

■ Movement of bellows

Three types of displacement are defined, Axial displacement(X), Perpendicular axial displacement(Y) and Angular displacement (θ), can be absorbed.

A. Axial displacement

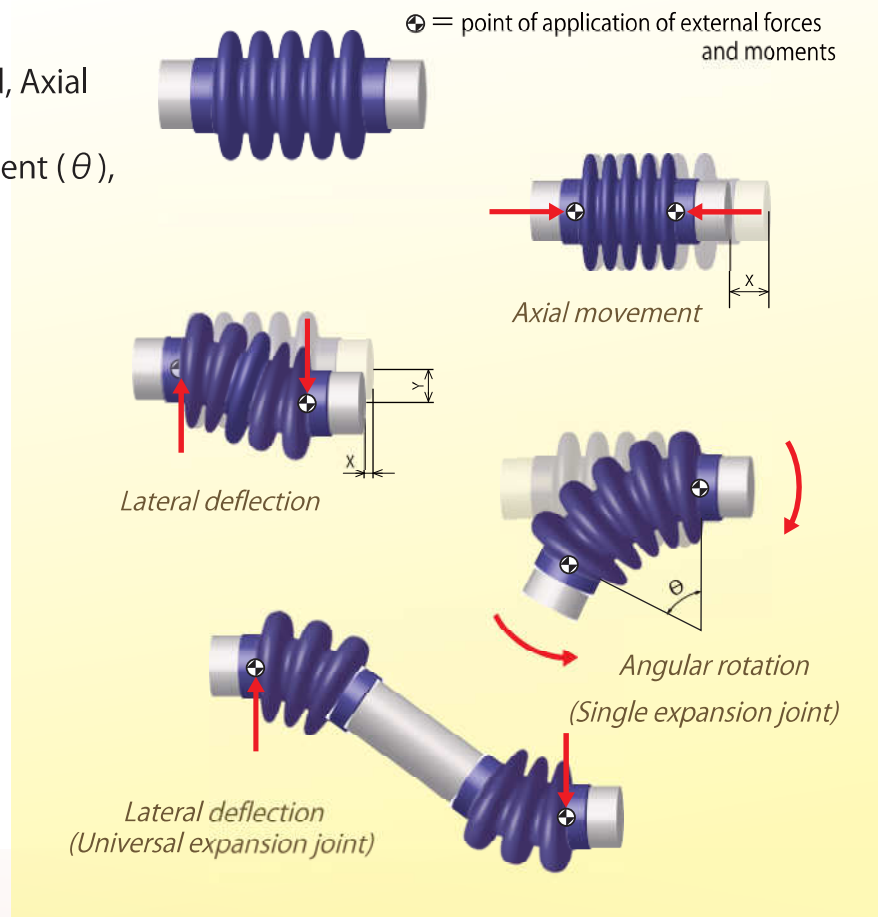
Movement caused by compression and extension is defined as axial displacement (X).

B. Perpendicular axial displacement

Movement caused by the faces being displaced parallel and perpendicular to their own axis is defined as perpendicular axial displacement (Y).

C. Angular displacement

Movement rotating the faces non parallel to each other is known as angular displacement (θ).



Safe, Save, Serve



■ Corrosion Resistance Tables

solution	Conc. (%)	Temp. ※	Ta	Ti	Nb	Zr	SUS 304	solution	Conc. (%)	Temp. ※	Ta	Ti	Nb	Zr	SUS 304	
hydrochloric acid	5	RT	○	○	○	○	×	phosphoric acid	30	RT	○	○	○	○	○	
		BP	○	×	○	○	×			BP	○	×	○	○	×	
	10	RT	○	×	○	○	×		50	RT	○	×	○	○	×	
		BP	○	×	×	○	×			BP	○	×	×	○	×	
20	RT	○	×	○	○	×	70	RT	○	×	○	○	×			
	BP	○	×	×	○	×		BP	○	×	×	○	×			
	35	RT	○	×	○	○		×	85	RT	○	×	○	○	×	
BP		○	×	×	○	×	BP	○		×	×	○	×			
sulfuric acid	5	RT	○	○	○	○	○	50	RT	○	○	○	○	○	×	
		BP	○	×	○	○	×		BP	○	×	○	○	×		
	10	RT	○	×	○	○	×	10	RT	○	×	○	○	×		
		BP	○	×	×	○	×		BP	○	×	×	○	×		
	60	RT	○	×	○	○	×	20	RT	×	○	×	○	○		
BP		○	×	×	○	×	BP		×	○	×	○	○			
80	RT	○	×	○	×	×	40	RT	×	○	×	○	○			
	BP	○	×	×	○	×		BP	×	○	×	○	○			
95	RT	○	×	○	×	×	chlorine gas	wet	RT	○	○	○	○	×	×	
	BP	○	×	○	×	×			BP	○	○	○	○	×	×	
nitric acid	10	RT	○	○	○	○	○	chlorine water	gaseous saturatio	RT	○	○	○	○	×	×
		BP	○	○	○	○	○			BP	○	○	○	○	○	○
	30	RT	○	○	○	○	○	sulfurous acid gas	wet	RT	○	○	○	○	○	
		BP	○	○	○	○	○			BP	○	○	○	○	○	
68	RT	○	○	○	○	○	It may be required to test with solution used in actual operation, even if it is applicable material. In such cases, we can test at our laboratory, or provide you with test piece. So please feel free to ask us.									
	BP	○	○	○	○	×										
smoke	RT	○	○	○	○	○										
	BP	○	○	○	○	×										

Rare Metal Bellows

Ta • Nb • Zr • Ti • Ni alloy etc.
Corrosion Resistant Metals Bellows
(patent pending)



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A durable and lasting piece

Rare metal works well done.



