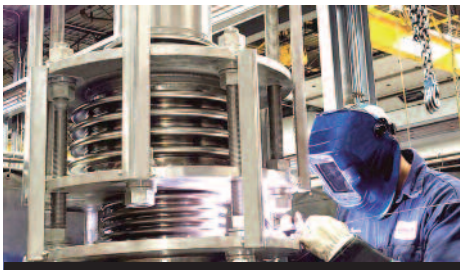
ThorburnFlex



Metallic Expansion Joints

Rubber Expansion Joints

Fabric Expansion Joints

CHEMICAL PROCESSING

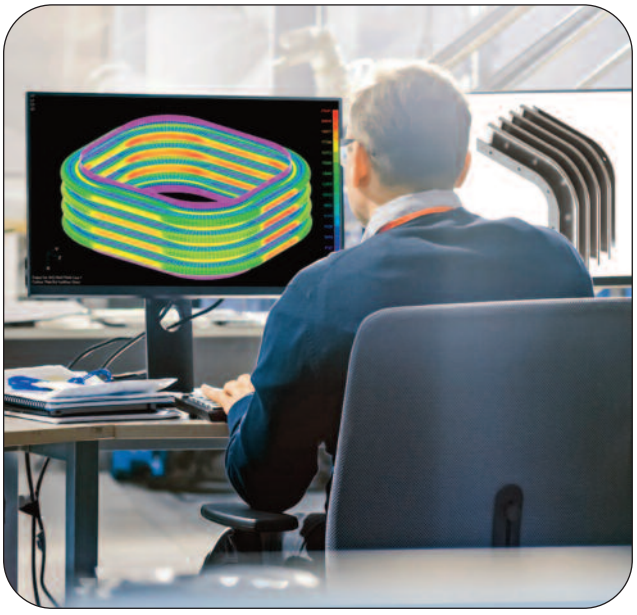
Engineered Solutions For Pipe Motion

www.thorburnflex.com

ThorburnFlex

Engineered Solutions For Pipe Motion

Thorburn Engineering & Site Services



Team Thorburn can provide answers to piping and ducting problems by performing piping stress and finite element analysis, on-site measuring the results against the actual failure mode. Our services Include...

- Quality verification of installation before start up
- On-site consultation, engineering & training sessions
- Maintenance service during shutdowns & turnarounds
- Refurbishing, retrofitting, repairing & replacements
- Guidance in the installation & maintenance
- Stress analyses to verify design

Design Tools & Capabilities

- Finite Element Analysis (FEA)
- Pipe stress analysis
- CAD & Solidworks
- 3D Modeling
- Mathcad

Engineering Capabilities & Experience

Thorburn's design engineering expertise is supported by advanced FEA software that offers powerful and complete solutions for both routine and sophisticated engineering problems. Thorburn's engineers can analyse and provide innovative solutions for pipe and duct motion problems including dynamic vibration, nonlinear static, linear static, thermal gradient through material wall thickness, acoustic impedance and fatigue using a common model data structure and integrated solver technology.

Thorburn Custom Penetration Seal Bellows

Thorburn custom metallic penetration seal bellows are used to allow tubes or pipes to thermally expand and contract without damaging the surrounding shell or pressure casing. The packing material in this joint is used to help reduce the escape of heat and gas from the boiler. Thorburn penetration seals can operate at flow temperatures up to 1400°F (760°C) and have the longest service life under design conditions and provide good insulation between the boiler wall and the attachment ring.

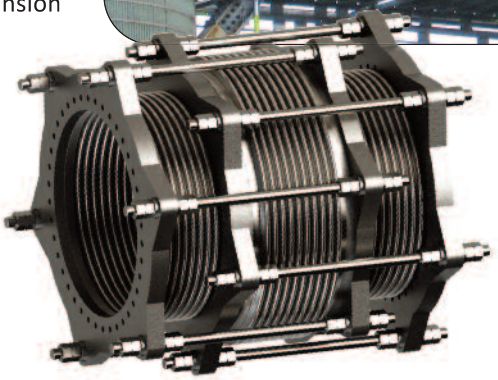
Advantages

- 100% gas-tight operation
- Accommodates axial, angular, and lateral movements
- Stainless and nickel alloys available for corrosion resistance
- Reduces stress in penetration pipe and boiler wall
- Improved boiler efficiency through reduced heat loss
- Low maintenance
- External insulation options available

