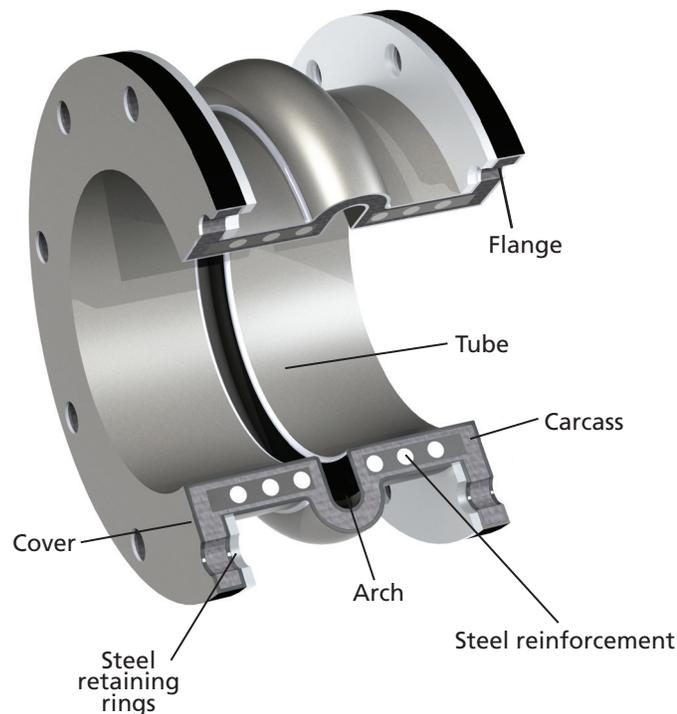


Unaflex® Expansion Joints



*Hand-craft and
precision-molded
expansion joints*

Overview



Flanges

Full-faced and made as an integral part of the joint to ensure a tight reliable seal. No gaskets are necessary. Drilled to conform to the bolt pattern of the mating pipe flange.

Tube

A single piece of leak-proof lining extending flange-to-flange. Furnished in natural rubber, neoprene, chlorobutyl, Hypalon®, Viton®, nitrile, or other compounds and can also be lined with PTFE. All rubber is specially formulated to provide maximum sound and heat insulation as well as abrasion resistance.

Carcass

Strong, bias-ply construction, high-strength woven polyester reinforcing fabric between the tube and cover. Will not rot or mildew and is impregnated with a special friction compound to give maximum adhesion under pressure, vacuum, and stress.

Arch

Arches are built-in as an integral part of the carcass. They function to provide flexibility to the joint.

Steel Retaining Rings

Made of flat-rolled steel, split, beveled and galvanized, painted, fluoropolymer coated or electroplated. Rings are required for installation of the joint.

Cover

The exterior surface of the joint, compounded of fire-retardant neoprene to withstand aging, cracking, and corrosion. Other compounds may also be used.

Steel Reinforcements

Chemically treated, solid-round, endless steel rings or wire embedded in the carcass (with the Kadant Unaflex proprietary method to prevent ring migration) giving maximum strength to the joint. Round rings are used so there will be no sharp edges to cut into the carcass while flexing of the joint occurs, eliminating premature wear.



Unaflex rubber expansion joints provide relief from stresses caused by thermal expansion and contraction in pipelines. Movement is always experienced in piping systems due to varying ambient temperatures, differences in temperature of materials handled, and differences in composition. Expansion joints absorb this movement and mitigate the risk of buckling or pulling apart.

Supreme™ Spool Type

Unaflex Supreme spool-type rubber expansion joints are available in three basic styles:

- Style 150 for pressure and vacuum
- Style 1000 for pressure, vacuum, and greater movement
- Style 200 for high-pressure service
- Style 200XL for extra high-pressure service

Unaflex Supreme tapered spool-type expansion joints are used to connect flanges with different diameters, whether parallel or offset, with initial misalignment less than 0.12".

