of elbows, tees, valves or cyclonic devices should be considered to be subject to flow turbulence. The actual flow velocity should be multiplied by 4 to determine if a liner is required per the above guidelines. Actual or factored flow velocities should always be included with design data, particularly flow that exceeds 100 ft./sec. which require heavy gauge liners.

External Covers are mounted at one end of the expansion joint, 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 leach chlorides or other substances that could damage a bellows.

Tie rods eliminate pressure thrust and the need for main anchors required in an unrestrained piping system. Axial movement is prevented with the use of tie rods. Designs that have only two tie rods have the additional ability to accommodate angular rotation. Limit rods are similar, however they accommodate a specified axial capability.

SINGLE & DOUBLE EXTERNALLY PRESSURIZED EXPANSION JOINTS

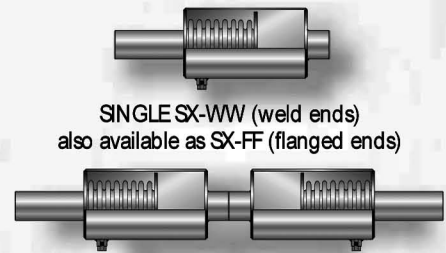
Externally pressurized expansion joints are designed for use in straight pipe runs to accommodate high pressure and large amounts of thermal expansion and contraction. Pressure is applied to the bellows external surface via a gap between the inner guide ring and outer pipe shell. The stabilizing effect of external pressure permits use of a longer bellows with larger movement capability than a comparable internally pressurized design.

This rugged construction fully encases the bellows, assuring a high level of safety and durability. A convenient drain port is included that allows removal of condensate and sediment in steam service applications.

How to order:

DIA	STYLE	ENDS	PRESSURE	TRAVEL
2	SX	FF	150	4

 Example P/N



SINGLE SX-WW (weld ends)
also available as SX-FF (flanged ends)

Dual with Anchor Base DX-WW (weld ends)
also available as DX-FF (flanged ends)

SX AND DX DATA

	SINGLE
Size Range	2" to 12"* NPS
Allowable Pressure Stainless Steel	Vacuum to 300 psig
Temperature Limits Stainless Steel	-20°F to 800°F **
Axial Traverse	To 8" (SX). . . To 16" (DX). . .

*For sizes larger than 12" consult factory for information.
**With special alloys, temperatures of minus 300°F to plus 1600°F can be handled.

150 AND 300 PSIG DESIGNS AVAILABLE

SIZE (ins.)	Single (SERIES SX)					Double (SERIES NDX)					Axial Sp. Rate (lbs/in)	Effective Area (in. ²)	Shell O.D. (in.)
	Axial Mvmt.	FF OAL	Wt.	WW OAL	Wt.	Axial Mvmt.	FF OAL	Wt.	WW OAL	Wt.			
2	4	27	39	26	29	8	53	73	52	63	570	19	6 5/8
2 1/2	4	27	47	26	33	8	53	85	52	71	570	19	6 5/8
	8	47	103	46	89	16	93	157	92	185	285		
3	4	27	65	26	49	8	53	119	52	105	570	19	6 5/8
	8	47	113	46	97	16	93	200	92	200	285		
4	4	27	112	26	86	8	53	208	52	180	792	35	8 5/8
	8	47	170	46	144	16	93	230	92	300	396		
5	4	27	140	26	110	8	53	265	52	230	792	35	8 5/8
	8	47	214	46	184	16	93	333	92	378	396		
6	4	27	176	26	138	8	53	330	52	285	890	54	10 3/4
	8	47	262	46	224	16	93	505	92	455	445		
8	4	29	250	28	190	8	57	460	56	390	1296	88	12 3/4
	8	49	342	48	282	16	97	644	96	574	649		
10	4	29	312	28	226	8	57	563	56	462	1434	118	14 1/2
	8	49	462	48	376	16	97	863	96	762	717		
12	4	29	387	28	259	8	57	676	56	530	1105	163	16 3/4
	8	49	563	48	435	16	97	1028	96	882	553		