Thorburn In-Line Pressure Balanced Expansion Joints

Thorburn Model IPBU in-line pressure balanced expansion joint will absorb thermal motion while eliminating the pressure thrust loads on a piping system without a change in direction of the piping. The unique design of this in-line pressure balanced joint consists of a constant volume device which is created by the addition of a balancing bellow where the difference in cross-sectional area is exactly twice the cross-sectional area of the line bellows.

By proper crosslinking, the change in volume of the line bellows, due to a change in length (i.e. compression and/or extension) can be made to cause an equal but opposite change in volume of the balancing bellows. Thus, since the volume changes are of an equal value, the pressure forces that are normally present in a piping system containing bellows expansion joints are eliminated.



Features

- Absorbs axial deflection
- Absorbs lateral deflection independently from the balancing and line bellows
- Neutralizes pressure thrust forces
- Eliminates the requirement for main anchors
- Protects sensitive equipment against detrimental pressure thrust forces

Thorburn Elbow Pressure Balanced Metallic Expansion Joints

Features

- Absorbs axial and lateral movements without imposing pressure thrust on the turbine nozzles
- Eliminates main anchors, Minimum guiding required

Thorburn's elbow expansion joint uses line and balancing bellows that are typically linked with tie rods. The balancing bellows is subjected to the same pressure as the line bellows. When there is thermal growth of the piping, the line bellows compresses. The tie rods transfer this thermal growth to the balancing bellows causing it to extend by an equal amount. Since there is no change in the volume of the system, the pressure thrust forces remain in balance. It should be noted that when the line bellows deflects laterally, there is also no volume change. The reader shall take note that the line bellows can absorb both axial and lateral motion but the balancing can only absorb axial motion.

Thorburn's custom designed pressure balanced elbow expansion joints are the ideal flexible piping solution when there is a change in direction of the piping and a main anchor cannot be installed at the change of direction and when the expansion joint must absorb axial movement and a small amount of lateral motion as it has only a single line bellows.

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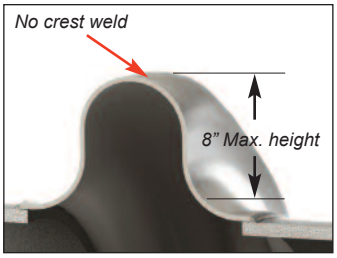
Thorburn Series AF High-Core Bellows Expansion Joints

Welding a Thorburn Series AFS single convolution lens High-Core bellows

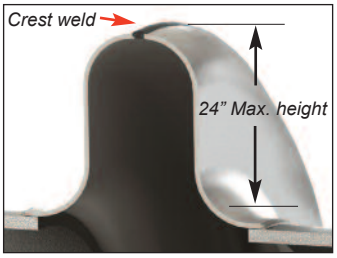
Thorburn's High-Core bellows expansion joints are used in acid plant piping systems

Thorburn's large hydroforming press making large multi-convolutions up to 4 meters with convolution heights up to 250mm (10 inches)

Thorburn High-Core Bellows Profiles



Thorburn Series AFU hydro-formed bellows



Thorburn Series AFS spun bellows

Series AF High-Core Bellows

Thorburn Series AF High-Core bellows are characterized by a higher convolution profile and a thicker ply construction than traditional bellows expansion joints. Series AF bellows are typically composed of a single or multi-convolution with a bellows height of 80mm (2") to 600mm (24"). Thorburn AF Series bellows are manufactured by a spinning process, referred as lens style bellows (Series AFS) or a hydroforming process (Series AFU). The bellows are made from a single ply thickness from 1.5mm (1/16") to 6mm (1/4"). Available with welded or flanged ends. Thorburn Series AF bellows expansion joints arefound mainly in ducting systems in acid plants and fixed tube sheet heat exchangers to accommodate thermal growth. In fixed tube sheet heat exchangers, Thorburn AF bellows are fabricated from steel plate of the same material and thickness as the shell barrel.