Tapered joints can be made filled arch, sleeve ends, without arch; with special tube materials; with larger arch; with straight section on smaller end of joint to assure clearance of bolts on eccentric type joints and on joints with considerable taper.

Both concentric and eccentric shapes are available in a variety of sizes. As with the regular expansion joints, when piping is not anchored, control units must be used to prevent over-elongation of the joints.

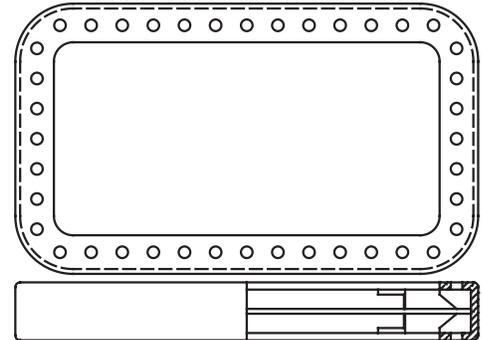
Rubber

Supreme U-Style Type

Unaflex Supreme U-style rubber expansion joints form a flexible connection between equipment outlet and inlet flanges. They are constructed of a natural rubber tube, several heavy plies of rubber or neoprene-impregnated fabric, and a neoprene cover to protect the carcass. The following configurations are available:

Rectangular (Style 145)

With internal flange (no arch) for vacuum and pressure. They allow axial and lateral movement capable of withstanding up to 30 inches of vacuum, or 25 psi. Retaining flanges are provided for support.



Oval (Style 155 and 157)

With external flange. Available in style 155 for vacuum only and style 157 for pressure and vacuum. Used in installations where external bolting is desired. Style 155 withstands up to 30 inches of vacuum with standard flat steel retaining rings. Style 157 is designed for both 30 inches of vacuum and up to 25 psi and are designed with steel fabricated support rings.

Round (Style 156 and 185)

Lightweight rubber expansion joints available in style 156, U-type, no arch, for vacuum only; style 185, round U-type, no arch, steel reinforced for vacuum and pressure. Style 156 body is of duck and rubber without metal reinforcing. Style 185 is constructed with steel reinforcement. These units can also be supplied with offset features.

Mighty-Span™ Type

Unaflex Mighty-Span style 600 rubber flue duct expansion joints are designed to handle hot air or gases in industrial duct work and fluids produced by power plant and pollution control equipment. They are custom constructed of rubber and fabric to absorb thermal movements and vibration in duct work and to aid in the elimination of noises caused by scrubber equipment and mechanical dust collectors.

Mighty-Span joints are capable of handling large movements which might occur in a ducting system due to thermal expansion. Mighty-Span joints create almost no load on damper and fan interfacing flanges.

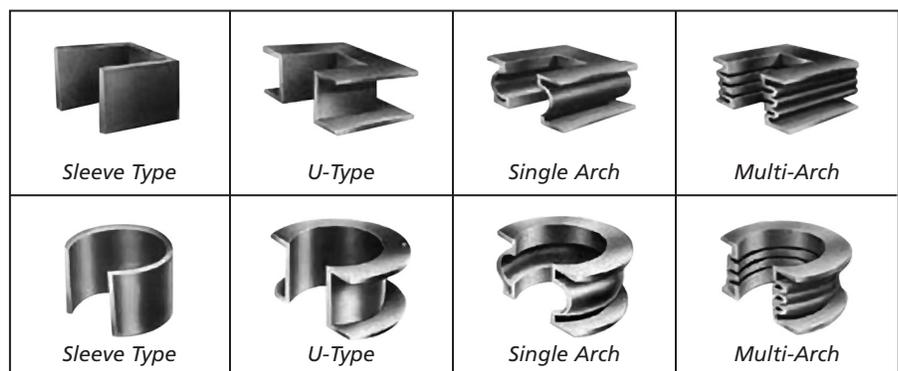
A wide range of elastomers and fabric substrates are available to provide resistance to corrosion and high temperature as well as white FDA food grade elastomers.