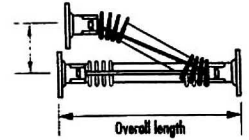
MATERIALS OF CONSTRUCTION

- BELLOWS
A 240-304
Other Materials Available
- FLANGES
A-105/A516-70
2" thru 12" 150 lb.
& 300 lb.
R.F.S.O. B16.5
- PIPE/SHELL
A53/106 Gr. B
or A516-70
2" thru 10" Sch. 40
12" Std. Wall .375" thk.
- RINGS
A285 GR C or A516-70
- ANCHOR BASE
Carbon Steel
(Standard on NDX)
- DRAIN, VENT PORTS
Carbon Steel

TYPE RFL

DESIGNED TO ACCOMMODATE UNIVERSAL LATERAL MOVEMENT

UNIVERSAL LATERAL MOVEMENT



Size Range: 50mm (2") to 600mm (24").

Larger sizes are available against enquiry.

Nominal Bore		Max. Working Pressure		Outside Diameter		Moment to Deflect Max.		Force to Deflect Max.		Lateral Spring Rate	Length for $\pm 25\text{mm}$ (1") Lateral Mvmt		For each extra $\pm 25\text{mm}$ (1") Mvmt Add.	
mm	ins	bar	psi	mm	ins	kg m	lb ft	kg	lb	N/mm	mm	ins	mm	ins
250	10	6	87	312.3	12.30	27	195	141	311	40.2	352	13.85	240	9.45
250	10	10	145	313.4	12.34	52	375	265	584	73.5	361	14.21	240	9.45
250	10	16	232	314.5	12.38	76	550	379	836	101.1	368	14.49	240	9.45
250	10	25	363	315.6	12.43	99	716	481	1060	124.2	376	14.80	240	9.45
300	12	6	87	363.1	14.30	27	495	107	236	31.8	472	18.58	360	14.17
300	12	10	145	364.2	14.34	52	375	205	452	58.0	480	18.90	360	14.17
300	12	16	232	365.3	14.38	77	557	293	646	80.0	488	19.21	360	14.17
300	12	25	363	366.4	14.43	100	723	376	829	99.2	496	19.53	360	14.17
350	14	6	87	349.8	15.54	35	253	140	309	37.2	472	18.58	360	14.17
350	14	10	145	359.9	15.59	68	492	266	586	67.8	480	18.90	360	14.17
350	14	16	232	397.0	15.63	100	723	382	842	93.5	488	19.21	360	14.17
350	14	25	363	398.1	15.67	131	948	489	1078	114.7	496	19.53	360	14.17
400	16	6	87	458.6	18.06	58	420	226	498	53.2	500	19.69	360	14.17
400	16	10	145	460.0	18.11	113	817	432	952	96.6	510	20.08	360	14.17
400	16	16	232	461.4	18.17	166	1201	621	1369	133.2	520	20.47	360	14.17
400	16	25	363	462.8	18.22	217	1570	796	1755	163.4	530	20.87	360	14.17
450	18	6	87	509.4	20.06	57	412	182	401	36.4	635	25.00	478	18.82
450	18	10	145	510.8	20.11	112	810	348	767	66.8	646	25.43	478	18.82
450	18	16	232	512.2	20.17	164	1186	502	1107	91.7	658	25.90	478	18.82
450	18	25	363	513.6	20.22	215	1555	645	1422	113.6	669	26.34	478	18.82
500	20	6	87	560.2	22.06	77	557	245	540	42.5	635	25.00	478	18.82
500	20	10	145	561.6	22.11	151	1092	470	1036	77.7	646	25.43	478	18.82
500	20	16	232	563.0	22.17	222	1606	677	1493	106.8	658	25.90	478	18.82
500	20	25	363	564.4	22.22	290	2098	869	1916	130.7	669	26.34	478	18.82
600	24	6	87	661.8	26.06	131	948	415	915	93.0	651	25.63	478	18.82
600	24	10	145	663.2	26.11	254	1837	791	1744	172.1	664	26.14	478	18.82
600	24	16	232	664.6	26.17	373	2698	1142	2518	239.7	676	26.61	478	18.82
600	24	25	363	666.0	26.22	488	3530	1463	3225	298.3	689	27.13	478	18.82

Design and Dimensional Alterations May Be Made Without Notice