Non-metal expansion joint

Star Bellows

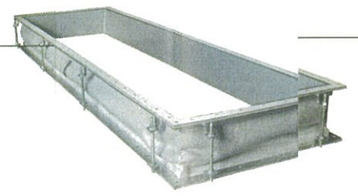
MEISEI INDUSTRIAL CO.,LTD.

Star Bellows (non-metal expansion joint)

The Star Bellows is a highly flexible yet durable non-metal expansion joint with excellent corrosion resistance properties, designed to absorb displacement of pipe ducts due to expansion/contraction and heat stress typically caused by thermal expansion, vibration and wind pressure.

- Smoke and air ducts in thermal power plants
- Ventilation and air conditioning ducts in nuclear power plants
- Smoke and air ducts in waste incinerator facilities
- Smoke and gas exhaust ducts at ironworks
- All types of ducts and flues at industrial facilities such as chemical and cement plants and shipyards

Note: Metal expansion joints should be used in locations with significant exposure to high-temperature dust particles where non-metal expansion joints may not be suitable.



Benefits of choosing Star Bellows

Design flexibility

- Readily accommodates major displacement and complex movements thanks to minimal reaction force
- Excellent durability and corrosion and heat resistance properties
- Superior vibration and sound absorption performance
- Lightweight and easy to use
- Accommodates irregular shape and aperture designs and diameters of all sizes

Economical

- Possible to shorten installation period
- Suitable for a wide variety of applications without the need for modifications to existing ducts and equipment

Low maintenance

- Repair or replace specific sections as needed
- Design to enable external inspection

Key performance specifications

Star Bellows are made from E-glass cloth fabric, which offers excellent electrical insulation, and are bulked to enhance flexibility and elongation performance.
Star Bellows use corrosion-resistant seals made from the compound material PTFE Glass Cloth, which combines the thermal resistance, mechanical strength and flexibility of glass cloth with the enhanced chemical and heat resistance properties of PTFE. PTFE Glass Cloth is lightweight and durable, and can be configured to fit a wide range of shape or size dimensions.
Key physical properties are listed below.

Glass cloth

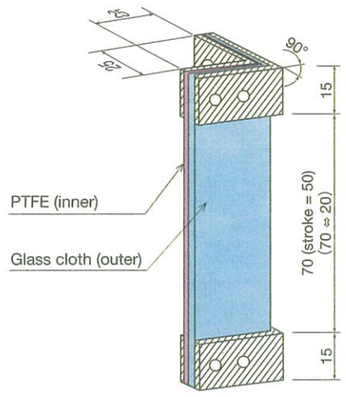
			Glass cloth
Nominal thickness (mm)			1.5
Tensile strength (N/25 mm)	Normal temperature	Vertical	1,274 minimum
		Horizontal	686 minimum

PTFE Glass Cloth

			PTFE Glass Cloth
Nominal thickness (mm)			1.4±0.3
Tensile strength (N/25 mm)	Normal temperature	Vertical	1,176 minimum
		Horizontal	980 minimum
Buckling fatigue stress (50 mm stroke x 500 repetitions)			No evidence of buckling

Seal chemical resistance

	Butyl rubber (IIR)	Neoprene rubber	PTFE Glass Cloth Teflon sheet
Diesel/gasoline	×	×	○
Benzene/toluene	△~×	×	○
Alcohol	○	○	○
Ether	△~×	×	○
MEK	○	△~×	○
Acid resistance	○	△	○
Alkaline resistance	○	○	○



NB: PTFE Glass Cloth in horizontal orientation for buckling fatigue test

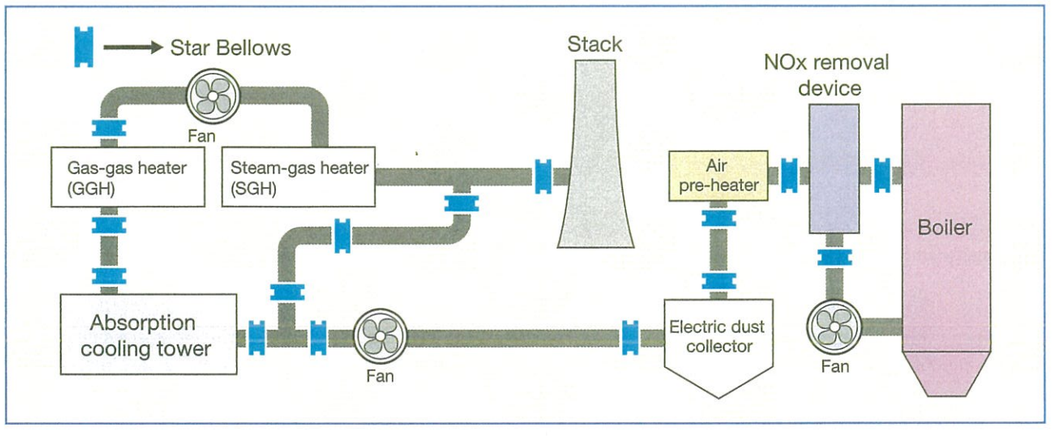
PTFE Glass Cloth sample for buckling fatigue test