Advantages Over Thin Wall Bellows

- Holds up better to mechanical damage
- Facilitates weld repair
- Performs better to corrosive media attack

Industry Applications

- Acid Plants
- Iron and Steel
- Mining
- Chemical
- Power Stations
- Cement Factories

Special Applications

- Heat Exchangers

ASME Sec.VIII, Appendix 5
(circumferential welded convolutions)
ASME Sec.VIII, Appendix 26
(for U-shaped and Omega shaped bellows without circumferential welds)

Thorburn Hot-Flex™ PTFE Lined Metallic Bellows

Thorburn's Hot-Flex™ high pressure PTFE lined expansion joint system with tangent pipe combines the properties of metal and teflon into the most advanced and versatile expansion joint available in the world today

High Pressure /Temperature & Corrosive Resistant

Thorburn's Hot-Flex™ "HF" Series PTFE lined expansion joint system is designed to provide high pressure and temperature transfer containment of highly corrosive media that could not be safely handled by conventional metallic, elastomeric or PTFE expansion joints. Hot-Flex™ expansion joints combine the high pressure rating of a metallic expansion joint with the high temperature corrosion resistance of PTFE, creating a product that will outperform them both. Hot-Flex™ PTFE lined expansion joints can be custom engineered to your specific application. Available in hinged, gimbal, pressure balanced or tied universal designs.

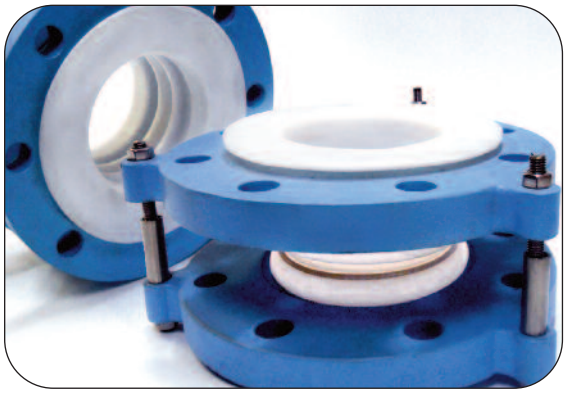
Advantages

- Protects against start-up & surge forces
- Absorbs pipe movement
- Isolates mechanical vibration
- Reduced System Noise
- Compensates Misalignment

Thorburn Model HF-LP high density ETFE (Ethylene tetrafluoroethylene) lined bellows for low permeation

Benefits

- Corrosive resistant & Anti stick
- PTFE Liner covers flange face
- Liners are spark tested
- Absorbs pipe movements and stress
- Isolates mechanical vibration
- No pigments or additives to the PTFE liner
- Reduces system noise
- Sizes from 1" to 96" (DN25 to DN2440)
- Protects against surge forces



Thorburn's Tef-Flex Model 4TF3 PTFE Expansion Joints with axial movement limiting sleeve

Optional Top Hat Liner

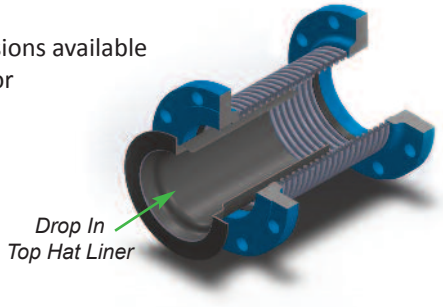
Top hat liner inserted through the Tef-Flex expansion joint is recommended when the media contains solids or the fluid velocity is high (steam).

Tef-Flex PTFE Expansion joints

Thorburn's Tef-Flex, is a molded PTFE expansion joint which has been specifically designed for piping systems requiring the transfer of corrosive medias at higher pressures and temperatures. Thorburn's Tef-Flex provides tremendous flex life and unmatched reliability. The virgin unpigmented properties of Tef-Flex increase its physical properties, adding strength, impermeability and stability at high temperatures. Only known chemicals to react with Tef-Flex are molten alkali metals, liquid or gaseous florine.