Configurations:

- Square, rectangular, or round in any size. Standard construction is U-shape, 9" face-to-face, 3" flange.
- Arch shapes also available. One-piece body 5/16" thick. Steel retaining rings are provided.

Choice of material:

- Fabric reinforcement
- Style 600 joints may be constructed of Nomex® (to 400°F), fiberglass, or polyester cloth impregnated



Unasphere Type

Unaflex Unasphere style 800 expansion joints are precision molded of neoprene and tire cord. These units require less force to move than conventional joints, allowing maximum deflection, elongation, and compression. The design is stronger than other configurations because of the spherical shape. The smooth flow arch reduces turbulence and allows quiet flow without sediment build-up. All three styles available in EPDM, Buna-N, neoprene, and butyl. Also available in the following sizes – 1", 1¼", 1½", and 14".

Design data:

Vacuum: 26" Hg

Operating Pressure: 225 psig

Temperature: -65°F to 300°F (depending on elastomer)



Twin-Sphere Style 802

The Twin-Sphere joint is precision molded of neoprene and nylon tire cord. The double arch design allows for greater movement four different ways and provides for a non-turbulent flow. Angular movement up to 30° is obtainable with its highly flexible design. Rated for 225 psig WP at 170°F. Pressure is reduced at higher temperatures. Vacuum rating to 26" Hg.



Twin-Sphere Style 803

The economical style 803 expansion joint is available for smaller diameter piping systems found in power plants, chemical plants, waterworks, sewage treatment plants, and private residences. The Twin-Sphere joint provides vibration absorption and stress relief in a light, compact construction.

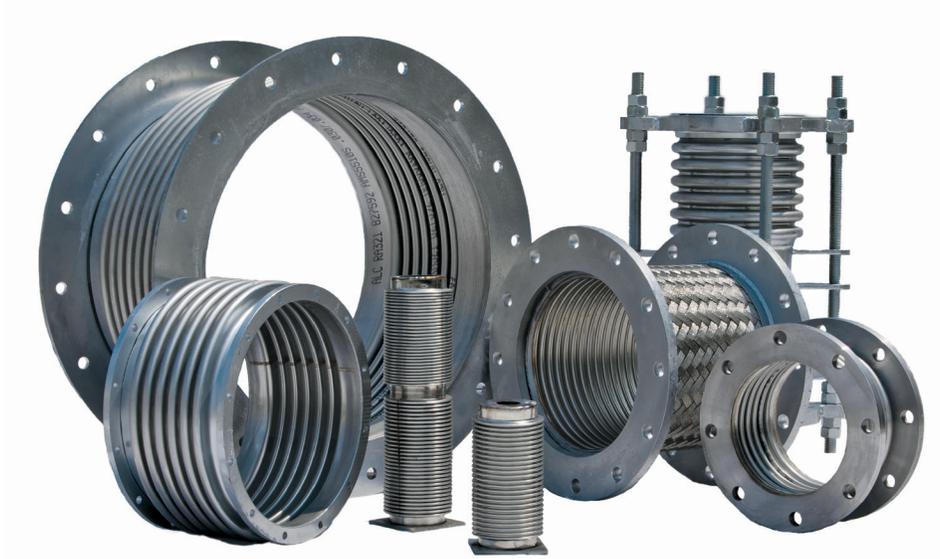
Operating pressure: 150 psig

Vacuum rating: 15" Hg

Available in ¾", 1", 1¼", 1½" and 2"



Metal



Unaflex Matchless™ bellows are manufactured from solution annealed 321SS sheet rolled into a tube and seam welded. Multi-ply bellows can be designed and manufactured based on the application and design requirements. Kadant Unaflex has a wide variety of materials available to design and manufacture bellows.