○ : Little or no effect

△ : Minor to moderate effect

× : Severe effect

Typical installation in thermal power plant

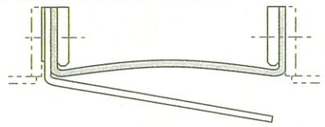


Design and materials

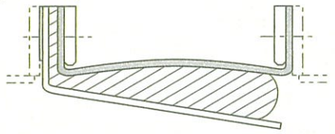
Basic design

Less than 260°C

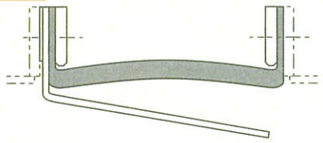
● Flow speed of 20 m/s or more



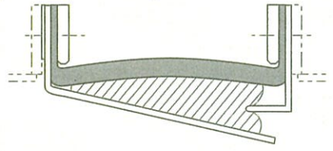
● High dust quantities



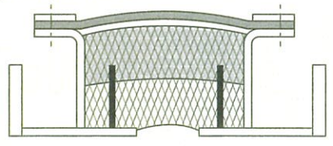
260°C and above



● High dust quantities plus vibration

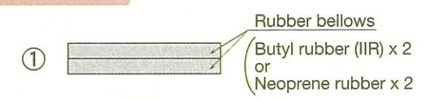


● High temperatures

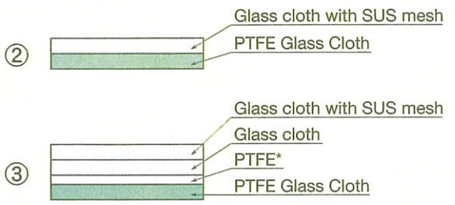


Fabric composition

100°C and below

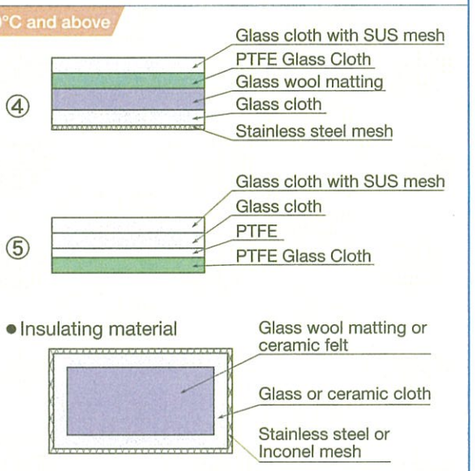


Less than 260°C



* PTFE = Polytetrafluoroethylene

260°C and above



● Insulating material

Elongation properties

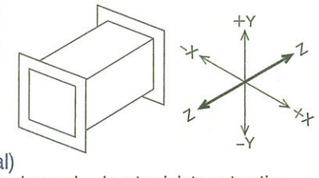
■ Z axis (horizontal) displacement

0.2 – 0.25 x effective separation between bellows faces

■ X/Y axis (orthogonal) displacement

0.2 – 0.25 x effective separation between bellows faces

Elongation conditions



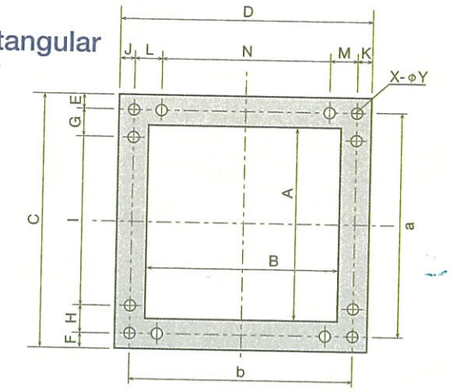
Z axis (horizontal)
+ denotes joint expansion and – denotes joint contraction

X/Y axis (orthogonal)
+ denotes movement in direction of arrow and
– denotes movement in opposite direction