Features

- Custom sizes and face-to-face dimensions available
- Double containment 2 ply available for higher pressures
- Low spring rates
- Sizes 1" to 96" available
- Up to 10 convolutions
- Temperature up to 400°F
- Floating flange



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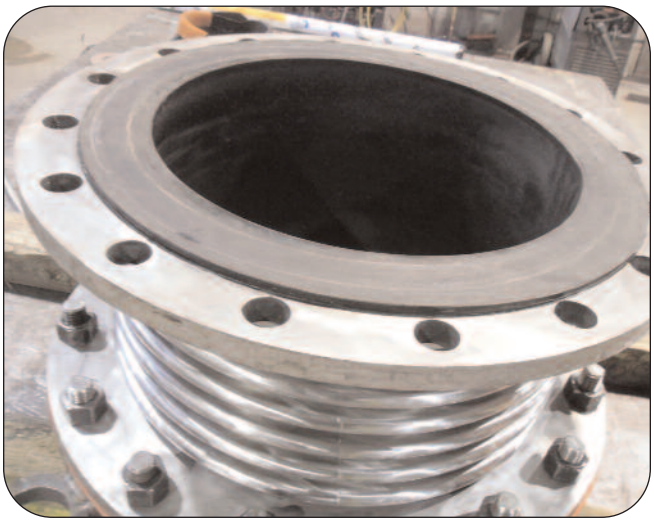
Thorburn Rubber Lined Metallic Bellows



RLB-SF Rubber Lined Metallic Expansion Joint

Thorburn Rubber Lined Metallic Expansion Joints

Full vacuum to 70 bar (1000psi), Sizes 100mm to 4000mm

Thorburn's RLB Series rubber lined metallic expansion joints are specifically designed to address pipe movement requirements in high pressure applications that exceed the capabilities of Thorburn's 42HPXX Series rubber expansion joints. Thorburn's RLB Series incorporates the security of using ASME code allowable stress values to calculate pressure containment & movement capabilities of a metallic expansion joint while combining the superior abrasion, erosion and corrosion resistance of a rubber expansion joint.

Features

- Provides smooth unobstructed flow
- Abrasive resistant to fine & coarse media
- Relieves stress in piping systems
- ASME B31.1 & B31.3 compliant
- CRN for all Canadian Provinces

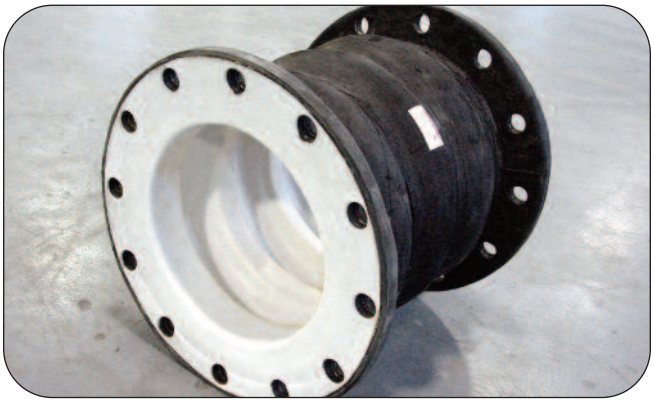
Thorburn In-line Rubber Pressure Balanced Expansion Joints

Eliminates pressure thrust loads on your piping system while absorbing axial & lateral movement. An alternative to metallic in-line pressure balanced bellows expansion joints, which are susceptible to failures from corrosive media, cyclic loading conditions and solids from settling into the thin walled metallic convolutions.

Design

- ASME B31.1, B31.3 Pressure Piping Certification
- FSA Technical Handbook 8th Edition
- Sizes 12.7mm (1/2") to 4000mm (276") ID
- Pressures full vacuum to 20 bar
- Available with CRN

Thorburn PTFE/FEP Lined Rubber Expansion Joints



Thorburn's 42HPW Series PTFE/FEP lined rubber expansion joints are specifically designed to resist corrosive attack from chemically charged media at high temperatures and pressures. Custom designs for greater movements available upon request.