Kadant Unaflex has the most commonly used bellows materials and thicknesses in stock to serve our customers faster. Kadant Unaflex Matchless bellows conform to the latest EJMA standards.

Overall lengths of standard assemblies are based on Class 150 drilling for both plate flange and raised face slip-on flange thicknesses. Overall length may change if other types of flanges are requested. Overall lengths of the SHP and LHP series are based on raised face slip-on flanges.



Fixed Plate Flanges–Type 44

Unaflex type 44 expansion joints are provided with Class 150 drilling carbon steel flanges (AWWA Class D C207) fixed on each end of the expansion joint. Bellows necks are welded directly to the flanges.

Floating Plate Flanges–Type 66

Unaflex type 66 expansion joints are provided with Class 150 drilling carbon steel flanges (AWWA Class D C207) floating on each end of the expansion joint. Bellows necks are flared (Vanstone) to retain the flanges. The floating flange arrangement allows use of carbon steel flanges when all wetted materials are required to be either stainless steel or an alloy material. Floating flanges also permit bolt hole alignment in the field.

Weld Ends–Type 22

Unaflex type 22 expansion joints are provided with carbon steel weld ends on each end. Weld ends are beveled per ANSI standards. Schedule 40 pipe is used through 24" ND and 1/4" wall thickness for sizes over 24" unless otherwise specified.

Raised Face Slip-on Flanges–Type 55

Unaflex type 55 expansion joints are provided with Class 150 drilling or Class 300 drilling carbon steel raised face slip-on flanges.

Pressure-Balanced and Dual Expansion Joints

Kadant Unaflex custom designs and manufactures expansion joints based on your needs and requirements of the system. Some commonly used non-standard expansion joint types are:

Dual Expansion Joints

Dual expansion joints are used where axial movement is larger than can be absorbed by a single expansion joint. The dual assembly consists of two single bellows connected by an interconnecting weld end. In some cases, this interconnecting weld end has an integral anchor base. The anchor base is designed to withstand the forces required to move either bellows but not for pressure forces. When no anchor base is used, interconnecting weld end must be anchored with standard pipe anchors.

Dual expansion joints can also be used where large movement in any combination (i.e. axial, lateral, and angular rotation) is required which cannot be absorbed by a single expansion joint. In this type of application, the interconnecting weld end is not anchored, but the remaining system must be properly anchored and guided.



Elbow Pressure Balanced Unit

Matchless elbow pressure-balanced expansion joints are designed to absorb axial and/or lateral deflection while continuously restraining pressure force. Balance (out-of-line) bellows create an equal and opposite force to the working (in-line) bellows.

The typical arrangement (as shown) is to have a balance side and a working side separated by an elbowed mid-section. Tie-rods are used to balance and restrain pressure forces.



Additional Types of Metal Expansion Joints Available

- Gimbal expansion joint
- Hinge expansion joint
- In-line pressure balanced expansion joint
- Externally pressurized
- Expansion joints with pantograph linkage
- Expansion joints with two-ply testable bellows
- Jacketed expansion joints

Fabric

Therma Flex™ expansion joints are non-metallic flue duct expansion joints or flexible connectors which provide stress relief for piping and ducting systems by absorbing thermal growth and shock, isolating mechanical vibration, and allowing for misalignments.

Flue duct expansion joints are custom-engineered designed to handle low pressure applications with temperatures from -40°F to 2000°F. The expansion joints are manufactured using innovative non-metallic materials and designs.

Features of Fabric Expansion Joints

- Absorb axial, transverse, and torsional movements
- More movement in shorter face-to-face
- Less force to flex than metal expansion joints
- Excellent corrosion and chemical resistance
- Temperature capability range (-40°F to 2000°F)
- Variety of flexible belt materials
 - ▶ Single-layer and composite belts
 - ▶ Elastomers have excellent abrasion resistance
 - ▶ Custom designed for each specific application



Product Applications

Industrial applications can be separated into general categories based on the media composition (air or gas) and temperature. This section is designed to aid in the selection of the appropriate expansion joint for the specific application range. All plants are unique; therefore, the service locations and temperatures may vary.