SPF produces chemical process equipment and ductwork, made of corrosion resistant metals, such as Titanium, Niobium, Zirconium and Tantalum. SPF can provide consistency in all facets from design stage to manufacturing. In response to strong market demand, SPF started to develop exotic metal bellows to clients' requirements in 2005.

■ Features

Studies show that when Teflon bellows are used, deterioration due to long-term use under severe conditions is essentially inevitable. So if used for long periods, one is required to give consideration to shutdown due to the replacement of the bellows.

On the other hand, rare metal bellows, which are developed by SPF, are much more durable even for long-term use. This enables the end user to reduce losses due to shutdowns.

Additionally, metal bellows are superior in heat and pressure resistance as compared to Teflon bellows.

As such, under conditions that are typically difficult for Teflon bellows to withstand, metal bellows have many benefits.

■ Applicable materials



Ta (Tantalum)
Nb (Niobium)
Zr (Zirconium)
Ti (Titanium)
HASTELLOY®,
Monel®

etc.

■ Applicable dimensions

【OD】 DN50A~500A (2"~20")
【Thickness】 0.6~3mm (16Ga.~0.125")
【Length】 according to customer requirements.

■ Design standard

【Pressure】
Full Vacuum~150 lbf/in² (FV~1.0MPa)
【Temperature】
-325F~500F (-200°C~250°C)
【Degree of compression and extension】
according to customer requirements.
【Allowable number of cycles】
according to customer requirements.

Please do not hesitate to contact us about other size.



We provide the following inspections to improve performance and quality.

■ Fatigue testing

By using a fatigue test machine, we research connections to the number of times reaches to fatigue limit state for each shape and material.



Testing condition . . . Zirconium 150A (6") 1.0 (.040") Thk.
Pressure 0.2MPa (30 lbf/in²) Displacement: 10mm (0.375")
Testing result . . . 4,590 cycles (Allowable number of cycles: 300)

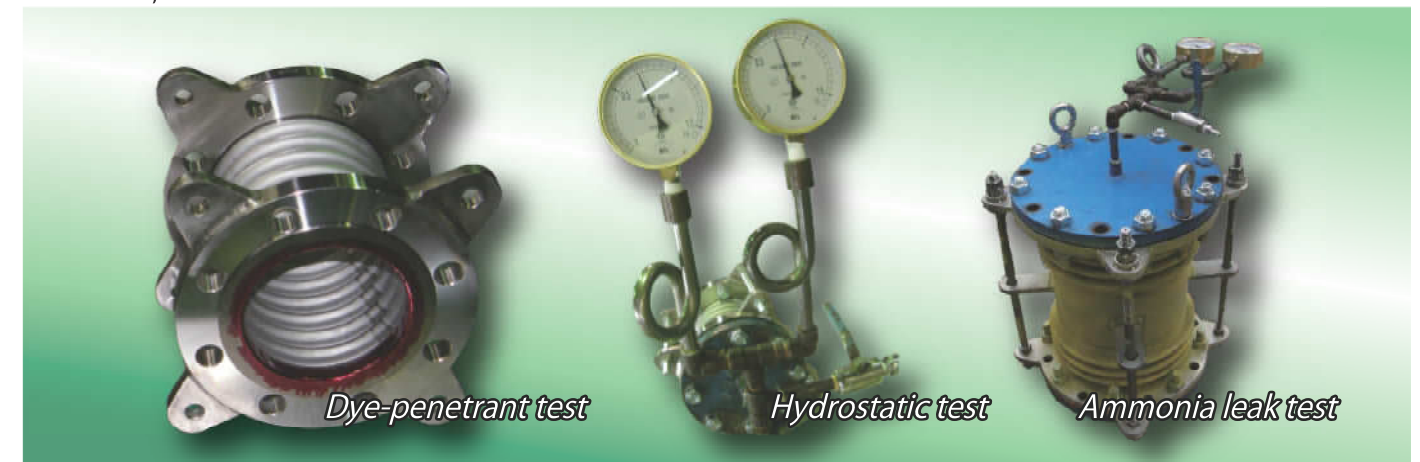
■ Heat treatment

We make it a habit to perform heat treatment according to the specification. This is to remove internal stresses which created during welding and forming process. At the same time, this process makes it possible to produce stable structure durable in severe conditions.



■ Inspections

Appearance test, Visual test for oxidation, Dimensional inspection, Hydrostatic test, Pneumatic test, Radiographic examination (prior to forming), Dye-penetrant test, Helium leak test, Ammonia leak test, etc.



Dye-penetrant test

Hydrostatic test

Ammonia leak test