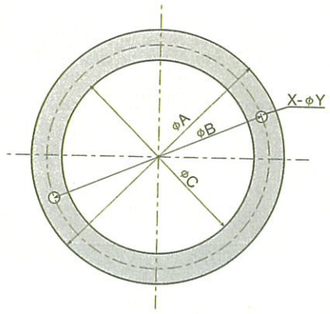
Design standards

【Flange】

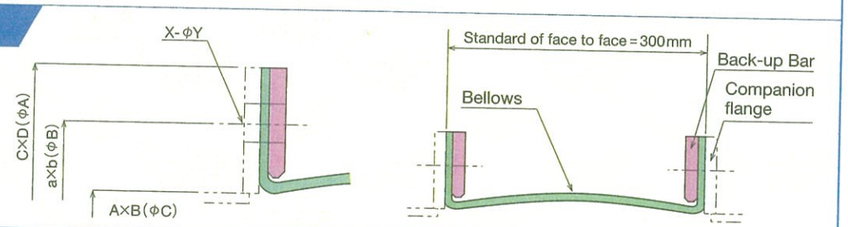
■Rectangular type



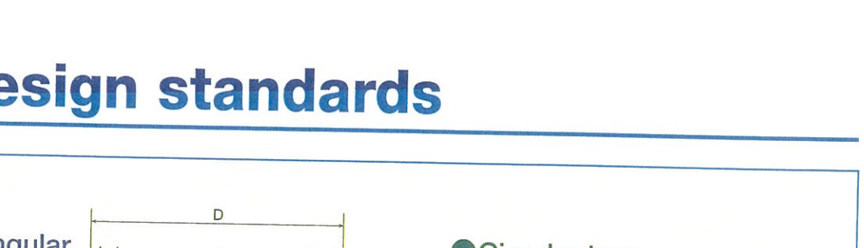
●Circular type



No sleeve

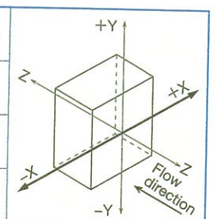


With sleeve



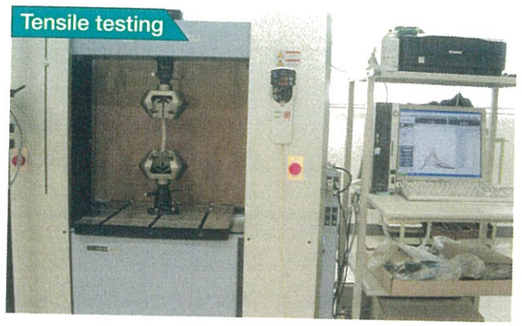
Design conditions

Flow specifications	Material							
	Dust quantity							g/m³
	Temperature	MAX.	°C	NOR.	°C	MIN.	°C	
	Internal pressure	MAX.	kPa	NOR.	kPa	MIN.	kPa	
	Internal flow rate	MAX.	m/sec	NOR.	m/sec	MIN.	m/sec	
	Vibration	Yes	·	No				
	Corrosive	Yes	·	No				
	Abrasive	Yes	·	No				
Separation between installed faces								mm
Designated temperature at bellows face		Yes · No (ambient temperature °C, surface temperature °C)						

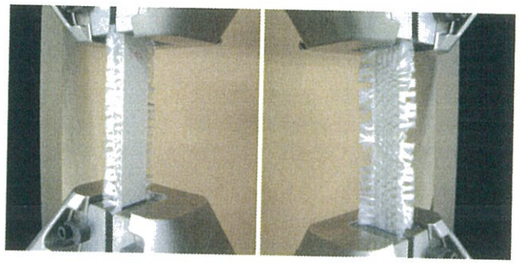
Displacement	Axial (Z axis) direction—elongation	mm	
	Axial (Z axis) direction—contraction	mm	
	Perpendicular to Z axis—X direction	mm	
	Perpendicular to Z axis—Y direction	mm	
Companion flange and duct	Flange thickness		mm
	Flange material		
	Duct thickness		mm
	Duct material		

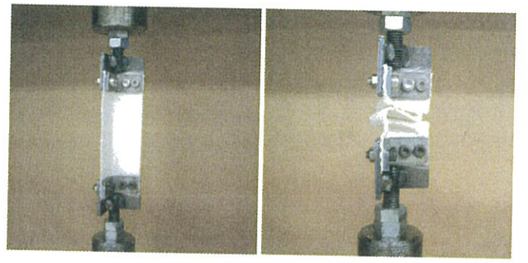
Testing equipment

Tensile testing

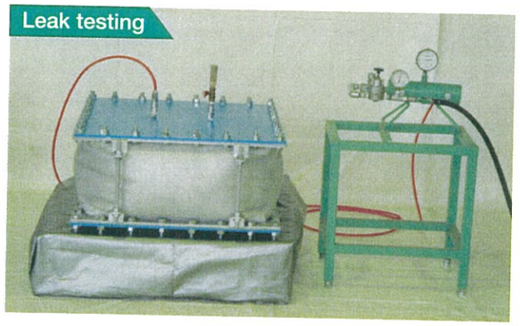


Fatigue testing

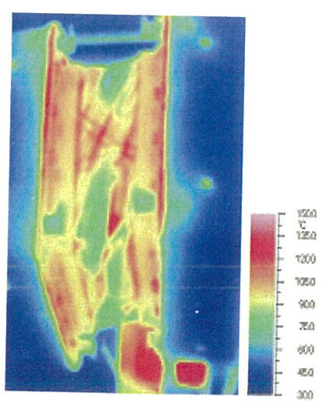




Leak testing



Temperature distribution



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