Ambient Air Services (-40°F to 400°F)

Ambient air temperature clean air without particulate or chemicals to damage the flexible element. Expansion joint is used frequently for vibration and sound attenuation from fan equipment.

Locations for use:

- FD Fan intake/outlet
- Primary air fan to air heater
- Service air intakes
- Primary air to recovery boiler

A Kadant Unaflex integrally flanged elastomeric joint is suggested, using either the Therma Flex or Mighty-Span expansion joint styles. Neoprene, EPDM, or Viton® single layer belts are frequently used.

Hot Air Services (500°F to 800°F)

Clean air coming into contact with hot flue gases at the air pre-heater where temperatures are elevated with minimal particulate and or gas carryover. Expansion joint will see thermal movements and vibration. Elevated temperatures require a composite flexible element and a flow liner.

Locations for use:

- Air heater/air outlet
- Over fire air fans
- Secondary air fan
- Mill air

A Therma Flex flat composite belt with a bolt-in or weld-in frame design and a flow liner is suggested.

Moderate Temperature Flue Gas Services (150°F to 600°F)

Flue gas which has passed through an air pre-heater and dust collector to reduce the temperature and particulate level. Flue gas may cycle near the dew point where condensation can occur, and chemicals are present. Expansion joint may see thermal movements, vibration, and chemical attack.

Locations for use:

- Precipitation outlet
- I.D. Fan inlet/outlet
- Scrubber inlet/outlet
- HRSG inlet/outlet
- Re-heater inlet/outlet

A single-layer belt with chemical barrier is suggested in either integrally flanged or flat belt type. Such as the Therma Flex weld in outboard angle frame design and PTFE coated single layer belt with gas film layer.

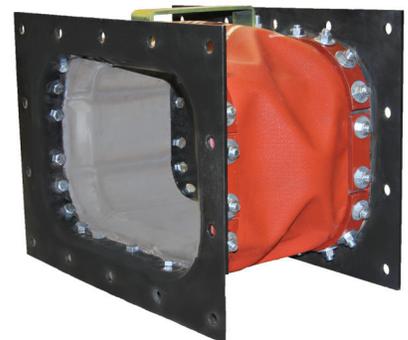
Hot Flue Gas Services (600°F to 1200°F)

Flue gas directly after combustion stage at elevated temperatures with possible particulate present. Expansion joint is used for large thermal movements at elevated temperatures.

Locations for use:

- Economizer outlet
- Cyclone inlet/outlet
- Precipitation inlet
- Recovery boiler outlet
- Air heater gas inlet/outlet
- Gas recirculation system

Therma Flex high-temperature composite flat belt style setback frames, cavity pillow, and flow liners are suggested.



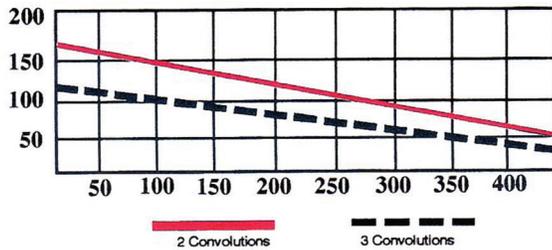
PTFE



Multi-Purpose PTFE Joints

Unalon™ PTFE molded expansion joints were developed to withstand higher pressures and temperatures. The design allows a shorter face-to-face dimension, making them ideal for use where space is limited. They are lightweight and corrosion resistant. Available in sizes from 1" to 12" and for temperatures from -300°F to 400°F.