Features

- Non-stick, self cleaning wide arch design
- 25% lower spring rate compared to a standard spool type
- Available with PTFE/FEP top hat liner for smooth flow
- Available in 1, 2, 3 or 4 arches
- Rated for full vacuum in all sizes
- Hand crafted by skilled builders

Flexi-Duct™ Bootflex™ Expansion Joints

Thorburn's BootFlex™ is available with integral cuff ends with clamps & flanged ends with custom bolting and backing bars

Thorburn's BootFlex™ Series BF & BFT are strong laminated seals that encapsulate a rugged helical, high tensile stainless steel spring coil (Series BF) or solid PTFE annular support rings (Series BFT). Thorburn's Bootflex™ is chemically inert (except molten alkali metals and organic halogenated compounds) and can be used on any wet or dry ducting applications including chlorine applications where permeation of chlorine molecules often corrode the metallic support coils of inferior flexible ducting hoses.

Features

- Zero porosity, lower permeation than coated products
- Stand alone temperature of -73°C to 316°C, Pressure ± 1300mm (50") H_2O
- Large amounts of axial and lateral movements 6:1 compression ratio
- Sizes from 25mm (1") to 760mm (30")
- Non-Flammable (as per Factory Mutual Test 4910)

Applications

- Clean rooms, Fume exhausting & control
- Pollution abatement
- Chemical & fossil fuel plants

Thorburn Chemical Suction & Discharge Hose Assemblies

Hose Assemblies are made with UHMWPE, XLPE, PTFE, FEP, EPDM, CSM & FKM Materials

Thorburn's premium series of rubber chemical S&D transfer hose assemblies are robust yet light weight and flexible for ease of handling, These premium hose assemblies are designed to operate under demanding full vacuum (suction) and discharge service. Thorburn's rubber chemical hoses are made from the most advanced liner materials such as UHMWPE (Ultra-High Molecular Weight Polyethylene), XLPE (Cross Link Polyethylene), PTFE (Polytetrafluoroethylene), FEP (Fluoronated Ethylene Propylene), EPDM (Ethylene Propylene Diene Monomer), CSM (Chloro-sulphonated Polyethylene), FKM (Fluorine Kautschuk Matrial) providing service for 100's of demanding chemical transfer applications. Thorburn uses a 360° crimp attachment system for all its fitting to end joints. The end materials are standard 316 stainless steel available with CMTR's for full traceability. Also available are PTFE encapsulated fitting to end joints for chemical applications that 316SS material are not compatible. All Thorburn chemical S&D transfer hose assemblies are tested to 1.5 times design pressure with a minimum 4:1 safety factor and available with a Canadian CRN for added assurance.

THORBURN FLEX - Canada
165 Oneida, Pointe-Claire, Quebec
Canada, H9R 1A9
Tel: +1-514-695-8710
Fax: +1-514-695-1321

sales@thorburnflex.com

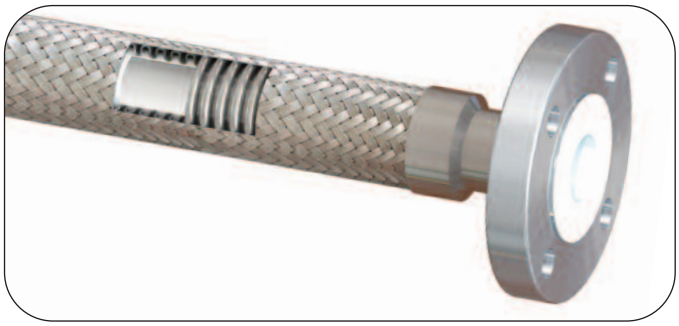
1-800-363-6613
(Toll Free North America)

European Conformity | ISO 9001 | B31.1, B31.3 | ASME "NPT" Sec. III Class 1 | ASME "U" Sec. VIII Div. 1 | N285.0, B51 CGA CR96-001 | 97/23/EC Module H | UL 536

ISCIR Romania | CNCAN Romania | EN 13480-2002 | HAF 604 China | TSG China

Other Innovative Thorburn Engineered Solutions for Pipe Motion

TR40 PTFE Hose Assemblies



59TT PTFE Lined High Pressure Swivel Flanged Hose Assembly

58TC Composite Hose Assemblies

60TMH Custom Flex-Pipe Hose Assemblies

559TW Convoluted PTFE Hose Assemblies

22TWHD High Pressure TPU Lined Lay Flat Hose Assemblies

ThorburnFlex