Unalon Performance Curve of Working Pressures vs. Operating Temperatures



Vacuum Service Maximum Temperature for Full Vacuum (29.9 Hg)	
Two Convolutions	
1" to 6"	400°F
8" to 10"	250°F
12"	150°F
Three Convolutions	
1" to 4"	400°F
5" to 6"	300°F
8" to 12"	125°F

Note: For greater pressure or safety requirements than shown, Viton® and Kevlar® overlays are available. Optional flow liners are available in PTFE, elastomeric, stainless steel, and nickel alloys. Vacuum support rings can be added in the crest of the convolution for full vacuum at 400°F for sizes 6" and larger. Support rings can be manufactured from various types of stainless steel, tantalum, and nickel alloys.

PTFE-Lined Rubber Joints

Dura-Perm FEP-lined expansion joints combine the features of FEP/PTFE for chemical resistance, anti-stick properties, thermal stability, and resistance to age cracking. Dura-Perm expansion joints are designed for noise and vibration dampening, flexibility, and high-pressure ratings. Temperature ratings to 400°F available. Sizes of 1" to 48" in standard face-to-face dimensions or special lengths.



1/2"-12" are PTFE-lined
14" and above are FEP-lined

PTFE-Lined Metal Joints

The Unalon 9500 series is a metal expansion joint that combines the properties of metal and PTFE into an advanced and versatile expansion joint.

The Unalon 9500 series will:

- Absorb pipe movement and stress
- Isolate mechanical vibration
- Reduce system noise
- Protect against surge forces



Unlike ordinary solid PTFE or elastomeric expansion joints, should up-set conditions exceeding 500°F occur, Unalon series 9500 will maintain its pressure carrying capacity up to 1200°F, adequate time for system shut-down and replacement.

Safety

The Unalon 9500 series PTFE or FEP tubes are formed into a stainless steel, Inconel®, Monel®, or Hastelloy® corrugated tube.

Note: For environmentally corrosive applications, laminated (multi-ply) bellows as well as the optional features listed below are available.

- Highly corrosive chemical-petrochemical systems
- Abrasive industrial process piping systems
- Power generating and waste water treatment plants
- Pulp and paper systems and marine services
- Pollution control systems

Optional testing procedures:

- Radiography of longitudinal bellows seam weld
- Positive Material Identification (PMI) of bellows

Optional coatings:

- Four-part epoxy coating for flanges
- Fluoropolymer coated flanges, threaded rod, and nuts

Standard testing procedures:

- Dye penetrant test of all pressure boundary welds
- Spark test at 30,000 volts
- Hydro test at 1.5 times the design pressure for 10 minutes

Optional features:

- Special flange construction, configuration and materials
- Internal vacuum rings for full vacuum service constructed of stainless steel, nickel alloys, and tantalum
- Protective covers available in stainless steel and nickel alloys
- Internal flow liners available in stainless steel, nickel alloys, and PTFE

Working temperature from -300°F to 400°F. Working pressure: 50, 150, and 300 psig.

Related Products



Flexible Pump Connectors

Kadant Unaflex Master™ flexible metal pump connectors are designed with a flexible core of corrugated 321 or 316 stainless hose under a 304 stainless steel braid. Flat-face flanges are standard, however, other types (150# R.F.S.O, 300# R.F.S.O flanges, stainless, metric flanges, male nipples) are available. A wire braid is used over the flexible core on most designs to provide strength for the rated operating pressure. PTFE lining is also available.



Corrugated Hose

Kadant Unaflex flexible metal hoses are designed as general, all-purpose hose for conveying liquids and gases. They are available in stainless steel types 304, 321, and 316/316L or series B-bronze.



Industrial Hose

Custom-engineered and hand-built flexible hose for a variety of industrial applications including high-pressure FDA compliant sanitary hose, chemical hose, air hose, petroleum hose, brewers hose, and material handling hose. Lengths available up to 500 feet and diameters up to 28”.

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Dimensions are for reference only and subject to change.

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Kadant is a global supplier of high-value, critical components and engineered systems used in process industries worldwide.

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